School District of Manawa

Special Board of Education / Buildings & Grounds Meeting Agenda
June 26, 2019

Enter LWJr./Sr.HS @ Door H20 at the Back of the Building Near the Art Room; Follow Signs to the Library Entrance

1. Call to Order – President Johnson – **5:30 p.m.** – **Little Wolf Jr./Sr. High School Library - 515 E. 4th St.**
2. Pledge of Allegiance
3. Roll Call
4. Verify Publication of Meeting

5. Unfinished Business:
    a. Consider Approval of the Hire of a 1.0 FTE Elementary Teacher for Gr. 1, Casey Johnson for the SY1920 as Presented

6. New Business:
    a. Accept Resignation from Sandi Anderson, Food Service Employee as Presented
    b. Consider Approval of the Pollution Insurance Recommendation as Presented
    c. Presentation on Interior Design - Jody Andres, Hoffman Planning, Design & Construction
    d. Building Project Progress Update - Hoffman Planning, Design & Construction
    e. Consider Approval of Construction Documents for Bid Package #2 as Presented
    f. Consider Approval of PSI Proposal for Football Field Soil Borings

7. Next Meeting Dates:
    a. July 6, 2019 - Notice of BOE Participation in Manawa Rodeo Parade - District Float
    b. July 8, 2019 - Finance Committee Mtg – 5:00 p.m. – LWHS Library
    c. July 8, 2019 – Curriculum Committee Mtg – 6:00 p.m. – LWHS Library
    d. July 15, 2019 – Policy & Human Res. Committee Mtg – 5:00 p.m. – LWHS Library
    e. July 22, 2019 – Regular BOE Mtg – 7:00 p.m. – LWHS Library
    f. Aug. 5, 2019 - Student Registration & Picture Day - BOE Photo 9 a.m. to 7 p.m. LWHS Commons
    g. **Tentative** Aug. 8, 2019 - BOE/Administrator Retreat - 7:00 p.m. - MES Board Room
    h. Aug. 12, 2019 – Mental Health Community Meeting – City Hall Mtg Room 7:00 p.m.
    i. Aug. 14, 2019 – MS/HS Project Groundbreaking – 5:30-6:00 p.m.
    j. Aug. 19, 2019 – Regular BOE Mtg – 7:00 p.m. – HS Library
    k. Aug. 20, 2019 MES Site Project Grand Opening & Ribbon Cutting – 6:00-6:30 p.m.

8. Adjourn

PLEASE NOTE: Any person with a qualifying disability under the Americans with Disabilities Act that requires the meeting or material to be in accessible format, please contact the District Administrator to request reasonable accommodation. The meeting room is wheelchair accessible.

MANAWA

Students choosing to excel; realizing their strengths.

To: Dr. Melanie Oppor
From: Michelle Pukita
Date: June 7, 2019
Re: Recommend Hire for 1.0 FTE First Grade Teaching Position

The purpose of this memo is to formally recommend Casey Johnson for the 1.0 FTE first grade teaching position for the 2019-20 school year pending Mr. Johnson's passing of the Foundations of Reading Test and obtaining DPI Licensure.

Mr. Johnson received his Bachelor of Arts Degree majoring in Middle Childhood through Early Adolescents and Physical Education.

Mr. Johnson was born and raised in Manawa. Mr. Johnson did his first student teaching placement at Quest Elementary School, Ripon, WI, Grade 5, from August 2018 through October 2018. Mr. Johnson did his second student placement at Waupun Jr./Sr. High School, Waupun, WI, Physical Education, from November 2018 through January 2019. Mr. Johnson began subbing for the School District of Manawa starting March 2019, including being a long-term special education substitute teacher for Manawa Elementary School from April 2019 through May 2019.

Mr. Johnson has experience with teaching in a project-based learning environment in the Quest Elementary School placement. Mr. Johnson has experience with Lucy Calkins Reading, Lucy Calkins Writing and Math Expressions through his subbing experiences.

Mr. Johnson expressed through the interview process that he wants to give back to the community. Mr. Johnson wants the students, here in Manawa, to succeed. The Director of Teacher Education for Ripon College describes Casey as intelligent, passionate, and committed. The Director also describes Casey as being a team player and collaborating with his peers.

There was a total of 7 applicants that applied for the job. Two out of the seven applicants did not return phone calls for an interview. Four applicants interviewed for the position. Mr. Johnson had a great deal of enthusiasm, very positive, and very eager to be a teacher for the School District of Manawa. Mr. Johnson will complement the MES team.

School District of Manawa

"Students Choosing to Excel, Realizing Their Strengths"

800 Beech Street | Manawa, WI 54949 | (920) 596-2525

District Fax (920) 596-5308 | Elementary Fax (920) 596-5339 | Jr./Sr. High Fax (920) 596-2655

www.manawaschools.org

June 7, 2019

Casey A. Johnson
E7586 Symco Rd.
Bear Creek, WI 54922

Dear Mr. Johnson:

The purpose of this letter is to confirm the offer of employment made to you to teach in the School District of Manawa (the "District") for the 2019-2020 school year. If you intend to accept the offer of employment, please sign and return a copy of this letter to Dr. Melanie Oppor, District Administrator, on or before June 10, 2019. Failure to return a signed copy of this letter to Dr. Oppor on or before June 10, 2019 shall be deemed notice that you do not intend to accept the offer of employment.

Please be advised that the Board of Education intends to take up the issue of your employment at a scheduled meeting on June 17, 2019. In the event the Board of Education approves your employment for the 2019-2020 school year, you will be issued an Individual Teaching Contract for the 2019-2020 school year.

Any Individual Teaching Contract issued to you for the 2019-2020 school year is subject to the provisions of Sections 118.21 and 118.22, Wis. Stats., the rules, regulations and policies of the Board of Education, now in effect or becoming effective during the 2019-2020 school year. You will be expected to abide by and comply with the same.

Be advised that all school programs offered in the School District of Manawa are regularly reviewed, with recommendations regarding program changes and staffing made to the Board of Education. Because of enrollment fluctuations, program changes, budgetary constraints or other unknown factors and conditions, it may be necessary for the District to modify assignments, add positions or reduce/eliminate positions. Should program changes result in a change in your status, you will be notified as soon as possible.

Sincerely,

Melanie J. Oppor

Dr. Melanie J. Oppor
District Administrator

It is my intent to accept employment with the School District of Manawa for the 2019-2020 school year, subject to any Individual Teaching Contract.

Casey Johnson 6-7-19

Signature Date

Dr. Melanie J. Oppor	Daniel J. Wolfgram	Michelle Pukita	Carmen O'Brien	Danielle Brauer
District Administrator	Jr./Sr. High School Principal	Elementary Principal	Business Manager	Curriculum/Special Ed. Dir.
moppor@manawaschools.org	dwolfgram@manawaschools.org	mpukita@manawaschools.org	cobrien@manawaschools.org	dbrauer@ manawaschools.org
(920) 596-2525	(920) 596-5800	(920) 596-5700	(920) 596-5332	(920) 596-5301

6-14-2019

Brenda Suehs
Manawa High School
800 Beech Street
Manawa, WI 54949

Dear Brenda:

The purpose of this letter is to resign from my employment with the Manawa School District. My last day will be 6-14-2019.

Best wishes for the future. Please call on me if there is anything I can do to help ease the transfer of my work or to aid a future employee with any questions about my job duties.

Regards,

Sandi Anderson

Sandi Anderson
E7309 Doud Road
New London, WI 54961
(920) 982-7113

MANAWA

Students choosing to excel; realizing their strengths.

To: Board of Education
From: Carmen O'Brien
cc: Dr. Melanie Oppor
Date: 6/14/2019
Re: Pollution Insurance recommendation

Recommendation:

I recommend that the Pollution Insurance for the 2019-20 referendum construction projects be purchased through Willis Towers Watson from Great American.

Rationale:

The construction agreement with Hoffman Planning, Design & Construction indicated that the School District of Manawa would purchase pollution insurance for the referendum construction project. When I contacted Ansay, the District insurance broker, our broker indicated that they did not have contacts for this type of insurance. Hoffman recommended Willis Towers as a possible agent to purchase pollution insurance from.

Pollution insurance covers the project for claims that are related to pollutants that could cause illness or harm. For example, it covers claims for mold, Legionella pneumophila bacteria, toxic chemicals, and other pollutants. In the past, each subcontractor would have to carry this insurance privately. It has been found to be more efficient and cost effective to have the project covered by the owner rather than each subcontractor passing that charge on to the owner.

Willis Towers Watson requested bids from four different companies. Only Navigators, Great American, and Ironshore responded. Ironshore did not have a complete bid and was therefore eliminated as a provider. Between Navigators and Great American, both are reputable and have equitable coverage according to the broker. Great American is the low bid and the company I am recommending.

Table of Contents

Marketing Summary **1**
Financial Summary **1**
Commission Disclosure 1
Payment Terms 2
Coverage Summary **3**
Subjectivities **6**
Direction for Binding **7**
Important Notices **8**
Surplus Lines 8
Appendix A – Brokerage Terms, Conditions & Disclosures **9**
Appendix B – Carrier Quotations **17**

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Willis Towers Watson

School District of Manawa – Project Specific Contractors Pollution Liability

Marketing Summary

Thank you for the opportunity to market your insurance requirements. The results of our negotiations with the carriers we approached are summarized below. This proposal is presented in conjunction with the Brokerage Terms, Conditions & Disclosures for US Property & Casualty Retail Accounts which is enclosed.

Carrier Name	Intermediary Name	Line of Business	Response	Premium	Comm.
Navigators	N/A	Owner Controlled Project Pollution Liability	Quoted	See below	15%
AIG	N/A	Owner Controlled Project Pollution Liability	Indication	$24,242 premium with $25,000 deductible	15%
Ironshore	N/A	Owner Controlled Project Pollution Liability	Indication	$14,000 premium with $25,000 deductible	
Great American	N/A	Owner Controlled Project Pollution Liability	Quoted	See below	15%

Financial Summary

Item	Navigators	Great American	Ironshore
Limit – Operational Pollution Liability	$3,000,000 each incident $3,000,000 aggregate	$3,000,000 each incident $3,000,000 aggregate	$3,000,000 each incident $3,000,000 aggregate
Deductible	$25,000	$25,000	$25,000
Environmental Crisis Management	Limit - $50,000 each incident $50,000 aggregate	Limit - $50,000 each incident $50,000 aggregate	
Project Term	2 years	2 years	2 years
Completed operations coverage	Statute of limitations – 7 years in Wisconsin	Statute of limitations – 7 years in Wisconsin	Statute of limitations – 7 years in Wisconsin
Premium	**$19,570**	**$15,155**	**~ $14,000** (Indication Only)
Optional terrorism premium	$196	TBD (likely ~ $150)	
Surplus Lines Tax (3% in WI)	$587.10	$454.65	$420
Revenue / Contract Value base	$12,365,000	$12,365,000	$12,365,000
Rate per $1,000 revenue	$1.58	$1.23	$1.13
Minimum earned premium	100%	100%	
Quote expiration	6/15/2019	6/15/2019	

Please let us know if you would like a copy of any quote not included in this Proposal.

Commission Disclosure
Willis Towers Watson negotiates commission rates with certain insurers on a corporate level. If the rate on your placement is lower than the negotiated rate, Willis Towers Watson will collect the difference directly from the insurer. These payments will not increase the cost of your insurance or otherwise impact your premium or rates. Details of these arrangements where there is compensation beyond the base

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compensation detailed in your Quote Proposal can be found at:
http://www.willis.com/About_Willis/The_Willis_Way/Commission_Rates/.

Payment Terms
Please review the premium payment terms as set forth in this proposal. We will not be responsible for any consequences that may arise from any delay or failure by you to pay the amount payable by the indicated date.

Coverage	Carrier	Agent or Carrier Billed	Payment Plan
Project Pollution	Navigators	Agent	Full Term Premium
Project Pollution	Great American	Agent	Full Term Premium
Project Pollution	Ironshore	Agent	Full Term Premium

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School District of Manawa – Project Specific Contractors Pollution Liability

Coverage Summary

	Great American	Navigators
Who is an Insured Section includes the following as named insureds	Who is an Insured includes the first named insured, scheduled additional insureds, any present or former director, officer, partner, member, employee, leased or temporary worker of the FIRST NAMED INSURED or any ADDITIONAL NAMED INSURED, while acting within the scope of his/her duties as such	Who is an Insured includes the first named insured, project contractors, employees, officers and directors of the first named insured & project contractors, and project owners or any other person or entity listed in a schedule of additional insureds
Owner Controlled Insurance Program (OCIP) Endorsement, Includes:	• Each of the following entities are Additional Named Insureds: All contractors and subcontractors at all tiers, but only with respect to the performance of covered CONTRACTING SERVICES	• Project Owner is a named insured but solely with respect to liability arising out of "your work"
	• CONTRACTING SERVICES means any contracting services stated in the Declarations or scheduled as such onto this Policy by an endorsement issued by the Company, performed by or on behalf of the FIRST NAMED INSURED at a PROJECT SITE	• Project Contractors are included as named insureds solely with respect to liability arising of "your work"
	• PROJECT SITE defined as: Little Wolf Jr./Sr. High School & Manawa Elementary School – Manawa, WI 54949 • CONTRACTING SERVICES are defined as: "All construction services associated with Hoffman Planning, Design & Construction, Inc. Project # (TBD) for the School District of Manawa	• "Your work" is defined as: a) "work or operations performed by a "project contractor" for the "project owner." b) Materials, parts or equipment furnished in connection with such work or operations noted in paragraph a above c) "Transportation" and "wrongful delivery" d) Use of a "waste disposal facility" by a "project contractor" for the "project owner"
Amended "insured vs. insured" exclusion	Yes, allows claims that arise out of an indemnification given by one INSURED to another INSURED as specified in a contract that was	Yes, allows claims brought by project owner (the first named insured) against a project contractor,

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School District of Manawa – Project Specific Contractors Pollution Liability

	Great American	Navigators
	submitted and approved by the Company and added to this Policy by endorsement; or made by the FIRST NAMED INSURED against another INSURED	and to allow claims brought by a scheduled additional insured against a project contractor
Responsible insured amendment endorsement – Responsible insureds are the ones who must report a claim if they have knowledge of an incident	Responsible insureds include the Corporate General Counsel, Risk Manager or equivalent roles of the FIRST NAMED INSURED; or the manager, foreman, or supervisor of the FIRST NAMED INSURED responsible for environmental or health and safety affairs, control or compliance	Solely with respect to the First Named Insured, **Responsible Insured** means owners, executive officers, or an individual acting in a capacity as Vice President of Operations
Primary and Non-contributory insurance endorsement	Yes, included in the definition of insured amendatory endorsement	Yes, included in additional insured endorsement
Definition of Pollutant Amendatory Endorsement	Definition of pollutants includes any solid, liquid, gaseous or thermal pollutant, irritant or contaminant, including but not limited to smoke, vapors, odors, soot, fumes, acids, alkalis, toxic chemicals, hazardous substances, petroleum hydrocarbons, waste materials, including medical, infectious and pathological wastes, legionella, electromagnetic fields, silica, lead, asbestos, organic or inorganic pollutants, silt, sediments, MOLD MATTER and low-level radioactive waste and material	Definition includes Legionella pneumophila, bacteria, viruses and fungus
Modified “damage to your work” exclusion.	No exclusion in form	Yes, Exclusion is modified to ONLY exclude “damage to that particular part” to real property on which your work is being performed
Choice of Law and Jurisdiction	Choice of law and Jurisdiction and venue – condition deleted – allows for claims to be adjudicated in the of choice by the various parties	
Known Conditions Exclusion	Yes – known conditions exclusion however there is coverage for LOSS or CLEAN-UP COSTS incurred due to the inadvertent exacerbation of any such known or reported POLLUTION CONDITION, but only if such inadvertent exacerbation occurs during the performance of CONTRACTING SERVICES	

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School District of Manawa – Project Specific Contractors Pollution Liability

	Great American	Navigators
Non-owned disposal site coverage included	Yes	Yes
Blanket coverage for all contractors working on site	Yes	Yes, all project contractors are included as named insureds
Separate limit for defense expenses	Yes, $750,000	No – defense expenses are included in the limit of the policy

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School District of Manawa – Project Specific Contractors Pollution Liability

Subjectivities

Navigators	Due
Copy of GL loss runs for lead General Contractor over the last 5 years	Required at binding
Copy of Contract along with the details on the scope of work for the project seeking coverage	Required at binding
Signed TRIA form	Required at binding

Great American	Due
Completed and signed Great American Application for Environmental Insurance	Required at binding
5 years currently valued Pollution Loss runs	Required at binding
Copies of last two years financial statements	Required at binding
Completed Supplemental Application for Contracting Services Project Specific Environmental Insurance	Required at binding
Receipt of the contract including full scope of services, indemnity and insurance requirements	Required at binding

AIG	Due
No Known loss letter from the start of the project	Required at binding
Copy of environmental reports	Required at binding
Signed TRIA form	Required at binding

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Willis Towers Watson

School District of Manawa – Project Specific Contractors Pollution Liability

Direction for Binding

Please review this proposal and advise of any changes or questions you may have. To request the binding of coverage, please complete and sign the following or contact me with your binding instructions.

☐ As recommended by Willis Towers Watson in the Financial Summary.

or

☐ As follows:
(insert complete instructions for binding including carrier, limits, options, etc.)

_____

_____

_____

_____

_____

_____

School District of Manawa

_____ _____
Signature **Date**

_____
Title

_____
Printed Name

Other Coverages for Consideration – Subject to Underwriting, Quoting and Binding	
	☐ Yes ☐ No
	☐ Yes ☐ No

If not indicated, coverage will not be pursued.

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Important Notices

Surplus Lines
The premium quoted for the Owner Controlled Project Pollution Liability insurance is subject to Surplus Lines Tax which is in addition to the premium charged.

Brokerage Terms, Conditions & Disclosures
This proposal is presented in conjunction with the Brokerage Terms, Conditions & Disclosures which is enclosed.

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Appendix A – Brokerage Terms, Conditions & Disclosures

Brokerage Terms, Conditions & Disclosures

Your decision to purchase insurance coverages, products, and/or services through Willis Towers Watson is subject to the following terms and conditions.

1. General Terms and Conditions

1.1. Fees Exclusive of Taxes. Any fees or rates quoted or estimated will be exclusive of income tax or of any sales, ad valorem, value added tax or any similar tax unless such tax is required to be included pursuant to a statutory requirement. If required, we will add the relevant tax to the invoice, separately stated, and remit such tax to the appropriate authority.

1.2. Our Responsibilities. We will provide the services in a professional manner with reasonable skill and care and in accordance with all laws and regulations applicable to us. We will assign to the project team, members of our staff with adequate education, training and experience to perform the tasks assigned to them. We will use reasonable endeavors to meet any agreed timetable.

The work product we produce in the course of providing the services (the "Work Product") will not infringe any intellectual property right of any third party. Unless otherwise expressly agreed in writing, we do not accept any fiduciary or trust responsibilities or related liability in connection with the performance of the services. We do not provide legal, accounting or tax advice.

1.3. Your Responsibilities. You will provide us, in a timely manner, with all documentation, information, access to your personnel, access to your premises (if applicable) and cooperation reasonably required to provide the services. Any delay or failure to provide such documentation, information, access to your personnel or cooperation may result in: (a) a revision to any agreed timetable; and (b) if we are required to perform any additional work as a result, in additional fees being charged. We will rely on the documentation and information provided by you or your representatives and we do not take responsibility for verifying the accuracy or completeness of it. You may rely only upon our final Work Product and not on any drafts or oral statements made by us in the course of performing the services.

1.4. Intellectual Property Rights and Work Product. You will retain ownership of all original data and materials provided to us by you or your representatives, and the intellectual property rights in that data and materials. You will have the right to use, reproduce and adapt the copies of the Work Product for internal purposes within your organization. We will retain the intellectual property rights in the Work Product, and the skills, know-how and methodologies used or acquired by us during the course of providing any of the services.

The services, including the Work Product, are provided solely for the intended purpose, and may not be referenced or distributed to any other party without our prior written consent. You may distribute the Work Product to your affiliates, provided that you ensure that each such affiliate complies with these Terms, Conditions, & Disclosures, as if it were a party to them, and you remain responsible for such compliance.
You will not refer to us or include any of the Work Product in any shareholder communication or in any offering materials (or fairness opinion provided by your professional advisers) prepared in connection with the public offering or private placement of any security, unless otherwise agreed in writing.

1.5. Confidentiality and Data Privacy. Each party (the "Recipient") will protect all confidential information which the other party (the "Discloser") provides to it (whether orally, in writing or in any other form) ("Confidential Information") using the same standards as the Recipient applies to its own comparable confidential information, but in no event less than reasonable measures. Confidential Information will not include information that is: (a) already known to the Recipient at the time of disclosure; (b) in the public domain or publicly available; (c) provided to it by a third party who is under no such obligation of confidentiality; (d) independently developed by it; or (e) is required to be disclosed by court order, regulatory authority or other legal process, provided that prior to disclosing any Confidential Information, the Recipient will, if permitted by law, notify, and cooperate with the Discloser, at Discloser's expense, to lawfully limit and/or obtain appropriate protective orders with respect to such portion(s) of the Confidential Information which is the subject of any such required disclosure. Each party may disclose Confidential Information to its legal advisers to protect its own legitimate interests or to comply with any legal or regulatory requirements.

In the course of providing the services, the parties acknowledge that you may provide us with information about an identifiable individual or information which relates to a natural person and allows that person to be identified, including your customer or employee information ("Personal Data"). It is further acknowledged that we are a global business and that we may transmit your

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information, including Personal Data, within our global network of offices to our affiliates and providers of IT outsourcing who will be subject to appropriate data protection standards. You represent that Willis Towers Watson is authorized to receive and possess any such Personal Data and that you have obtained any necessary consents from third parties, including the individual to which such Personal Data relates, that may be required for us to use the Personal Data for the purposes of providing the services. Irrespective of where we receive or hold Personal Data on your behalf, we will take appropriate technical, physical and organizational/administrative measures to protect it against accidental or unlawful destruction or accidental loss or unauthorized alteration, disclosure or access. Each party will comply with the provisions and obligations imposed on it by applicable data privacy legislation and regulations.

You agree that we may maintain, process and transfer your Confidential Information and Personal Data in order to perform the services, and for other reasonable ancillary purposes, unless you instruct otherwise.

In addition, you hereby grant us permission to use data we receive from you or your representatives in the course of the services for use in industry benchmarking studies, trend analyses and research. We may use the results of these studies, analyses and research for various purposes, including articles and studies for distribution to our other clients and prospects. Any such articles or studies will not disclose your participation or mention the inclusion of your information to any other party. Any findings from these studies that may show individual participant results will be on a blinded basis, and not attribute any finding to a specific participant.

1.6. Nonconforming Services. If the services do not conform to the requirements agreed between the parties, you will notify us promptly and we will re-perform any non-conforming services at no additional charge or, at our option, refund the portion of the fees paid with respect to such non-conforming services. The re-performance of the services or refund of the applicable fees is intended to provide an adequate remedy for any failure on our part to adhere to the requirements agreed between the parties for the performance of services.

1.7. Indirect Damages. In no event shall we or any of our affiliates and our and their respective employees, directors, officers, agents and subcontractors be liable for any incidental, special, punitive, or consequential damages of any kind (including, without limitation, loss of income, loss of profits, or other pecuniary loss), except to the extent such liability may not be excluded as a matter of law.

1.8. Joint Liability. Where we are jointly liable to you with another party, we will to the extent permitted by law only be liable for those losses that correspond directly with our share of responsibility for the losses in question.

1.9. Third Parties. We accept no responsibility for any consequences arising from any third party relying on the Work Product. If we agree to provide the Work Product to a third party, you are responsible for ensuring that the third party is made aware of the fact that they are not entitled to rely upon it. You agree to reimburse us for all costs (including reasonable legal fees) that we incur in responding to any requests or demands from third parties, pursuant to legal process or otherwise, for data or information related to the services.

1.10. Force Majeure. Neither party will be liable for any delay or non-performance of its obligations caused by an event beyond its control (a "Force Majeure Event") provided that the party affected gives prompt notice in writing to the other party of such Force Majeure Event and uses all reasonable endeavors to continue to perform its obligations. Either party may terminate any Statement of Work or Service Agreement by written notice to the other with immediate effect if such Force Majeure Event continues for more than 3 months.

1.11. Miscellaneous. These Term, Conditions & Disclosures, together with any signed agreement between us applicable to the same services, set out the complete and exclusive statement of agreement and understanding between the parties, which supersedes and excludes all prior or contemporaneous proposals, understandings, agreements or representations, whether oral or written, with respect to your purchase of insurance. To the extent there is a conflict between these Terms, Conditions & Disclosures and a separately negotiated and signed agreement between you and Willis Towers Watson for the same services, the relevant portions of the signed agreement will control. Any modifications of or amendments to any MSA, Statement of Work, a Service Agreement, or a change to the services must be in writing and agreed by the parties. Should any provisions of an MSA, Statement of Work, Service Agreement, or any of the Terms, Conditions, & Disclosures be declared void, illegal or otherwise unenforceable, the remainder will survive unaffected.

Neither party may assign or delegate any of its rights or obligations to any third party without the prior written consent of the other party. Notwithstanding the foregoing, either party may assign or delegate any of its rights and obligations to an affiliate. We reserve the right to employ subcontractors to assist in providing services and to pass to them any information and materials they need to perform their work. Where we use affiliates or subcontractors to provide the services, we will remain ultimately responsible for the provision of the services.

Neither party will have any liability in respect of any statement (except in the case of fraud where the liability of each party to the other will be unlimited) made by such party or on its behalf to the other party which is not contained in an applicable Statement of

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Work, Service Agreement, or these Terms, Conditions, & Disclosures and each party acknowledges that it has not entered into an any Statement of Work, or Service Agreement or will enter into a Statement of Work or Service Agreement, in reliance on any representation by the other party which is not contained in the MSA, the applicable Statement of Work, Service Agreement, or these Terms, Conditions & Disclosures.
We do not tolerate unethical behavior either in our own activities or in those with whom we seek to do business. We will comply with applicable laws, regulations, and rules.

1.12. Sanctions and Export Control. Sanctions and export control laws from the EU, United States, Canada, and other government authorities prohibit companies, including Willis Towers Watson, from conducting business in certain jurisdictions or with certain individuals. The restrictions may differ based on your business activity, ownership structure, and the location or nationality of your employees. Please inform us of any insurance or service requirements you have which touch upon goods, countries, entities or individuals subject to any sanctions or export controls. We will comply with all applicable sanctions and export control laws, and we are not responsible for actions taken by third parties based on their own sanctions or export control constraints.

To comply with applicable anti-money laundering regulations there are times when we may ask clients to confirm (or reconfirm) their identity. We may need to do this at the time you become a client or have been one for some time or for example, when checking details on proposal forms and transferring claims payments. This information may be shared with other subsidiaries of Willis Towers Watson PLC and where we deem necessary with regulatory or law enforcement bodies. Please note that we are prohibited from disclosing to you any report we may make based on knowledge or suspicion of money laundering, including the fact that such a report has been made.
We have systems that protect our clients and ourselves against fraud and other crime and we may utilize the services of third parties in order to identify and verify clients. Client information can be used to prevent crime and trace those responsible. We may check your details against financial crime databanks. If false or inaccurate information is provided, we may be obliged to pass such details to relevant regulatory agencies that may use this information.

1.13. Dispute Resolution. The parties agree to work in good faith to resolve any disputes arising out of or in connection with the services provided under these Terms, Conditions & Disclosures. If a dispute cannot be resolved it will be submitted to non-binding mediation to be conducted by Judicial Arbitration and Mediation Services (JAMS) before either party pursues other remedies hereunder. If the mediation does not resolve the dispute and a party or both parties wish to pursue other remedies, the parties agree that their legal dispute will be resolved without a jury trial and agree not to request or demand a jury trial. To the fullest extent permitted by applicable law, the parties hereby irrevocably waive any right they may have to demand a jury trial.

To the extent the foregoing jury trial waiver is not enforceable under the governing law, except as provided below, any dispute arising out of or in connection with these Terms, Conditions & Disclosures which the parties are unable to resolve between themselves or through mediation as provided above, will be resolved by binding arbitration in the state as provided for in paragraph 14 below, or other mutually agreed location, before a panel of three arbitrators in accordance with the Commercial Arbitration Rules of the American Arbitration Association. Under these circumstances, the arbitration proceeding will be the sole and exclusive means for resolving any dispute between the parties, except for any dispute involving the ownership or use of work product or intellectual property, provided that either party may seek an injunction or other equitable relief if such action is necessary to avoid irreparable damage or to preserve the status quo. Each party will have the right to select one of the arbitrators and the two arbitrators so selected will agree on the choice of the third arbitrator. Each party will bear the expenses of the arbitrator it selects and one-half of the expenses of the third arbitrator and other costs related to the arbitration. Judgment on the award rendered by the arbitrators will be final and binding, and may be entered in any court having jurisdiction thereof. The arbitration proceeding will be confidential.

1.14. Governing Law. Any controversy, dispute or claim of any kind between the parties will be governed by and interpreted in accordance with the laws of the jurisdiction where the Willis Towers Watson office principally responsible for providing the services to you under the particular Statement of Work is located, without regard to any provisions governing conflicts of laws; provided that if such office is located outside of Canada or the US, the governing law will be that of the State of New York, without regard to any provisions governing conflicts of laws.

1.15. Additional Provisions Applicable Only to Health and Benefits Services.

1.15.1. If and to the extent that any portion of Willis Towers Watson's compensation is to be paid by or on behalf of any employee health or other welfare benefit plan ("Plan"), including commissions derived from Plan assets, then you will secure the approval of the applicable Plan fiduciaries for such portion of our compensation. You, and if applicable, the Plan fiduciaries, and not Willis Towers Watson, will determine whether any payment utilizing, or deriving from, Plan assets is appropriate. Willis Towers Watson will provide details concerning its charges to enable you, and if applicable, the Plan fiduciaries to make such determinations, but any information that Willis Towers Watson provides to you with its invoices

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or otherwise should not be construed as advice regarding the appropriate use of Plan assets. You, and if applicable, the Plan fiduciaries are encouraged to consult with legal counsel regarding such matters. Unless you tell us otherwise, in providing our services we will assume that the employee welfare benefits you provide to your employees and with respect to which we provide services have been wrapped into a single Plan. To the extent that you or your Plan enter into an Administrative Services Only contract with a Third party Administrator pursuant to which Willis Towers Watson receives a directed fee, you represent that all administrative fees are paid by you out of your general assets and will not be charged to the Plan.

1.15.2. Willis Towers Watson is not being engaged as a fiduciary or to provide investment advice and does not and will not perform or assume any fiduciary or trust responsibilities or liability in connection with the performance of the services. You agree that the services to be performed by Willis Towers Watson under an applicable Statement of Work are ministerial and not fiduciary in nature, that Willis Towers Watson has no discretionary authority or control with respect to the management or administration of your employee benefit plan(s) or any Plan assets, that Willis Towers Watson is not providing any advice with respect to products that may have an investment component, and that Willis Towers Watson's compensation has not been set at levels intended to compensate it for assuming fiduciary liability. You retain full responsibility for decisions to purchase or not purchase insurance policies, all claims for benefits against the Plan and any other discretionary decisions by the Plan or any fiduciary, trustee, Plan administrator, or Plan committee.

1.15.3. You agree that any enrollment or census data provided to Willis Towers Watson shall be provided by you in your role as an employer. You agree that you are responsible for you own access to and use of employee data, and that all persons whom you direct or request Willis Towers Watson to share employee data with are authorized to receive the employee data.

1.15.4. In the event that you and/or any of the employee benefit plans sponsored by you need to enter into business associate agreements with Willis Towers Watson to satisfy the requirements of the Health Insurance Portability and Accountability Act, the regulations implementing that Act (the "Standards for Privacy of Individually Identifiable Health Information," codified at 45 C.F.R. parts 160 and 164), or any other similar law, the parties will execute an agreement in compliance with these requirements.

2. Brokerage Terms and Conditions

2.1. The services we provide to you will rely in significant part on the facts, information and direction provided by you or your authorized representatives. In order to make our relationship work, we must each provide the other with accurate and timely facts, information and direction as is reasonably required. You must provide us with complete and accurate information regarding your loss experience, risk exposures, and changes in the analysis or scope of your risk exposures and any other information reasonably requested by us or insurers. It is important that you advise us of any changes in your business operations that may affect our services or your insurance coverages. Therefore, all information which is material to your coverage requirements or which might influence insurers in deciding to accept your business, finalizing the terms to apply and/or the cost of cover, or deciding to pay a claim, must be disclosed. Failure to make full disclosure of material facts might potentially allow insurers to avoid liability for a particular claim or to void the policy. This duty of disclosure applies equally at renewal or modification of your existing coverage and upon placement of new lines of coverage. You agree that Willis Towers Watson will not be responsible for any consequences arising from any delayed, inaccurate or incomplete information.

2.2. An insurer quote is an offer to provide coverage. Offers can be modified or withdrawn prior to your acceptance through your order to bind coverage. The quote itself is not a legally binding commitment or a confirmation of actual coverage. Should you choose to bind coverage, we will secure a formal commitment, typically in the form of a binder on a form issued or approved by the insurer(s) at issue. The quotes we will provide to you are based upon the information that you have provided to us. If you discover that previously submitted information is inaccurate or incomplete, please advise us immediately so that we can attempt to revalidate terms with insurers.

2.3. At the time of binding, we review the financial soundness of the insurers we recommend to provide your coverages based on publicly available information, including that produced by well-recognized rating agencies. Upon request, we will provide you with our analysis of such insurers. We do not guarantee or warrant the solvency of any insurer or any intermediary that we may use to place your coverage.

2.4. If you have a multi-year policy, it is important that you understand the limitations associated with the coverage options and the possibility that the financial strength of the insurer may change throughout the term of the policy. We recommend that you review the insurer's ratings for any downgrades during the term of this multi-year policy.

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2.5. The final decisions with respect to all matters relating to your insurance coverages, risk management, and loss control needs and activities are yours. We will procure the insurance coverage chosen by you, including the limits you choose, prepare or forward insurance binders, if applicable, and review and transmit policies to you.

2.6. We will review all binders, policies and endorsements to confirm their accuracy and conformity to negotiated specifications and your instructions and advise you of any errors in, or recommended changes to, such documents. You agree that you will also review all such documents and promptly advise us of any questions you have or of any document or provision which you believe may not be in accordance with your instructions as soon as possible, and in no event longer than two weeks, after you receive them. Your coverage is defined by the terms and conditions detailed in your insurance policies and endorsements. Your review of these documents, and any review you may seek from outside legal counsel or insurance consultants, is expected and essential.

2.7. We will inform you of the reporting requirements for claims, including where claims should be reported and the method of reporting to be used, if applicable. Please carefully review any claims-reporting instructions or information we provide. Failure to timely and properly report a claim may jeopardize coverage for the claim. In addition, you should retain copies of all insurance policies and coverage documents as well as claims-reporting instructions after termination of the policies because in some cases you may need to report claims after termination of a policy.

2.8. Our compensation may be revised if you request a change in the coverages and/or services during the term of this Agreement and we enter into a written agreement documenting any change in coverages, services and compensation.

2.9. If your insurance risks are in more than one jurisdiction, we, where required, will work with you and insurers to determine the allocation of premium between applicable jurisdictions, and the amount of insurance premium tax payable in each jurisdiction. In providing such services, Willis Towers Watson is acting in its capacity as an insurance broker, not as your tax advisor. You should seek your own advice in relation to such tax laws where you consider it necessary. We will not be liable to you should the apportionment of premium or amount of tax payable under the policy be challenged by any tax authority. In addition, we will not be liable to you should the insurers fail, or refuse, to collect and pay such insurance premium tax to the relevant authorities.

2.10. You will provide immediately available funds to pay premiums by the dates specified in the insurance policies, invoices, or other payment documents. Failure to pay premium on time may prevent coverage from incepting or result in cancellation of coverage by the insurer. You agree that we are not responsible for any consequences arising from any delay or failure by you to pay the amount due by the indicated date.

2.11. You may use a premium finance company, property appraiser, structured settlement firm or other similar service provider in connection with the insurance coverages we place for you. Premium finance options are not always available, but where they are, Willis Towers Watson currently works with industry leading finance providers for this service. Where permitted by law, we receive a fee for the services we provide those companies. These services include, but are not limited to, processing the premium finance applications and marketing and sales support they do not have. If you would like more information about the fee we receive, please let us know.

2.12. We will handle any premiums you pay through us and any funds which we receive from insurers or intermediaries for payment or return to you in accordance with applicable province/territory, state and federal insurance laws and regulations and province/territory and state unclaimed property laws. We may transfer your funds directly to insurers or to third parties such as wholesale brokers, excess and surplus lines brokers, or managing general agents to carry out transactions for you.

2.13. Where we collect funds from you, you agree that we may receive and retain interest on such funds from the date we receive the funds until we pay them to the insurers, intermediaries, or other third parties in the course of providing services, or until we return them to you after we receive such funds.

2.14. The following may be applicable where U.S. risks are insured with or through a foreign insurer or intermediary. The Foreign Account Tax Compliance Act (FATCA) is a U.S. law aimed at foreign financial institutions and other financial intermediaries (including insurance companies and intermediaries such as brokers) to prevent tax evasion by U.S. citizens and residents through offshore accounts. In order to comply with FATCA, insurance companies and intermediaries must meet certain legal requirements. Insurance placed with an insurance company that is not FATCA compliant may result in a 30% withholding tax on your premium. Where FATCA is applicable to you, in order to avoid this withholding tax, Willis Towers Watson will only place your insurance with FATCA-compliant insurers and intermediaries for which no withholding is required unless you instruct us to do otherwise and provide your advance written authorization to do so. If you do instruct Willis Towers Watson to place your insurance with a non-FATCA compliant insurer or intermediary, you may have to pay an additional amount equivalent to 30% of the premium covering U.S.-sourced risks to cover the withholding tax. If you instruct us to place your insurance with a non-FATCA compliant insurer but

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you do not agree to pay the additional 30% withholding if required, we will not place your insurance with such insurer. Please consult your tax adviser for full details of FATCA.

2.15. Unless otherwise provided in writing, you agree that we may use your company name and logo in marketing materials and for internal Willis Towers Watson use.

2.16. Unless otherwise agreed in writing, in the event of termination, we will be entitled to receive and retain any commissions payable under the terms of our commission agreements with the insurers in relation to policies placed by us, whether or not the commissions have been received by us.

2.17. Our obligation to render services under the agreement ceases on the effective date of termination of the agreement. Nevertheless, we will take reasonable steps to assist in the orderly transition of matters to you or to a new insurance broker. Claims and premium or other adjustments may arise after our relationship ends, and we have no responsibility to handle these things after our relationship ends. Such items are normally handled by the insurance broker serving you at the time the claim or adjustment arises. However, we will consider providing such services after the termination of this agreement for mutually agreed additional compensation. Nevertheless, we will process all remaining deposit premium installments on the policy(ies) in effect at the time of change.

2.18. The insurance market is complex, and there could be other relationships which are not described in this document which might create conflicts of interest. If a conflict arises for which there is no practicable way of complying with this commitment, we will promptly inform you and withdraw from the engagement, unless you wish us to continue to provide the services and provide your written consent. Please let us know in writing if you have concerns or we will assume that you understand and consent to our providing our services pursuant to these Terms, Conditions & Disclosures.

3. Brokerage Disclosures

3.1. If a Willis Towers Watson affiliate or office located outside of Canada or the United States serves as an intermediary in the placement of your coverages, it will also earn and retain compensation for providing those services, which compensation may not be included in the fee.

3.2. The compensation that will be paid to Willis Towers Watson will vary based on the insurance contract it sells. Depending on the insurer and insurance contract you select, compensation may be paid by the insurer selling the insurance contract or by another third party. Such compensation may be contingent and may vary depending on a number of factors, including the insurance contract and insurer you select. In some cases, other factors such as the volume of business Willis Towers Watson provides to the insurer or the profitability of insurance contracts Willis Towers Watson provides to the insurer also may affect compensation. Willis Towers Watson may accept this compensation in locations where it is legally permissible, and meets standards and controls to address conflicts of interest. Whether or how much insurers may pay in such compensation does not play any role in Willis Towers Watson's placement recommendations on behalf of its clients. If you prefer that we not accept this compensation related to your policy, please notify us in writing and we will request that your insurer(s) exclude your business from their payment calculations.

3.3. Upon request, Willis Towers Watson will provide you with additional information about the compensation Willis Towers Watson expects to receive based in whole or in part on your purchase of insurance, and (if applicable) the compensation expected to be received based in whole or in part on any alternative quotes presented to you.

3.4. To the extent Willis Towers Watson is compensated by commissions paid to us by insurers, they will be earned for the entire policy period at the time we place policies for you. We will be paid the commission percentage stated for the placement of your insurance as indicated, and will receive the same commission percentage for all subsequent renewals of this policy unless a different commission percentage is disclosed to you, or unless the insurer changes its commission rates, in which case the new commission rate will be disclosed to you before placement of the policy.

3.5. Willis Towers Watson may place your insurance or other business with members of a panel of insurers or other vendors. Willis Towers Watson develops panels of insurers and vendors in certain market segments. Participating insurers and vendors are reviewed on a variety of factors. Commission or fee rates on panel placements may be higher than rates paid on business placed outside of the panel process. Willis Towers Watson discloses its commission rates to clients on quotes obtained through the panel process prior to binding the coverage. In some instances, insurers or vendors pay an administration or management fee to participate in the panel process or for additional reporting. In some instances, Willis Towers Watson may earn a referral fee for referring your business to certain vendors.

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3.6. In some cases the use of a wholesale broker may be beneficial to you. We will not directly or indirectly place or renew your insurance business through a wholesale broker unless we first disclose to you in writing any compensation we or our corporate parents, subsidiaries or affiliates will receive as a result.

3.7. If wholesalers, underwriting managers or managing general agents have a role in providing insurance products and services to you, they will also earn and retain compensation for their role in providing those products and services. If any such parties are corporate parents, subsidiaries or affiliates of ours, any compensation we or our corporate parents, subsidiaries or affiliates will receive will be included in the total compensation we disclose to you. If such parties are not affiliated with us, and if you desire more information regarding the compensation those parties will receive, please contact us and we will assist you in obtaining this information.

3.8. Commission schedules and other compensation arrangements related to our services on your behalf may change over time and may not always be congruent with your specific policy period. Willis Towers Watson will provide you with accurate information to the best of our knowledge when information is presented to you, but it is possible that compensation arrangements may change over time. We will update you on any changes to our compensation prior to your renewal, and will do so at any time upon your request.

3.9. As an insurance intermediary, we normally act for you. However, we or our corporate parents, subsidiaries or affiliates may also provide services to insurers for which we may earn compensation. These services may include, for example, (a) acting as a managing general agent, program manager or in other similar capacities which give us binding authority enabling us to accept business on their behalf and immediately provide coverage for a risk; (b) arranging lineslips or similar facilities which enable an insurer to bind business for itself and other insurers; (c) managing lineslips for insurers; or (d) providing third party administration and other services to insurers. Contracts with these insurers may grant us certain rights or create certain obligations regarding the marketing of insurance products provided by the insurers. We may place your insurance business under such a managing general agent's agreement, binding authority, lineslip or similar facility when we reasonably consider that these match your insurance requirements/instructions. When we intend to do so, we will inform you and disclose that we will receive compensation related to these services. In addition, these services may include providing services to insurers as a client. For example, we or they may provide consulting, brokerage, outsourced administration, or reinsurance services to insurer clients. In such cases, we or they will be compensated separately for the services provided to those insurer clients. Some of these insurer clients may happen to be insurers with whom we place your insurance coverages. The services provided to you and the services provided to our insurer clients are separate and any compensation earned for the services provided to insurer clients are separate from and in addition to the compensation we earn for the services we provide you under this Agreement.

3.10. We are members of a major international group of companies. In addition to the commissions received by us from insurers for placement of your insurance coverages, other parties, such as excess and surplus lines brokers, wholesale brokers, reinsurance intermediaries, underwriting managers and similar parties (some of which may be owned in whole or in part by our corporate parents or affiliates), may earn and retain usual and customary commissions for their role in providing insurance products or services to you under their separate contracts with insurers or reinsurers.

4. Disclosures Applicable Only to Property and Casualty Placements (Not applicable to Health and Benefits Placements)

4.1. Willis Towers Watson negotiates commission rates with certain insurers on a corporate level. If the rate on your placement is lower than the negotiated rate, Willis Towers Watson will collect the difference directly from the insurer. These payments will not increase the cost of your insurance or otherwise impact your premium or rates. Details of these arrangements where there is compensation beyond the base compensation detailed in your Quote Proposal can be found at: http://www.willis.com/About_Willis/The_Willis_Way/Commission_Rates.

4.2. A separate business unit within the Willis Towers Watson Group, FINMAR Market Services, provides a wide range of services direct to certain insurers that write business for FINEX Global clients. A separate fee is paid to FINMAR Market Services by insurers for the delivery of these services to them. This fee is calculated within a range of 2.75% and 7.5% (plus VAT, if applicable) of the overall premiums placed depending on the scale of services provided. Unless otherwise stated, premiums paid by the clients of FINEX Global will not be increased as a result of these arrangements.

4.3. If a surplus lines insurer (sometimes referred to as an excess lines insurer, non-admitted insurer, or non-licensed insurer) was used to quote your coverage, its premium rates, coverage terms and policy forms are not regulated by your home state, province or territory, as applicable, and you will be required to pay an additional surplus lines premium tax which is on top of the premium. Also, in the event of the insurer's insolvency you will not be indemnified by any government guaranty fund for unpaid claims.

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4.4. In addition to any other terms governing the use of your information as provided herein or in any other master services agreement, statement of work, or other agreement, you agree that we may use your information and, if applicable, receive remuneration for such use, as described below. We may:

4.4.1. aggregate and anonymise your information and may disclose to third parties certain anonymized or industry-wide statistics or other information which may include information relating to you, but that we will not, without your consent, reveal any information specific to you other than on an aggregated and anonymized basis and as part of an industry or sector-wide comparison;

4.4.2. use your information to engage certain insurers in periodic discussions to gauge insurers' capabilities and interest in potentially quoting your business at a future date. Such discussions could be specific to your account or part of a discussion about a portfolio of accounts and typically increase the effectiveness and efficiency of our future marketing efforts on your behalf when you desire alternative bids;

4.4.3. share information concerning your insurance arrangement with insurers or their agents where this is necessary to enable insurers to decide whether to participate in insuring your risk or to participate in any arrangement made by Willis Towers Watson whereby participating insurers agree to insure (wholly or partly) a portfolio of risks without necessarily making underwriting decisions on a case by case basis for individual risks within such portfolio;

4.4.4. use any information you provide, without further notice to you, for the purpose of: (1) prospecting facultative reinsurance business from prospective insurer clients; (2) placing facultative reinsurance on behalf of our insurer clients; (3) marketing facultative reinsurance with prospective reinsurers on behalf of our insurer clients.

5. Language

5.1. It is the express wish of the parties that this Agreement and any related documents be drawn up in the English language. Les parties confirment qu'il est leur volonté expresse et réciproque que ce contrat et tout document qui s'y rattache soient rédigés en anglais.

6. Inquiries and Complaints

6.1. Your satisfaction is important to us. If you have questions or complaints, please inform the person who handles your business or contact the head of our office. Alternatively, you may call toll free 1-866-704-5115.

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Appendix B – Carrier Quotations

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Changes from DD to CD
School District of Manawa
Construction Documentation: 26 June 2019

Hoffman Project # 18-268

Most of the work during the Construction Documentation (CD) stage was spent adding detail to the drawing package with some of the notable changes listed below:

Architectural

- Drinking Fountain was added to the MS collaboration area.
- Exterior Finishes (Please reference renderings)
- Elevations were revised to provide a similar appearance to the design development renderings while becoming more economical using metal panel banding instead of glazing.

Structural Changes

- Put cmu fire walls back in along the existing buildings at both area A and C, revise foundations and details back.
- Raised the roof infill on the east side of area A lobby so it can drain onto the existing roof.
- Removed and then add in and revise extents of cmu along the lobby of area A and the elevator equipment room.
- Revised roof framing of area C for roof drainage and HVAC needs. Add bent beams to accommodate…

Electrical Changes

- ES FA – will be Alternate Bid, HS FA – smoke detection is limited to “work areas” only
- HS Paging – all wiring will be replaced
- Collaboration MS – Base and Alternate defined lighting layouts
- MSI documentation was incorporated into electrical plans
- Security doors rough-ins identified
- Incoming Telephone lines on the south-west side will need to be temp-ed while in construction (until new FA system is in place – unless Solaris confirm that existing FA can work on new fiber).

HVAC Changes

- New dust collector and location outside of STEAM Room F-319.
- 1.5 Ton Split system DX for elevator machine room LL-103 in lieu exhaust fan.
- Relocation for new RTU-17 over corridor C-133
- Dryer booster fans (BF-1/BF-2) for residential dryers.

Plumbing changes:

- Clean up demo sheets to remove new walls.
- Add 6” sanitary lateral through the new fitness center addition (area A) from the existing manhole at the south.
- Add invert elevations.
- Add duplex drain tile sump in storage room.
- Reconfigure storm piping at area A.
- Reconfigure storm piping at area C.
- Reroute sanitary from floor drains in room C-401 and C-405 to keep floor cutting and removal within rooms.
- Add floor drains in toilet rooms in area F.
- Add emergency gas shut off solenoid valves for science rooms.

SECTION 02 41 00
DEMOLITION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Selective demolition of built site elements.

B. Selective demolition of building elements for alteration purposes.

C. Abandonment and removal of existing utilities and utility structures.

1.02 RELATED REQUIREMENTS

A. Section 00 31 00 - Available Project Information: Existing building survey conducted by Owner; information about known hazardous materials.

B. Section 01 10 00 - Summary: Limitations on Contractor's use of site and premises.

C. Section 01 10 00 - Summary: Description of items to be removed by Owner.

D. Section 01 10 00 - Summary: Description of items to be salvaged or removed for re-use by Contractor.

E. Section 01 50 00 - TEMPORARY FACILITIES AND CONTROLS: Site fences, security, protective barriers, and waste removal.

F. Section 01 57 13 - TEMPORARY EROSION AND SEDIMENT CONTROL.

G. Section 01 60 00 - PRODUCT REQUIREMENTS: Handling and storage of items removed for salvage and relocation.

H. Section 01 70 00 - EXECUTION AND CLOSEOUT REQUIREMENTS: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products; temporary bracing and shoring.

I. Section 01 74 19 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL: Limitations on disposal of removed materials; requirements for recycling.

J. Section 31 10 00 - Site Clearing: Vegetation and existing debris removal.

K. Section 31 22 00 - Grading: Topsoil removal.

L. Section 31 23 23 - Fill: Fill material for filling holes, pits, and excavations generated as a result of removal operations.

1.03 REFERENCE STANDARDS

A. 29 CFR 1926 - U.S. Occupational Safety and Health Standards.

B. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Demolition Plan: Submit demolition plan as specified by OSHA and local authorities.
   1. Indicate extent of demolition, removal sequence, bracing and shoring, and location and construction of barricades and fences.
   2. Provide a copy of the engineering survey performed by a competent person prior to the start of demolition per OSHA 1926.850.
   3. Identify demolition firm and submit qualifications.

C. Shoring and Bracing: Submit calculations, plans, details, etc. sealed by a Professional Engineer licensed in the State in which the project is located.

D. Project Record Documents: Accurately record actual locations of capped and active utilities and subsurface construction.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Conduct a preinstallation meeting at least one week prior to the start of the work of this section.

1.06 MATERIALS OWNERSHIP

A. Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain the Owner's property, demolished materials shall become the Contractor's property and shall be removed from the site with further disposition at the Contractor's option.

1.07 QUALITY ASSURANCE

A. Demolition Firm Qualifications: Company specializing in the type of work required.
   1. Minimum of five years of documented experience.

1.08 SCHEDULING

A. Schedule work under the provisions of Section 01 32 16.

B. Schedule building demolition activities to precede site excavation work.

PART 2 PRODUCTS

2.01 MATERIALS

A. Fill Material: As specified in Section 31 23 23 - Fill.

PART 3 EXECUTION

3.01 SCOPE

A. Remove all other paving and curbs as indicated on drawings.

B. Remove concrete slabs on grade as indicated on drawings.

C. Remove other items indicated, for salvage, relocation, and recycling.

D. Fill excavations, open pits, and holes in ground areas generated as result of removals, using specified fill; compact fill as specified in Section 31 22 00.

3.02 GENERAL PROCEDURES AND PROJECT CONDITIONS

A. Comply with other requirements specified in Section 01 70 00.

B. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
   1. Obtain required permits.
   2. Comply with applicable requirements of NFPA 241.
   3. Use of explosives is not permitted.
   4. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.
   5. Provide, erect, and maintain temporary barriers and security devices.
   6. Use physical barriers to prevent access to areas that could be hazardous to workers or the public.
   7. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
   8. Do not close or obstruct roadways or sidewalks without permit.
   9. Conduct operations to minimize obstruction of public and private entrances and exits; do not obstruct required exits at any time; protect persons using entrances and exits from removal operations.
   10. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon or limit access to their property.

C. Do not begin removal until receipt of notification to proceed from Owner.

D. Do not begin removal until built elements to be salvaged or relocated have been removed.

E. Do not begin removal until vegetation to be relocated has been removed and specified measures have been taken to protect vegetation to remain.

F. Protect existing structures and other elements that are not to be removed.
   1. Provide bracing and shoring.

2. Prevent movement or settlement of adjacent structures.
3. Stop work immediately if adjacent structures appear to be in danger.

G. Minimize production of dust due to demolition operations; do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.

H. If hazardous materials are discovered during removal operations, stop work and notify Hoffman and Owner; hazardous materials include regulated asbestos containing materials, lead, PCB's, and mercury.

I. Perform demolition in a manner that maximizes salvage and recycling of materials.
1. Comply with requirements of Section 01 74 19 - Waste Management.
2. Dismantle existing construction and separate materials.
3. Set aside reusable, recyclable, and salvageable materials; store and deliver to collection point or point of reuse.

3.03 EXISTING UTILITIES

A. Coordinate work with utility companies; notify before starting work and comply with their requirements; obtain required permits.

B. Protect existing utilities to remain from damage.

C. Do not disrupt public utilities without permit from authority having jurisdiction.

D. Do not close, shut off, or disrupt existing life safety systems that are in use without at least 7 days prior written notification to Owner.

E. Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least 3 days prior written notification to Owner.

F. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.

G. Remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.

H. Prepare building demolition areas by disconnecting and capping utilities outside the demolition zone; identify and mark utilities to be subsequently reconnected, in same manner as other utilities to remain.

3.04 SELECTIVE DEMOLITION FOR ALTERATIONS

A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
1. Verify that construction and utility arrangements are as indicated.
2. Report discrepancies to Hoffman before disturbing existing installation.
3. Beginning of demolition work constitutes acceptance of existing conditions that would be apparent upon examination prior to starting demolition.

B. Separate areas in which demolition is being conducted from other areas that are still occupied.
1. Provide, erect, and maintain temporary dustproof partitions of construction indicated on drawings in locations indicated on drawings.
2. Provide sound retardant partitions of construction indicated on drawings in locations indicated on drawings.

C. Maintain weatherproof exterior building enclosure except for interruptions required for replacement or modifications; take care to prevent water and humidity damage.

D. Install temporary ventilation systems to permit continued occupancy. Clean filters of air intake system regularly.

E. Remove existing work as indicated and as required to accomplish new work.
1. Remove items indicated on drawings.

F. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications): Remove existing systems and equipment as indicated.

1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components.
2. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
3. See Section 01 10 00 for other limitations on outages and required notifications.
4. Verify that abandoned services serve only abandoned facilities before removal.
5. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification.

G. Protect existing work to remain.
1. Prevent movement of structure; provide shoring and bracing if necessary.
2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
3. Repair adjacent construction and finishes damaged during removal work.
4. Patch as specified for patching new work.

H. Lamps:
1. Remove fluorescent, HID and other lamps containing mercury intact from fixtures in demolition areas.
2. Properly dispose of lamps legally away from the site according to requirements of EPA and other state and local authorities.

3.05 DEBRIS AND WASTE REMOVAL

A. Remove debris, junk, and trash from site.

B. Do not burn or bury materials on site.

C. Remove from site all materials not to be reused on site; comply with requirements of Section 01 74 19 - Waste Management.

D. Leave site in clean condition, ready for subsequent work.

E. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION 02 41 00

SECTION 03 05 16

UNDERSLAB VAPOR BARRIER

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sheet vapor barrier under concrete slabs on grade.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - CAST-IN-PLACE CONCRETE: Preparation of subgrade, granular fill, placement of concrete.

1.03 REFERENCE STANDARDS

A. ASTM E1643 - Standard Practice for Selection, Design, Installation and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.

B. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit manufacturers' data on manufactured products.

C. Manufacturer's Installation Instructions: Indicate installation procedures and interface required with adjacent construction.

PART 2 PRODUCTS

2.01 MATERIALS

A. Underslab Vapor Barrier:
   1. Water Vapor Permeance: Not more than 0.010 perms, maximum.
   2. Thickness: 15 mils.
   3. Basis of Design:
      a. Stego Industries LLC; Stego Wrap Vapor Barrier (15-mil): www.stegoindustries.com/#sle.

B. Accessory Products: Vapor barrier manufacturer's recommended tape, adhesive, mastic, etc., for sealing seams and penetrations in vapor barrier.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surface over which vapor barrier is to be installed is complete and ready before proceeding with installation of vapor barrier.

3.02 INSTALLATION

A. Install vapor barrier in accordance with manufacturer's instructions and ASTM E1643.

B. Install vapor barrier under interior slabs on grade; lap sheet over footings and seal to foundation walls.

C. Lap joints minimum 6 inches.

D. Seal joints, seams and penetrations watertight with manufacturer's recommended products and follow manufacturer's written instructions.

E. No penetration of vapor barrier is allowed except for reinforcing steel and permanent utilities.

F. Repair damaged vapor retarder before covering with other materials.

END OF SECTION

SECTION 03 10 00
CONCRETE FORMING AND ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Formwork for cast-in place concrete, with shoring, bracing and anchorage.

B. Openings for other work.

C. Form accessories.

D. Form stripping.

1.02 RELATED REQUIREMENTS

A. Section 03 20 00 - Concrete Reinforcing.

B. Section 03 30 00 - CAST-IN-PLACE CONCRETE.

C. Section 05 12 00 - Structural Steel Framing: Placement of embedded steel anchors and plates in cast-in-place concrete.

1.03 REFERENCE STANDARDS

A. ACI 117 - Standard Specifications for Tolerances for Concrete Construction and Materials.

B. ACI 301 - Specifications for Structural Concrete.

C. ACI 318 - Building Code Requirements for Structural Concrete and Commentary.

D. ACI 347R - Guide to Formwork for Concrete.

E. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

F. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric).

G. PS 1 - Structural Plywood.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's data sheet for form release agents .

1.05 QUALITY ASSURANCE

A. The design, construction, and safety of all formwork shall be the responsibility of the Contractor. All forms, shores, backshores, falsework, bracing and any other temporary supports shall be engineered to support all loads imposed including the wet weight of concrete, construction equipment, live loads, lateral loads due to wind and wet concrete imbalances.

B. The Contractor is also solely responsible for determining when temporary supports, shores, and other bracing may be safely removed.

C. Designer Qualifications: Design formwork under direct supervision of a Professional Structural Engineer experienced in design of concrete formwork and licensed in Wisconsin.

PART 2 PRODUCTS

2.01 FORMWORK - GENERAL

A. Provide concrete forms, accessories, shoring, and bracing as required to accomplish cast-in-place concrete work.

B. Design and construct concrete that complies with design with respect to shape, lines, and dimensions.

C. Chamfer outside corners of beams, joists, columns, and walls.

D. Comply with applicable State and local codes with respect to design, fabrication, erection, and removal of formwork.

E. Comply with relevant portions of ACI 347R, ACI 301, and ACI 318.

F. Forms for Exposed Finish Concrete:
   1. Unless otherwise indicated, construct formwork for exposed concrete surfaces with plywood, metal, or other acceptable panel-type materials. Provide continuous, straight, smooth, exposed surfaces.
   2. Furnish in largest practicable sizes to minimize the number of joints.
   3. Provide form material with sufficient thickness to withstand pressure of newly placed concrete, restricting bow and deflection to specified tolerances.

G. Forms for Unexposed Finish Concrete:
   1. Form concrete surfaces that are not to be exposed in finished structure with plywood, lumber, metal or other material at contractor's option.

2.02 WOOD FORM MATERIALS

A. Softwood Plywood: PS 1, B-B High Density Concrete Form Overlay, Class I.

2.03 REMOVABLE PREFABRICATED FORMS

A. Preformed Steel Forms: Minimum 16 gage, 0.0598 inch thick, matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished surfaces.

B. Preformed Aluminum Forms: ASTM B221 (ASTM B221M), 6061-T6 alloy, matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished surfaces.

C. Tubular Column Type: Round, spirally wound laminated fiber material, surface treated with release agent, non-reusable, of sizes indicated.

2.04 FORMWORK ACCESSORIES

A. Form Ties: Removable type, galvanized metal, fixed length, free of defects that could leave holes larger than 1 inch in concrete surface.

B. Form Release Agent: Capable of releasing forms from hardened concrete without staining or discoloring concrete or forming bugholes and other surface defects, compatible with concrete and form materials, and not requiring removal for satisfactory bonding of coatings to be applied.
   1. Composition: Colorless reactive, mineral oil-based, soy-based, or vegetable-oil based compound.
   2. Do not use materials containing diesel oil or petroleum-based compounds.
   3. VOC Content: None; water-based.
   4. Products:
      a. SpecChem, LLC; Bio Strip WB (water-based): www.specchemllc.com/#sle.
      b. W. R. Meadows, Inc; Duogard II (water-based): www.wrmeadows.com/#sle.
      c. Dayton Superior Corporation; Farm Fresh XL (water based).
      d. TK Products; TK - Gold WB.
      e. Substitutions: See Section 01 60 00 - PRODUCT REQUIREMENTS.

C. Filler Strips for Chamfered Corners: Wood strip type; 3/4 x 3/4 inch size; maximum possible lengths.

D. Nails, Spikes, Lag Bolts, Through Bolts, Anchorages: Sized as required, of sufficient strength and character to maintain formwork in place while placing concrete.

E. Embedded Anchor Shapes, Plates, Angles and Bars: As specified in Section 05 12 00.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify lines, levels and centers before proceeding with formwork. Ensure that dimensions agree with drawings.

3.02 EARTH FORMS

A. Earth forms are not permitted.

3.03 ERECTION - FORMWORK

A. Erect formwork, shoring and bracing to achieve design requirements, in accordance with requirements of ACI 301.

B. Provide bracing to ensure stability of formwork. Shore or strengthen formwork subject to overstressing by construction loads.

C. Arrange and assemble formwork to permit dismantling and stripping. Do not damage concrete during stripping. Permit removal of remaining principal shores.

D. Align joints and make watertight. Keep form joints to a minimum.

E. Provide top forms for inclined surfaces where slope is too steep to place concrete with side forms only.

F. Obtain approval before framing openings in structural members that are not indicated on drawings.

G. Coordinate this section with other sections of work that require attachment of components to formwork.

H. If formwork is placed after reinforcement, resulting in insufficient concrete cover over reinforcement, request instructions from Hoffman before proceeding.

3.04 APPLICATION - FORM RELEASE AGENT

A. Apply form release agent on formwork in accordance with manufacturer's recommendations.

B. Apply prior to placement of reinforcing steel, anchoring devices, and embedded items.

C. Do not apply form release agent where concrete surfaces will receive special finishes or applied coverings that are affected by agent. Soak inside surfaces of untreated forms with clean water. Keep surfaces coated prior to placement of concrete.

3.05 INSERTS, EMBEDDED PARTS, AND OPENINGS

A. Provide formed openings where required for items to be embedded in passing through concrete work.

B. Locate and set in place items that will be cast directly into concrete.

C. Coordinate with work of other sections in forming and placing openings, slots, reglets, recesses, sleeves, bolts, anchors, other inserts, and components of other work.

D. Install accessories in accordance with manufacturer's instructions, so they are straight, level, and plumb. Ensure items are not disturbed during concrete placement.

E. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection. Locate openings at bottom of forms to allow flushing water to drain.

F. Close temporary openings with tight fitting panels, flush with inside face of forms, and neatly fitted so joints will not be apparent in exposed concrete surfaces.

3.06 FORM CLEANING

A. Clean forms as erection proceeds, to remove foreign matter within forms.

B. Clean formed cavities of debris prior to placing concrete.
   1. Flush with water or use compressed air to remove remaining foreign matter. Ensure that water and debris drain to exterior through clean-out ports.
   2. During cold weather, remove ice and snow from within forms. Do not use de-icing salts. Do not use water to clean out forms, unless formwork and concrete construction proceed within heated enclosure. Use compressed air or other means to remove foreign matter.

3.07 FORMWORK TOLERANCES

A. Construct formwork to maintain tolerances required by ACI 117, unless otherwise indicated.

B. Camber slabs and beams in accordance with ACI 301.

3.08 FIELD QUALITY CONTROL

A. Inspect erected formwork, shoring, and bracing to ensure that work is in accordance with formwork design, and to verify that supports, fastenings, wedges, ties, and items are secure.

3.09 FORM REMOVAL

A. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads.

B. Loosen forms carefully. Do not wedge pry bars, hammers, or tools against finish concrete surfaces scheduled for exposure to view.

C. Store removed forms to prevent damage to form materials or to fresh concrete. Discard damaged forms.

END OF SECTION

SECTION 03 20 00
CONCRETE REINFORCING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Reinforcing steel for cast-in-place concrete.

B. Reinforcing steel for concrete masonry.

C. Supports and accessories for steel reinforcement.

1.02 RELATED REQUIREMENTS

A. Section 03 10 00 - Concrete Forming and Accessories.

B. Section 03 30 00 - CAST-IN-PLACE CONCRETE.

C. Section 04 20 00 - Unit Masonry: Reinforcement for masonry.

1.03 REFERENCE STANDARDS

A. ACI 301 - Specifications for Structural Concrete.

B. ACI 318 - Building Code Requirements for Structural Concrete and Commentary.

C. ACI SP-66 - ACI Detailing Manual.

D. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.

E. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.

F. CRSI (DA4) - Manual of Standard Practice.

G. CRSI (P1) - Placing Reinforcing Bars.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit manufacturer's product data and installation instructions.
   1. Adhesives and grouting materials.

C. Shop Drawings: Comply with requirements of ACI SP-66. Include bar schedules, shapes of bent bars, spacing of bars, and location of splices.

1.05 QUALITY ASSURANCE

A. Perform work of this section in accordance with CRSI (DA4), CRSI (P1), ACI 301, ACI SP-66, and ACI 318.

B. Provide Hoffman with access to fabrication plant to facilitate inspection of reinforcement. Provide notification of commencement and duration of shop fabrication in sufficient time to allow inspection.

C. Adjustments: Bars may be moved as necessary to avoid interference with other reinforcing steel, conduits, or embedded items. If bars are moved more than one bar diameter, or in excess of specified tolerances, the resulting arrangement of bars shall require the Engineer's approval. Minimum spacings shall not be decreased, and the required number of bars shall be placed.
   1. Bars moved to permit access for cleanup operations shall be properly replaced and secured before the start of concrete placement.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver steel reinforcement to the jobsite, sort, and cover in a manner which will ensue that no damage shall occur to it from moisture, dirt, grease, oil, or other causes which might impair bond with concrete.

B. Deliver steel reinforcement properly tagged and identified for checking, sorting, and placing. Sizes and marks shall correspond to placing Shop Drawings and schedules. Tags and

markings shall be water-resistant and shall not be removed until steel reinforcement is placed in position.

PART 2 PRODUCTS

2.01 REINFORCEMENT

A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi).
   1. Deformed billet-steel bars.
   2. Unfinished.

B. Steel Welded Wire Reinforcement (WWR): Plain type; ASTM A1064/A1064M.
   1. Flat Sheets, coiled rolls when approved in writing by the Engineer.
   2. WWR Style: As indicated on drawings.

C. Reinforcement Accessories:
   1. Tie Wire: Annealed, minimum 16 gage, 0.0508 inch.
   2. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement.
   3. Provide plastic coated steel components for placement within 1-1/2 inches of weathering surfaces.

2.02 ACCESSORY MATERIALS

A. Bar/Anchor Grouting: Use one of the following depending on conditions.
   1. Epoxy Adhesive: Two component, 100% solid epoxy-based adhesive meeting ASTM C 881, Types I, II, IV, and V, Grade 3, Classes B and C.
      a. Uses: Anchor grouting and rebar doweling in temperatures above 40 degrees F.
      b. Product: Similar to ET-HP adhesive as manufactured by Simpson Strong-Tie.
   2. Acrylic Adhesive: Two component, acrylic based adhesive meeting ASTM C 881, Types I and IV, Grade 3, Classes A, B, and C.
      a. Uses: Anchor grouting and rebar doweling in temperatures to 0 degrees F.
      b. Product: Similar to AT adhesive as manufactured by Simpson Strong Tie.

2.03 FABRICATION

A. Fabricate concrete reinforcing in accordance with CRSI (DA4) - Manual of Standard Practice, ACI SP-66 - ACI Detailing Manual, and ACI 318.

B. Welding of reinforcement is not permitted.

C. Fabricate bars, cut to length, and bent cold. Heating of bars for bending or straightening will not be permitted.

D. Locate reinforcing splices not indicated on drawings at point of minimum stress.
   1. Review locations of splices with Hoffman.

PART 3 EXECUTION

3.01 GENERAL

A. Place reinforcement in accordance with drawings, approved shop drawings and requirements of ACI and CRSI.

B. Verify that anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not interfere with concrete placement.

3.02 REINFORCING BARS

A. Comply with requirements of ACI 301. Clean reinforcement of loose rust and mill scale.

B. Place, support and secure reinforcement against displacement. Do not deviate from required position.

C. Do not displace or damage vapor barrier.

D. Accommodate placement of formed openings.

E. Do not bend reinforcing after being partially embedded in hardened concrete, unless approved in writing by the Engineer.

F. Maintain concrete cover around reinforcing as follows:
   1. Column Ties:
      a. Exterior: 2 inch.
      b. Interior: 1 1/2 inch.
   2. Column Piers: 2 inch.
   3. Walls (exposed to weather or backfill): 2 inch.
   4. Footings and Concrete Formed Against Earth: 3 inch.
   5. Slabs on Fill: 2 inch.

G. Comply with applicable code for concrete cover over reinforcement.

H. Reinforcement Supports:
   1. On ground use metal or plastic bar chairs and spacers.
   2. Over formwork use metal, plastic or other specified bar chairs and spacers.

I. Reinforcement Bar Splices:
   1. Locate splices where indicated on drawings, on shop drawings, or where approved by the Engineer in advance of installation.
   2. Lap concrete reinforcement as noted on drawings:
      a. All splice lengths should be Class B unless otherwise noted on drawings.
      b. Splices of alternate bars shall be staggered a minimum clear offset of 2 feet between splices.
   3. Lap masonry reinforcement:
      a. Minimum 30 bar diameters for bars in compression members.
      b. Minimum 48 bar diameters for bars in flexural or tension members.
      c. Minimum 48 bar diameters for bond beams and lintels.

3.03 WELDED WIRE FABRIC

A. Lap adjoining pieces at least one full mesh and lace splices with wire.

B. Offset laps of adjoining widths to prevent continuous laps in either direction.

C. Do not continue mesh through expansion joints or other locations noted on drawings.

D. Support fabric off grade on permanent forms before placing concrete.

E. Fabric Depth:
   1. Slabs-on-Grade: Locate fabric not less than 1/3 nor more than 2/3 thickness of slabs, as measured from the top surface downward, unless otherwise noted on drawings.

3.04 TOLERANCES

A. Bar placement tolerances should meet the following:
   1. Between Bars: 1/4" (+/-).
   2. Vertical Bars - 8" Deep or Less: 1/4" (+/-).
   3. Vertical Bars - Members 8" to 24" Deep: 1/2" (+/-).
   4. Vertical Bars - Members Over 24" Deep: 1" (+/-).

3.05 FIELD QUALITY CONTROL

A. An independent testing agency, as specified in Section 01 40 00, or Hoffman field personnel will inspect installed reinforcement for conformance to contract documents before concrete placement.

END OF SECTION

SECTION 03 30 00

CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Concrete building frame members.

B. Concrete for steel stair treads and landings.

C. Floors and slabs on grade.

D. Concrete foundation walls and footings.

E. Joint devices associated with concrete work.

F. Miscellaneous concrete elements, including equipment pads.

G. Concrete curing.

H. Concrete floor grinding when required.

1.02 RELATED REQUIREMENTS

A. Section 01 45 33 - Code-Required Special Inspections.

B. Section 03 10 00 - Concrete Forming and Accessories: Forms and accessories for formwork.

C. Section 03 20 00 - Concrete Reinforcing.

D. Section 07 13 00 - Sheet Waterproofing: Waterproofing membrane.

E. Section 07 14 00 - Fluid-Applied Waterproofing: Waterproofing membrane.

F. Section 07 92 00 - Joint Sealants: Products and installation for sealants and joint fillers for saw cut joints and isolation joints in slabs.

G. Section 32 13 13 - Concrete Paving: Sidewalks, curbs and gutters.

1.03 REFERENCE STANDARDS

A. ACI 117 - Standard Specifications for Tolerances for Concrete Construction and Materials.

B. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete.

C. ACI 301 - Specifications for Structural Concrete.

D. ACI 302.1R - Guide for Concrete Floor and Slab Construction.

E. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete.

F. ACI 305R - Hot Weather Concreting.

G. ACI 306R - Cold Weather Concreting.

H. ACI 308R - Guide to Curing Concrete.

I. ACI 318 - Building Code Requirements for Structural Concrete and Commentary.

J. ASTM C1602/C1602M - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete.

K. ASTM C33/C33M - Standard Specification for Concrete Aggregates.

L. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.

M. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete.

N. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or (50-mm) Cube Specimens).

O. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete.

P. ASTM C150/C150M - Standard Specification for Portland Cement.

Q. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.

R. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete.

S. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.

T. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete.

U. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.

V. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).

W. ASTM C1240 - Standard Specification for Silica Fume Used in Cementitious Mixtures.

X. ASTM C1315 - Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete.

Y. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).

Z. ASTM D2103 - Standard Specification for Polyethylene Film and Sheeting.

AA. ASTM E1155 - Standard Test Method for Determining F(F) Floor Flatness and F(L) Floor Levelness Numbers.

AB. ASTM E1155M - Standard Test Method for Determining F(F) Floor Flatness and F(L) Floor Levelness Numbers (Metric).

AC. ASTM E1643 - Standard Practice for Selection, Design, Installation and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.

AD. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs.

AE. COE CRD-C 513 - COE Specifications for Rubber Waterstops.

AF. COE CRD-C 572 - Corps of Engineers Specifications for Polyvinylchloride Waterstop.

AG. NSF 61 - Drinking Water System Components - Health Effects.

AH. NSF 372 - Drinking Water System Components - Lead Content.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section.

B. Attendance:
   1. Hoffman Field Project Manager (FPM).
   2. Independent Testing Laboratory (ITL) retained by Hoffman.
   3. Structural Engineer -of-Record (SER) (optional).
   4. Representatives of the concrete contractor including project foreman.
   5. Representative of the concrete supplier.
   6. M-E-P contractors (optional).
   7. Representative of product manufacturer (optional).
   8. Special Inspection Agency when required for code-required special inspections.

C. Review the following as a minimum:
   1. Project schedule.
   2. Forming, placement, vibration, finishing, and curing of concrete.
   3. Concrete mix designs.
   4. Placement, inspection and protection of vapor retarder and seams.
   5. Loading limitation and protection of precast and steel decks.
   6. Field and laboratory procedures including defective concrete specifications.
   7. Governing regulations and requirements for safety and fall protection.

8. Placement of reinforcement and locations of joints in slabs.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Submit a minimum of 7 days prior to the start of work in this section the following:
   1. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements and installation instructions.
      a. Curing and sealing compounds.
      b. Water stops.
      c. Chemical admixtures.
      d. Accessory materials.
   2. For curing compounds, provide data on method of removal in the event of incompatibility with floor covering adhesives.
   3. Mix Design: Submit proposed concrete mix design.
      a. Indicate proposed mix design complies with requirements of ACI 301, Section 4 - Concrete Mixtures.
      b. Indicate proposed mix design complies with requirements of ACI 318, Chapter 19 - Concrete: Design and Durability Requirements and Chapter 26 - Construction Documents and Inspection.

C. Samples: Submit samples of underslab vapor retarder to be used.

D. Manufacturer's Installation Instructions: For concrete accessories, indicate installation procedures and interface required with adjacent construction.

1.06 QUALITY ASSURANCE

A. Perform work of this section in accordance with ACI 301 and ACI 318.

B. Acquire cement and aggregate from same source for entire project.

C. Follow recommendations of ACI 305R when concreting during hot weather.

D. Follow recommendations of ACI 306R when concreting during cold weather.

E. For slabs required to include moisture vapor reduction admixture (MVRA), do not proceed with placement unless manufacturer's representative is present for every day of placement.

F. Batch Tickets: For each load of concrete submit (2) legible copies of the batch ticket to the contractor. Conform to ASTM C94 for batch ticket requirements. Include the following as a minimum:
   1. Serial number of ticket and name of supplier.
   2. Date, truck number, name of purchaser, and job designation.
   3. Specification class or designation of the concrete.
   4. Amount of concrete in yards and time loaded or first mixing of cement and aggregates.
   5. Water added by receiver of concrete and initials.
   6. Type, brand and amount of cement and admixtures.
   7. Weights of fine and coarse aggregates
   8. Location where placed in structure and time of placement.
   9. Information required to calculate the total mixing water added by the producer. Total mixing water includes free water on the aggregates, water or ice batched at plant, and water added by truck operator at site.

G. Test Reports: Submit report for each test or series of tests specified.

1.07 WARRANTY

A. See Section 01 78 00 - CLOSEOUT SUBMITTALS, for additional warranty requirements.

B. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

C. Slabs with Moisture Vapor Reducing Admixture (MVRA): Provide warranty to cover the cost of flooring failures due to moisture migration from slabs for ten years.

1. Include cost of repair or removal of failed flooring, placement of topical moisture remediation system, and replacement of flooring with comparable flooring system.

D. Moisture Emission Reducing Curing and Sealing Compound: Provide warranty to cost of flooring delamination failures for 10 years.
   1. Include cost of repair or removal of failed flooring, remediation with a moisture vapor impermeable surface coating, and replacement of flooring with comparable flooring system.

PART 2 PRODUCTS

2.01 FORMWORK

A. Comply with requirements of Section 03 10 00.

2.02 REINFORCEMENT MATERIALS

A. Comply with requirements of Section 03 20 00.

2.03 CONCRETE MATERIALS

A. Cement: ASTM C150/C150M, Type I - Normal Portland type.
   1. Acquire cement for entire project from same source.

B. Fine and Coarse Aggregates: ASTM C33/C33M.
   1. Acquire aggregates for entire project from same source.

C. Fly Ash: ASTM C618, Class C or F.

D. Silica Fume: ASTM C1240, proportioned in accordance with ACI 211.1.

E. Water: ASTM C1602/C1602M; clean, potable, and not detrimental to concrete.

2.04 ADMIXTURES

A. Do not use chemicals that will result in soluble chloride ions in excess of 0.1 percent by weight of cement.

B. Air Entrainment Admixture: ASTM C260/C260M.

C. Water Reducing Admixture: ASTM C494/C494M Type A.

D. Moisture Vapor Reduction Admixture (MVRA): Liquid, inorganic admixture free of volatile organic compounds (VOCs) and formulated to close capillary systems formed during curing to reduce moisture vapor emission and transmission with no adverse effect on concrete properties or finish flooring.
   1. Provide admixture in slabs to receive adhesively applied flooring.

2.05 ACCESSORY MATERIALS

A. Underslab Vapor Retarder: Sheet material complying with ASTM E1745, Class A; stated by manufacturer as suitable for installation in contact with soil or granular fill under concrete slabs. The use of single ply polyethylene is prohibited.
   1. Installation: Comply with ASTM E1643.
   2. Accessory Products: Vapor retarder manufacturer's recommended tape, adhesive, mastic, prefabricated boots, etc., for sealing seams and penetrations.
   3. Manufacturers:
      a. Poly-America; Husky Yellow Guard 15-mil Vapor Barrier: www.yellowguard.com/#sle.
      b. Stego Industries, LLC; Stego Wrap 15: www.stegoindustries.com/#sle.
      c. W. R. Meadows, Inc; PERMINATOR Class A - 10 mils (0.25 mm): www.wrmeadows.com/#sle.
      d. Substitutions: See Section 01 60 00 - PRODUCT REQUIREMENTS.

B. Non-Shrink Cementitious Grout: Premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents.
   1. Grout: Comply with ASTM C1107/C1107M.
   2. Minimum Compressive Strength at 48 Hours, ASTM C109/C109M: 2,000 pounds per square inch.

3. Minimum Compressive Strength at 28 Days, ASTM C109/C109M: 7,000 pounds per square inch.
4. Products containing aluminum powder are not permitted.

2.06 BONDING AND JOINTING PRODUCTS

A. Waterstops: Chloroprene Rubber hydrophilic waterstop.
   1. Configuration: Square or rectangular.
   2. Size: 0.39 x 1.18 inch or 1.18 x 1.18 inches, as required.
   3. Manufacturers:
      a. Greenstreak; Hydrotite.
      b. Substitutions: See Section 01 60 00 - PRODUCT REQUIREMENTS.
   4. Accessories: Manufacturer's recommended adhesives, sealants, and primers.

B. Waterstops: PVC, complying with COE CRD-C 572.
   1. Configuration: Ribbed, with 1/4" inside diameter center-bulb.
   2. Size: 6 inch.
   3. Manufacturers:
      a. Greenstreak; Ribbed with Center Bulb, Style 703.
      b. Substitutions: See Section 01 60 00 - PRODUCT REQUIREMENTS.
   4. Accessories:
      a. Provide grommets, pre-punched holes, or hog rings (installed by others) spaced at 12 inches on center along length of waterstop.
      b. Provide factory made waterstop fabrications for all changes of direction, intersections, and transitions leaving only straight butt joint splices for the field.

C. Waterstops: Bentonite and butyl rubber, complying with NSF 61 and NSF 372.
   1. Configuration: Rectangular.
   2. Size: 3/4" x 1"..
   3. Manufacturers:
      a. Volclay Waterstop RX.
      b. Greenstreak Swellstop.
      c. Substitutions: See Section 01 60 00 - PRODUCT REQUIREMENTS.
   4. Accessories: Manufacturer's recommended adhesives and primers.

D. Slab Isolation Joint Filler: 1/2 inch thick, height equal to slab thickness.
   1. Material: ASTM D1751, cellulose fiber.

2.07 CURING MATERIALS

A. Curing Compound, Naturally Dissipating: Clear, water-based, liquid membrane-forming compound; complying with ASTM C309.
   1. Product dissipates within 4 to 6 weeks.
   2. Manufacturers:
      a. Dayton Superior Corporation; Clear Cure VOC J7WB: www.daytonsuperior.com/#sle.
      b. Euclid Chemical Company; Kurez DR VOX: www.euclidchemical.com/#sle.
      c. W. R. Meadows, Inc; 1100-Clear: www.wrmeadows.com/#sle.
      d. Substitutions: See Section 01 60 00 - PRODUCT REQUIREMENTS.

B. Curing and Sealing Compound, Moisture Emission Reducing, Membrane-Forming: Liquid, membrane-forming, clear sealer, for application to newly-placed concrete; capable of providing adequate bond for flooring adhesives, initially and over the long term; with sufficient moisture vapor impermeability to prevent deterioration of flooring adhesives due to moisture emission.
   1. Use this product to cure and seal all slabs to receive adhesively applied flooring or roofing.
   2. Comply with ASTM C309 and ASTM C1315 Type I Class A.
   3. VOC Content: Less than 100 g/L.
   4. Solids Content: 25 percent, minimum.

C. Polyethylene Film: ASTM D2103, 6 mil, 0.006 inch thick, clear.

D. Water: Potable, not detrimental to concrete.

2.08 CONCRETE MIX DESIGN

A. Proportioning Normal Weight Concrete: Comply with ACI 211.1 recommendations.

B. Concrete Strength: Establish required average strength for each type of concrete on the basis of field experience or trial mixtures, as specified in ACI 301. Concrete design submittal shall include history of breaks according to ACI 318.
   1. For trial mixtures method, employ independent testing agency acceptable to Hoffman for preparing and reporting proposed mix designs.

C. Admixtures: Add acceptable admixtures as recommended in ACI 211.1 and at rates recommended or required by manufacturer.

D. Normal Weight Concrete:
   1. Footings: 3,500 psi, 1-3/4" maximum aggregate, 2" - 4" (+/- 1/2") slump.
   2. Piers: 4,500 psi, 3/4" maximum aggregate, 2" - 4" (+/- 1/2") slump, 6% (+/- 1%) air entrainment.
   3. Foundation, Basement, and Retaining Walls: 4,500 psi, 3/4" maximum aggregate, 2" - 4" (+/- 1/2") slump, 6% (+/- 1%) air entrainment.
   4. Interior Slabs-On-Grade: 4,000 psi, 3/4" maximum aggregate, 2" - 4" slump.
   5. Concrete for Metal Pan Stairs: 3,500 psi, 3/8" maximum aggregate, 2" - 4" (+/- 1/2") slump, with secondary fiber reinforcement.

E. Fly Ash Content: Maximum 5 percent of cementitious materials by weight.

F. Silica Fume Content: Maximum 5 percent of cementitious materials by weight.
   1. The use of Silica Fume (ground granulated blast furnace slag) is not permitted in elevated slabs, toppings, interior or exterior slabs-on-grade unless written approval is received from the Structural Engineer-of-Record (SER) prior to receipt of bids.
   2. Silica Fume is not permitted in interior slabs-on-grade to receive finish flooring materials.

G. Water-Cement Ratio:
   1. Water-Cement Ratio:
      a. Non-Air Entrained Concrete: Maximum 0.50 percent by weight.
      b. Air Entrained Concrete: Maximum 0.45 percent by weight.
   2. Maximum Aggregate Size: 3/4 inch.

2.09 MIXING

A. Transit Mixers: Comply with ASTM C94/C94M.

B. Adding Water: If concrete arrives on-site with slump less than suitable for placement, do not add water that exceeds the maximum water-cement ratio or exceeds the maximum permissible slump.

C. Temperature Control:
   1. Use preparation methods capable of producing concrete with a temperature not more than 90 degrees F. and not less than 45 degrees F. at the time of placement.
   2. Do not heat concrete ingredients to a temperature higher than that necessary to keep the temperature of the mixed concrete as placed, within the specified temperatures.

D. Adding Water: No water shall be added after the initial introduction of mixing water for the batch except as follows:
   1. Approval from the on-site Hoffman representative must be received before adding any water.
   2. The slump of the concrete upon arrival at the site is less than that specified, and the maximum water/cement ratio for the mix has not been exceeded.
   3. The added water should not result in a slump that exceeds the specified values.
   4. The drum should be turned at least 30 additional revolutions at mixing speed.
   5. Water shall not be added to the batch at any later time.
   6. The contractor shall insure that the concrete strength meets specifications with the added water.

E. Mixing Time: ASTM C94 and as noted:
   1. Discharge of the concrete shall be completed within 90 minutes after the introduction of the water to the cement and aggregate mixture or before the drum has achieved 300 revolutions, whichever comes first.
   2. The 90 minute/300 revolution requirement may be waived by Hoffman if the slump is within specifications without the addition of water.
   3. The 90 minute/300 revolution requirement may be reduced during hot weather or during conditions that may contribute to a shorter stiffening time of the concrete.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify lines, levels, and dimensions before proceeding with work of this section.

B. Examine the areas and conditions under which the work of this section will be performed. Correct conditions detrimental to the timely and proper completion of the work. Do not proceed until unsatisfactory conditions are corrected.

3.02 EARTH FORMS

A. Earth forms are not permitted.

3.03 VAPOR RETARDER INSTALLATION

A. Place vapor retarder sheeting in longest lengths possible with longest dimension parallel with direction of placement.

B. Interior Slabs on Grade: Install vapor retarder under interior slabs on grade. Lap joints minimum 12 inches. Seal joints, seams and penetrations watertight with manufacturer's recommended products and follow manufacturer's written instructions. Repair damaged vapor retarder before covering.

3.04 INSTALLING WATERSTOPS

A. Install waterstops in accordance with manufacturer's written installation guidelines.

B. Prime surfaces of concrete if required by manufacturer of waterstop.

C. Remove dust, oil, etc. from concrete surfaces prior to installation.

D. PVC Waterstop:
   1. Fasten to reinforcement at 12" o.c..
   2. Place waterstop exterior to outermost reinforcement or as noted on drawings.

E. Bentonite or Rubber Waterstop:
   1. Fasten/adhere to concrete as required by manufacturer.
   2. Place waterstop to provide a minimum of 2" of concrete cover to the hydrostatic surface.
   3. Keep waterstops dry until new concrete is cast.

3.05 PLACING CONCRETE

A. Place concrete in accordance with ACI 304R.

B. Place concrete for floor slabs in accordance with ACI 302.1R.

C. Notify Hoffman not less than 24 hours prior to commencement of placement operations.

D. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.

E. Ensure reinforcement, inserts, waterstops, embedded parts, and vapor retarders will not be disturbed during concrete placement.

F. Place concrete continuously without construction (cold) joints wherever possible; where construction joints are necessary, before next placement prepare joint surface by removing laitance and exposing the sand and sound surface mortar, by sandblasting or high-pressure water jetting.

G. Repair underslab vapor retarder damaged during placement of concrete. Repair with vapor retarder material; lap over damaged areas minimum 12 inches and seal watertight.

H. Place concrete as rapidly as practicable by methods which prevent segregation.

I. If an interruption occurs when placing concrete and is long enough for the concrete to take a set, the working face shall be given a shape by the use of forms or other means, that will secure proper union with subsequent work; provided that construction joints shall be made only where acceptable to the Engineer.

J. Place concrete continuously between predetermined expansion, control, and construction joints.

K. Place and maintain all concrete to the lines, grades, and elevations shown on the project drawings.

L. Place concrete so a minimum amount of concrete is permitted to flow from one position to another

M. Thoroughly work concrete around reinforcement and embedded fixtures and into corners of forms during placing operations.

N. Use mechanical vibrators to consolidate concrete until it is dense and free of honeycombing and other defects.
   1. Insert vibrator in such a pattern that the influence area of each insert overlaps that of an adjacent insert.
   2. Do not over-vibrate the concrete.
   3. Do not move concrete by use of the vibrator.

O. Finish floors level and flat, unless otherwise indicated, within the tolerances specified below.

P. Concrete Temperature:
   1. The temperature of the concrete when it is being placed shall be not more than 90 degrees F nor less than 45 degrees F.
   2. If concrete is placed when the weather is such that the temperature of the concrete would exceed 90 degrees F, the contractor shall employ effective means, such as pre cooling of aggregates and mixing water, use of ice, or placing later in day, as necessary to maintain the temperature of the concrete as it is placed, below 90 degrees F.

3.06 SLAB JOINTING

A. Locate joints as indicated on drawings.

B. Anchor joint fillers and devices to prevent movement during concrete placement.

C. Isolation Joints: Use preformed joint filler with removable top section for joint sealant, total height equal to thickness of slab, set flush with top of slab.
   1. Install wherever necessary to separate slab from other building members, including columns, walls, equipment foundations, footings, stairs, manholes, sumps, and drains.

D. Saw Cut Contraction Joints: Saw cut joints before concrete begins to cool, within 4 to 12 hours after placing; use 3/16 inch thick blade and cut at least 1 inch deep but not less than one quarter (1/4) the depth of the slab.
   1. If joint pattern is not indicated in Contract Drawings, provide joints at intervals not exceeding 30 times the slab thickness in either direction, and located to conform to bay spacing wherever possible at column centerlines, half bays, or third bays.

E. Construction Joints: Locate construction joints in floor slab, which are not shown on drawings, and notify Engineer for approval.
   1. Provide keyways at least 1-1/2 inches deep in construction joints in walls.
   2. Place construction joints perpendicular to main reinforcement. Continue reinforcement across construction joints.

3.07 SEPARATE FLOOR TOPPINGS

A. Seal all openings in substrate larger than 1/8 inch prior to placing topping.

B. Prior to placing floor topping, roughen substrate concrete surface and remove deleterious material. Broom and vacuum clean. Roughen the surface of existing concrete by means that does not produce micro cracking.

C. Place required dividers, edge strips, reinforcing, and other items to be cast in.

D. Apply sand and cement slurry coat on base course, immediately prior to placing toppings.

E. Place concrete floor toppings to required lines and levels.

3.08 FLOOR FLATNESS AND LEVELNESS TOLERANCES

A. An independent testing agency, as specified in Section 01 40 00, will inspect finished slabs for compliance with specified tolerances.

B. Minimum F(F) Floor Flatness and F(L) Floor Levelness Values:
   1. Exposed to View and Foot Traffic: F(F) of 20; F(L) of 15.
   2. Under Thick-Bed Tile: F(F) of 20; F(L) of 15.
   3. Under Carpeting: F(F) of 25; F(L) of 20.
   4. Under Thin Resilient Flooring and Thinset Tile: F(F) of 35; F(L) of 25.

C. Measure F(F) Floor Flatness and F(L) Floor Levelness in accordance with ASTM E1155 (ASTM E1155M), within 48 hours after slab installation; report both composite overall values and local values for each measured section.

D. Correct the slab surface if composite overall value is less than specified and if local value is less than two-thirds of specified value or less than F(F) 13/F(L) 10.

E. Correct defects by grinding or by removal and replacement of the defective work. Areas requiring corrective work will be identified. Re-measure corrected areas by the same process.

3.09 CONCRETE FINISHING

A. Repair surface defects, including tie holes, immediately after removing formwork.

B. Rough Form Finish: Rub down or chip off fins or other raised areas 1/4 inch or more in height.

C. Smooth Form Finish: Formed concrete surfaces exposed to view, to be covered with a coating material applied directly to the concrete, or as scheduled.
   1. An as-cast concrete surface obtained with selected form-facing materials, arranged in an orderly and symmetrical manner with a minimum of seams.
   2. Completely remove and smooth fins and other projections.
   3. Repair and patch all surface defects including tie holes immediately after removing formwork.

D. Exposed Form Finish: Rub down or chip off and smooth fins or other raised areas 1/4 inch or more in height. Provide finish as follows:

E. Smooth Rubbed Finish: Wet concrete and rub with carborundum brick or other abrasive, not more than 24 hours after form removal.

F. Grout Cleaned Finish: Wet areas to be cleaned and apply grout mixture by brush or spray; scrub immediately to remove excess grout. After drying, rub vigorously with clean burlap, and keep moist for 36 hours.

G. Finishes for Related Unformed Surfaces: At tops of walls and horizontal surfaces, strike-off smooth and finish with texture matching adjacent formed surfaces.

H. Concrete Slabs: Finish to requirements of ACI 302.1R, and as follows:
   1. Scratch Finish: Wood float to FI15/FI13 then roughen surface with stiff brushes or rakes before final set
      a. Locations: Surfaces to receive thick floor coverings including quarry tile and ceramic tile with full bed setting system over 1 inch in thickness.
   2. Float Finish: After screeding, consolidating, and leveling concrete slabs, do not work surface until ready for floating.
      a. Begin floating when surface water has disappeared and when concrete has stiffened sufficiently to permit operation of power-driven floats.

b. Cut down high spots and fill low spots.
c. Immediately after leveling, re-float surface to uniform, sandy texture.
d. Provide float finish for all surfaces requiring trowel finish.

3. Other Surfaces to Be Left Exposed: Trowel as described in ACI 302.1R, minimizing burnish marks and other appearance defects.
4. Fine Broom Finish: After trowel finish, while surface is still plastic, draw soft fiber bristle broom uniformly over surface to create fine-grained but smooth texture.
   a. Locations: Interior stairs and ramps.
5. Heavy Broom Finish: After float finish, while surface is still plastic, draw fiber bristle broom uniformly over surface to provide texture perpendicular to main traffic or at right angles to floor slope.
   a. Locations: Sidewalks, exterior steps, landings, ramps and platforms.

I. In areas with floor drains, maintain floor elevation at walls; pitch surfaces uniformly to drains as indicated on drawings.

3.10 CURING AND PROTECTION

A. Comply with requirements of ACI 308R. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.

B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
1. Normal concrete: Not less than seven days.
2. High early strength concrete: Not less than four days.

C. Surfaces Not in Contact with Forms:
1. Slabs and Floors To Receive Adhesive-Applied Flooring: Curing compounds and other surface coatings are usually considered unacceptable by flooring and adhesive manufacturers. If such materials must be used, either obtain the approval of the flooring and adhesive manufacturers prior to use or remove the surface coating after curing to flooring manufacturer's satisfaction.
2. Begin curing before surface is dry.
   a. Moisture-Retaining Sheet: Lap strips not less than 3 inches and seal with waterproof tape or adhesive; secure at edges.
   b. Curing Compound: Apply in two coats at right angles, using application rate recommended by manufacturer.
   c. Do not apply curing compound on slabs with wood float finishes or which are to receive urethane or epoxy coatings.

3.11 TOLERANCES

A. Tolerances for concrete construction and materials shall conform to all requirements of ACI 117, Standard Specifications for Tolerances for Concrete Construction and Materials except as noted above.
1. Correct slab surfaces if tolerances are less than specified.
2. Correct defects by grinding or by removal and replacement of the defective work. Areas requiring corrective work will be identified by the Engineer/Architect. Re-measure corrected areas by the same process.

3.12 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in Section 01 40 00 - Quality Requirements.

B. Provide free access to concrete operations at project site and cooperate with designated firm.

C. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of concrete operations.

D. Testing Requirements:
1. Tests of concrete and concrete materials may be performed at any time to ensure compliance with specified requirements.

2. Air Content: ASTM C 231; one test for every 50 cu yd of concrete placed, minimum one for each day's pour of each type of air-entrained concrete.
3. Compression Test Specimen: ASTM C 31; mold and store cylinders for laboratory-cured test specimens except when field-cured test specimens are required.
4. Compressive Strength Tests: ASTM C39/C39M. For each test, mold and cure three concrete test cylinders. Obtain test samples for every 50 cubic yards or less of each class of concrete placed.
    a. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.
5. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below, when 80 deg F and above, and one test for each set of compressive-strength specimens.
6. Slump: ASTM C 143/C; perform one slump test for each set of test cylinders taken; for each day's pour of each type of concrete; additional tests when concrete consistency seems to have changed..
7. Slab Testing: Cooperate with manufacturer of specified moisture vapor reduction admixture (MVRA) to allow access for sampling and testing concrete for compliance with warranty requirements.

E. Coordinate with Special Inspection Agency for any required code-required special inspections related to work of this section.

3.13 DEFECTIVE CONCRETE

A. Test Results: The testing agency shall report test results in writing to Hoffman and Contractor within 24 hours of test.

B. Defective Concrete: Concrete not complying with required lines, details, dimensions, tolerances or specified requirements.

C. Repair or replacement of defective concrete will be determined by the Hoffman. The cost of additional testing shall be borne by Contractor when defective concrete is identified.

D. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Hoffman for each individual area.

3.14 PROTECTION

A. Do not permit traffic over unprotected concrete floor surfaces until fully cured.

B. Protect all concrete against damage until final acceptance by Hoffman.

C. Fresh concrete shall be protected from damage due to rain. The contractor shall provide such protection while the concrete is still plastic and whenever such precipitation is imminent or occurring.

3.15 SCHEDULE - CONCRETE FINISHES

A. Retaining Walls:
    1. Exposed to View: Smooth rubbed finish.
    2. Not Exposed to View: Rough formed finish.

B. Below Grade Frost Walls:
    1. Exposed to View: Smooth formed finish.
    2. Not Exposed to View: Rough formed finish.

C. Foundation Walls:
    1. Exposed to View: Smooth rubbed finish.
    2. Not Exposed to View: Smooth formed finish.

D. Walls to Receive Waterproofing: Smooth formed finish.

END OF SECTION

SECTION 03 35 11
CONCRETE FLOOR FINISHES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface treatments for concrete floors and slabs.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - CAST-IN-PLACE CONCRETE: Finishing of concrete surface to tolerance; floating, troweling, and similar operations; curing.

B. Section 03 30 00 - CAST-IN-PLACE CONCRETE: Curing compounds that also function as sealers.

C. Section 09 67 00 - Fluid Applied Flooring.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the work with concrete floor placement and concrete floor curing.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's published data on each finishing product, including information on compatibility of different products and limitations.

C. Maintenance Data: Provide data on maintenance and renewal of applied finishes.

1.05 MOCK-UP

A. For coatings, construct mock-up area under conditions similar to those that will exist during application, with coatings applied.

B. Mock-Up Size: 10 feet square.

C. Locate where directed.

D. Mock-up may remain as part of the work.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer's sealed packaging, including application instructions.

1.07 FIELD CONDITIONS

A. Maintain light level equivalent to a minimum 200 W light source at 8 feet above the floor surface over each 20 foot square area of floor being finished.

B. Do not finish floors until interior heating system is operational.

C. Maintain ambient temperature of 50 degrees F minimum.

PART 2 PRODUCTS

2.01 CONCRETE FLOOR FINISH APPLICATIONS

A. Concrete Stain:
   1. Use at following locations: As indicated in Drawings.

B. High Gloss Clear Sealer:
   1. Use at following locations: As indicated in Drawings.

C. Polished Finish:
   1. Use at following locations: As indicated in Drawings.

2.02 COATINGS

A. Concrete Stain or Dye: Translucent, penetrating compound for interior or exterior use; must be finished with a topical sealer.
   1. Composition: Water-based, non-reactive.
   2. Number of Coats: Minimum of two.

3. VOC: 100 g/L or less.
4. Primary Color: Rich Earth, in a formulation to match approved mock-up.
5. Secondary Color: Red Rock, applied after primary color has completely dried, in a formulation to match approved mock-up.
6. Application:
   a. Primary Color: Spray applied.
   b. Secondary Color: Spray applied.
7. Products:
   a. Euclid Chemical Company; STONE ESSENCE: www.euclidchemical.com/#sle.
   b. Substitutions: See Section 01 60 00 - PRODUCT REQUIREMENTS.

B. High Gloss Clear Coating: Transparent, non-yellowing, water- or solvent-based coating.
1. Composition: Acrylic polymer-based.
2. Nonvolatile Content: 35 percent, minimum, when measured by volume.
3. Products:
   a. Euclid Chemical Company: ULTRAGUARD: www.euclidchemical.com/#sle.
   b. Substitutions: See Section 01 60 00 - PRODUCT REQUIREMENTS.

2.03 POLISHED CONCRETE SYSTEM

A. Polished Concrete System: Materials, equipment, and procedures designed and furnished by a single manufacturer to produce dense polished concrete of the specified sheen.
1. Acceptable Systems:
   a. Euclid Chemical Company; DOUBLE DIAMOND POLISHED CONCRETE FLOOR SYSTEMS: www.euclidchemical.com/#sle.
   b. Substitutions: See Section 01 60 00 - PRODUCT REQUIREMENTS.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that floor surfaces are acceptable to receive the work of this section.

B. Verify that flaws in concrete have been patched and joints filled with methods and materials suitable for further finishes.

3.02 GENERAL

A. Apply materials in accordance with manufacturer's instructions.

3.03 COATING APPLICATION

A. Verify that surface is free of previous coatings, sealers, curing compounds, water repellents, laitance, efflorescence, fats, oils, grease, wax, soluble salts, residues from cleaning agents, and other impediments to adhesion.

B. Protect adjacent non-coated areas from drips, overflow, and overspray; immediately remove excess material.

C. Apply coatings in accordance with manufacturer's instructions, matching approved mock-ups for color, special effects, sealing and workmanship.

3.04 CONCRETE POLISHING

A. Execute using materials, equipment, and procedures specified by manufacturer, using manufacturer approved installer.

END OF SECTION

SECTION 03 35 19
STAINED AND POLISHED CONCRETE

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Dyed and polished concrete.

1.02 RELATED SECTIONS

A. Section 03 30 00 Cast-in-Place Concrete.

B. Section 07 92 00 - Joint Sealants.

1.03 REFERENCES

A. American Concrete Institute (ACI):
   1. ACI 302.1R Guide for Concrete Floor and Slab Construction.

B. ASTM International:
   1. ASTM C309 Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
   2. ASTM C171 Standard Specification for Sheet Materials for Curing Concrete.
   3. ASTM C779 Standard Test Method for Abrasion Resistance of Horizontal Concrete Surfaces.

C. Reunion Internationale des Laboratoires D'Essais et de Recherches sur les Materiaux et les Constructions (RILEM):
   1. Rilem Test Method 11.4 Standard Measurement of Reduction of Moisture Penetration through Horizontal Concrete Surfaces.

D. National Floor Safety Institute (NFSI):
   1. NFSI Test Method 101-A Standard for Evaluating High-Traction Flooring Materials, Coatings, and Finishes.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meetings: Conduct a preinstallation meeting to verify project requirements, manufacturer's installation instructions and manufacturer's warranty requirements. Review the following:
   1. Environmental requirements.
   2. Scheduling and phasing of work.
   3. Coordinating with other work and personnel.
   4. Protection of adjacent surfaces.
   5. Surface preparation.
   6. Repair of defects and defective work prior to installation.
   7. Cleaning.
   8. Installation of polished floor finishes.
   9. Application of liquid hardener, densifier.
   10. Protection of finished surfaces after installation.

1.05 SYSTEM DESCRIPTION

A. Performance Requirements: Provide polished flooring that has been selected, manufactured and installed to achieve the following:
   1. Abrasion Resistance: ASTM C779, Method A, high resistance, no more than 0.008 inch (0.20 mm) wear in 30 minutes.
   2. Reflectivity: Increase of 35% as determined by standard gloss meter.
   3. Waterproof Properties: Rilem Test Method 11.4, 70% or greater reduction in absorption.
   4. High Traction Rating: NFSI 101-A, non-slip properties.

B. Design Requirements:
   1. Hardened Concrete Properties:
      a. Minimum Concrete Compressive Strength: 3,500 psi.

b. Normal Weight Concrete: No lightweight aggregate.
c. Non-air entrained.
d. Placement Properties:
    1) Natural concrete slump of 4 1/2 inches - 5 inches. Admixtures may be used.
    2) Flatness Requirements:
        (a) Overall FF 40.
        (b) Local FF 20.
e. Hard-Steel Troweled (3 passes) Concrete: No burn marks. Finish to ACI 302.1R, Class 5 floor.
    1) Class 6 floors, special colored mineral aggregate hardener with repeated hard steel trowel finish.
f. Curing Options:
    1) Membrane forming curing compounds (ASTM C309, Type 1, Class B, all resin, dissipating cure).
        (a) Acrylic curing and sealing compounds not recommended.
    2) Sheet membrane (ASTM C171); polyethylene film not recommended.
    3) Damp Curing: Seven day cure.

1.06 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit product data for specified products.
    1. Safety Data Sheets (SDS).
    2. Preparation and concrete grinding procedures.
    3. Colored Concrete Surface, Dye Selection Guides.

1.07 INFORMATION SUBMITTALS

A. Quality Assurance:
    1. Test Reports: Certified test reports showing compliance with specified performance characteristics and physical properties as cited in 1.03 Performance Requirements.
    2. Certificates:
        a. Product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
        b. Letter of certification from the National Floor Safety Institute confirming the system has been tested and passed phase Two Level of certification when tested by Method 101-A.
        c. Current contractor’s certificate signed by manufacturer declaring contractor as an approved installer of polishing system.
        d. Manufacturer’s Instructions: Manufacturer’s installation instructions.

1.08 CLOSEOUT SUBMITTALS

A. Warranty: Submit warranty documents specified.

B. Operation and Maintenance Data: Submit operation and maintenance data for installed products in accordance with Section 01 78 00 - Closeout Submittals.
    1. Include:
        a. Manufacturer’s instructions on maintenance renewal of applied treatments.
        b. Protocols and product specifications for joint filing, crack repair and/or surface repair.

1.09 QUALITY ASSURANCE

A. Qualifications:
    1. Installer experienced in performing work of this section who has specialized in installation of work similar to that required for this project.
    2. Installer trained and holding current certification for FGS PermaShine installation.
    3. Manufacturer Qualifications: Manufacturer capable of providing field service representation during construction and approving application method.

B. Regulatory Requirements.

1. NFSI Test Method 101-A Phase Two Level High Traction Material.

C. Mock-Ups:
   1. Construct mock-ups in accordance with Section 01 45 00 - Quality Control.
   2. Mock-Up Size: 4 x 4 foot sample panel at jobsite at location as directed under conditions similar to those which will exist during actual placement.
   3. Mock-up will be used to judge workmanship, concrete substrate preparation, operation of equipment, material application, color selection and shine.
   4. Allow 24 hours for inspection of mock-up before proceeding with work.
   5. When accepted, mock-up will demonstrate minimum standard of quality required for this work. Approved mock-up may remain as part of finished work.

1.10 DELIVERY, STORAGE, AND HANDLING

A. General: Comply with 01 61 00 - Common Product Requirements.

B. Ordering: Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.

C. Delivery:
   1. Deliver materials in manufacturer's original packaging with identification labels and seals intact.

D. Storage and Protection:
   1. Store materials protected from exposure to harmful weather conditions and at temperature conditions recommended by manufacturer.
   2. Protect concrete slab.
      a. Protect from petroleum stains during construction.
      b. Diaper hydraulic power equipment.
      c. Restrict vehicular parking.
      d. Restrict use of pipe cutting machinery.
      e. Restrict placement of reinforcing steel on slab.
      f. Restrict use of acids or acidic detergents on slab.

E. Waste Management and Disposal:
   1. Separate waste materials for Reuse and Recycling in accordance with Section 01 74 19 - Construction Waste Management and Disposal.
   2. Remove from site and dispose of packaging materials at appropriate recycling facilities.

1.11 PROJECT AMBIENT CONDITIONS

A. Installation Location: Comply with manufacturer's written recommendations.

1.12 SEQUENCING

A. Sequence with Other Work: Comply with manufacturer's written recommendations for sequencing construction operations.

1.13 WARRANTY

A. Project Warranty: Refer to Contract Conditions for project warranty provisions.

B. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to, and does not limit, other rights Owner may have under Contract Documents.

C. Warranty: Commencing on date of substantial completion.

1.14 MAINTENANCE

A. Comply with manufacturer's written instructions to maintain installed product.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Ensure manufacturer has minimum 5 years experience in manufacturing components similar to or exceeding requirements of project.

2.02 POLISHED CONCRETE FINISHING PRODUCTS

A. Manufacturer: L & M Construction Chemicals, Inc.

B. Proprietary Products/Systems:

1. Hardener, Sealer, Densifier: Proprietary, water based, odorless liquid, VOC compliant, environmentally safe chemical hardening solution leaving no surface film.
   a. Acceptable Material: L & M Construction Chemicals, Inc., FGS Hardener Plus.
   b. Joint Filler: Semi-rigid, 2-component, self-leveling, 100% solids, rapid curing, polyurea control joint and crack filler with Shore A 80 or higher hardness.
      1) Acceptable Material: L & M Construction Chemicals, Inc., Joint Tite 750.
   c. Oil Repellent Sealer: Ready to use, silane, siloxane and fluoropolymers blended water based solution sealer, quick drying, low-odor, oil and water repellent, VOC compliant and compatible with chemically hardened floors.
      1) Acceptable Material: L & M Construction Chemicals, Inc., Petrotex.
   d. Concrete Dyes: Fast-drying dye, packaged in premeasured units ready for mixing with VOC exempt solvent; formulated for application to polished cementitious surfaces.
      1) Acceptable Material: L & M Construction Chemicals, Inc., Vivid Concrete Dyes.
   e. Cleaning Solution: Proprietary, mild, highly concentrated liquid concrete cleaner and conditioner containing wetting and emulsifying agents; biodegradable, environmentally safe and certified High Traction by National Floor Safety Institute (NFSI).
      1) Acceptable Material: L & M Construction Chemicals, Inc., FGS Concrete Conditioner.

2.03 SOURCE QUALITY CONTROL

A. Ensure concrete finishing components and materials are from single manufacturer.

2.04 PRODUCT SUBSTITUTIONS

A. Substitutions: See Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.01 MANUFACTURERS INSTRUCTIONS

A. Compliance: Comply with manufacturer's written data, including product technical bulletins, product catalog installation instructions, and product carton installation instructions.

3.02 EXAMINATION

A. Site Verification of Conditions:

1. Verify that concrete substrate conditions, which have been previously installed under other sections or contracts, are acceptable for product installation in accordance with manufacturer's instructions prior to installation of concrete finishing materials.

B. Verify Concrete Slab Performance Requirements:

1. Verify concrete surfaces received a hard steel-trowel finish (3 passes) during placement.

3.03 PREPARATION

A. Ensure surfaces are clean and free of dirt and other foreign matter harmful to performance of concrete finishing materials.

B. Examine surface to determine soundness of concrete for polishing.

C. General Contractor to remove surface contamination.

3.04 INSTALLATION

A. Floor Surface Polishing and Treatment:

1. Provide polished concrete floor treatment in entirety of slab indicated by drawings. Provide consistent finish in all contiguous areas.
2. Apply floor finish prior to installation of fixtures and accessories.
3. Diamond polish concrete floor surfaces with power disc machine recommended by floor finish manufacturer. Sequence with coarse to fine grit using dry method.

a. Comply with manufacturer's recommended polishing grits for each sequence to achieve desired finish level. Level of sheen shall match that of approved mock-up.
b. Expose aggregate in concrete surface only as determined by approved mock-up.
c. All concrete surfaces shall be as uniform in appearance as possible.
d. Dyed and Polished Concrete (option):
    1) Locate demarcation line between dyed surfaces and other finishes.
    2) Polish concrete to final finish level.
    3) Apply diluted dyes to polished concrete surface.
    4) Allow dye to dry.
    5) Remove residue with dry buffer; reapply as necessary for desired result.
e. Apply FGS Hardener Plus, Hardener, Densifier As Follows:
    1) First coat at 250 ft2/gal (6.25 m2/L).
    2) Second coat at 350 ft2/gal (8.75 m2/L).
    3) Follow manufacturer's recommendations for drying time between successive coats.

4. Remove defects and repolish defective areas.
5. Finish edges of floor finish adjoining other materials in a clean and sharp manner.

3.05 ADJUSTMENTS

A. Polish to higher gloss those areas not meeting specified gloss levels per mock-up.

B. Fill joints flush to surface.

3.06 FINAL CLEANING

A. Mechanically scrub treated floors for seven days with soft to medium pads with approved cleaning solution.

B. Upon completion, installer must remove surplus and excess materials, rubbish, tools and equipment.

3.07 PROTECTION

A. Protect installed product from damage during construction.

B. Protect with EZ Cover™ by McTech Corp., or comparable product.

END OF SECTION

SECTION 03 54 00
CAST UNDERLAYMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Liquid-applied self-leveling floor underlayment.
   1. Use gypsum-based type at locations noted on drawings.

B. Sound Control Mat.

1.02 RELATED REQUIREMENTS

A. Section 01 70 00 - EXECUTION AND CLOSEOUT REQUIREMENTS: Alteration project procedures; selective demolition for remodeling.

B. Section 06 10 00 - Rough Carpentry: Wood sheathing substrate.

1.03 REFERENCE STANDARDS

A. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or (50-mm) Cube Specimens).

B. ASTM C1602/C1602M - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete.

C. ASTM C348 - Standard Test Method for Flexural Strength of Hydraulic-Cement Mortars.

D. ASTM C472 - Standard Test Methods for Physical Testing of Gypsum, Gypsum Plasters and Gypsum Concrete.

E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate location of devices for fire protection, plumbing, mechanical and electrical work.

B. Preinstallation Meeting: Convene one week before starting work of this section.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's data sheets documenting physical characteristics and product limitations of underlayment materials. Include information on surface preparation, mixing instructions, environmental limitations, storage and handling requirements, and installation instructions.
   1. Acoustical Data: Submit sound tests according to IBC code criteria ASTM E492 (IIC) and ASTM E90 (STC).

C. Manufacturer's Instructions.

1.06 QUALITY ASSURANCE

A. Applicator Qualifications: Company specializing in performing the work of this section, and approved by manufacturer.

B. All materials shall be furnished by a single manufacturer and installed in accordance with current written recommendations.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Keep dry and protect from direct sun exposure, freezing, and ambient temperature greater than 105 degrees F.

1.08 SYSTEM REQUIREMENTS

A. Sound Control: 2009 IBC: Section 1207.2 and 1207.3.
   1. Minimum Sound Transmission Class (STC): 50 per ASTM E90 and E336.

1.09 FIELD CONDITIONS

A. Do not install underlayment until floor penetrations and peripheral work are complete.

B. Maintain minimum ambient temperatures of 50 degrees F 24 hours before, during and 72 hours after installation of underlayment.

C. During the curing process, ventilate spaces to remove excess moisture.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Gypsum Underlayment:
   1. Hacker Industries, Inc: www.hackerindustries.com/#sle.
   2. Maxxon Corporation; Gyp-Crete 2000/3.2K: www.maxxon.com/#sle.
   3. Substitutions: See Section 01 60 00 - PRODUCT REQUIREMENTS.

2.02 MATERIALS

A. Cast Underlayments, General:
   1. Comply with applicable code for combustibility or flame spread requirements.
   2. Provide certificate of compliance from authority having jurisdiction indicating approval of underlayment materials in the required fire rated assembly.
   3. Fire Rating: Meeting the requirements of the Underwriters Laboratory File Number as noted on drawings.

B. Gypsum-Based Underlayment: Gypsum based mix, that when mixed with water in accordance with manufacturer's directions will produce self-leveling underlayment with the following properties:
   1. Compressive Strength: Minimum 2500 pounds per square inch, tested per ASTM C472.
   2. Density: Maximum ___ pounds per cubic foot.
   3. Final Set Time: 1 to 2 hours, maximum.
   4. Thickness: 3/4 inch to maximum 1-1/2 inch.
   5. Surface Burning Characteristics: Flame spread/Smoke developed index of 0/0 in accordance with ASTM E84.

C. Aggregate: Dry, well graded, washed silica aggregate, approximately 1/8 inch in size and acceptable to underlayment manufacturer.

D. Sound Control Mat: Random filament, corrugated "U" groove core sound control mat designed to limit impact noise. Sound control mat cannot negate the fire rating and must be specified in the UL design.
   1. Product - 1/8 Inch Mat: Similar to Firm-Fill SCM-125 as manufactured by Hacker Industries.
   2. Product - 1/4 Inch Mat: Similar to Firm-Fill SCM-250 as manufactured by Hacker Industries.
   3. Substitutions: See Section 01 60 00 - PRODUCT REQUIREMENTS.

E. Water: ASTM C1602/C1602M; clean, potable, and not detrimental to underlayment mix materials.

F. Primer or Bonding Agent: Manufacturer's recommended type.

G. Joint and Crack Filler: Latex based filler, as recommended by manufacturer.

2.03 MIXING

A. Site mix materials in accordance with manufacturer's instructions.

B. Add aggregate for areas where thickness will exceed 1/2 inch. Mix underlayment and water for at least two minutes before adding aggregate, and continue mixing to assure that aggregate has been thoroughly coated.

C. Mix to self-leveling consistency without over-watering.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are clean, dry, unfrozen, do not contain petroleum byproducts, or other compounds detrimental to underlayment material bond to substrate.

B. Do not proceed with underlayment installation until unacceptable conditions are corrected.

3.02 PREPARATION

A. Remove substrate surface irregularities. Fill voids and deck joints with filler. Finish smooth.

B. Vacuum clean surfaces.

C. Prime substrate in accordance with manufacturer's instructions. Allow to dry.

D. Close floor openings.

3.03 APPLICATION - SOUND CONTROL MAT

A. Install sound control mat in strict accordance with manufacturer's recommendations.

3.04 APPLICATION - UNDERLAYMENT

A. Install underlayment in accordance with manufacturer's instructions.

B. Pump or pour material onto substrate. Do not retemper or add water.
   1. Pump, move, and screed while the material is still highly flowable.
   2. Be careful not to create cold joints.
   3. Wear spiked shoes while working in the wet material to avoid leaving marks.

C. Place to indicated thickness, with top surface level to 1/8 inch in 10 ft.

D. Place after partition installation.

E. Where additional aggregate has been used in the mix, add a top layer of neat mix (without aggregate), if needed to level and smooth the surface.

3.05 CURING

A. Once underlayment starts to set, prohibit foot traffic until final set has been reached.

B. Air cure in accordance with manufacturer's instructions.

3.06 FIELD QUALITY CONTROL

A. An independent testing agency will perform field inspection and testing, as specified in Section 01 40 00 - Quality Requirements.
   1. Compressive Strength Test: Make and test cubes in accordance with ASTM C472.
   2. At least one set of 3 molded cubes shall be taken from each 10,000 sq. ft., minimum of one set of cubes per day.

B. Placed Material: Agency may inspect and test for conformance to specification requirements.

3.07 PROTECTION

A. Protect against direct sunlight, heat, and wind; prevent rapid drying to avoid shrinkage and cracking.

B. Do not permit traffic over unprotected floor underlayment surfaces.

END OF SECTION

SECTION 04 01 00
MAINTENANCE OF MASONRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Water cleaning of brick surfaces.

B. Repointing mortar joints.

C. Repair or replacement of damaged brick masonry.

D. Sawcutting exterior control joints in existing walls.

1.02 RELATED REQUIREMENTS

A. Section 04 05 11 - Mortar and Masonry Grout.

B. Section 04 20 00 - Unit Masonry: Brick masonry units.

1.03 REFERENCE STANDARDS

A. ACI 530/530.1/ERTA - Building Code Requirements and Specification for Masonry Structures and Related Commentaries.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week prior to commencing work of this section.
   1. Require attendance of parties directly affecting work of this section.
   2. Review conditions of installation, installation procedures, and coordination with related work.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on cleaning solutions.

C. Samples: Submit four samples of face brick units to illustrate matching color, texture and extremes of color range.

D. Manufacturer's Instructions: For cleaning materials, indicate special procedures, conditions requiring special attention.

1.06 QUALITY ASSURANCE

A. Comply with provisions of ACI 530/530.1/ERTA, except where exceeded by requirements of the contract documents.

B. Restorer: Company specializing in masonry restoration with minimum three years of documented experience.

1.07 MOCK-UP

A. Restore and repoint an existing masonry wall area sized 4 feet long by 4 feet high; include in mock-up area instances of mortar.

B. Locate where directed.

C. Acceptable panel and procedures employed will become the standard for work of this section.

D. Mock-up may remain as part of the Work.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver masonry neatly stacked and tied on pallets. Store clear of ground with adequate waterproof covering.

B. Store blast medium materials in manufacturer's packaging.

1.09 FIELD CONDITIONS

A. Maintain materials and surrounding air temperature to minimum 40 degrees F prior to, during, and 48 hours after completion of masonry work.

B. Maintain materials and surrounding air temperature to maximum 90 degrees F prior to, during, and 48 hours after completion of masonry work.

PART 2 PRODUCTS

2.01 MORTAR MATERIALS

A. Comply with requirements of Section 04 05 11.

2.02 MASONRY MATERIALS

A. Brick: Section 04 20 00.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces to be restored are ready for work of this section.

3.02 PREPARATION

A. Protect surrounding elements from damage due to restoration procedures.

B. Carefully remove and store removable items located in areas to be restored, including fittings; reinstall upon completion.

C. Separate areas to be protected from restoration areas using means adequate to prevent damage.

D. Cover existing landscaping with tarpaulins or similar covers.

E. Mask immediately adjacent surfaces with material that will withstand cleaning and restoration procedures.

F. Close off areas, materials, and surfaces not receiving work of this section to protect from damage.

G. Close off adjacent occupied areas with dust proof partitions.

H. Immediately remove stains, efflorescence, or other excess resulting from the work of this section.

I. Protect roof membrane and flashings from damage with minimum 1/2 inch plywood laid on roof surfaces over full extent of work area and traffic route.

J. When using cleaning methods that involve water or other liquids, install drainage devices to prevent runoff over adjacent surfaces unless those surfaces are impervious to damage from runoff.

3.03 REBUILDING

A. Cut out damaged and deteriorated masonry with care in a manner to prevent damage to any adjacent remaining materials.

B. Support structure as necessary in advance of cutting out units.

C. Cut away loose or unsound adjoining masonry as directed.

D. Build in new units following procedures for new work specified in other section(s).

E. Mortar Mix: Colored and proportioned to match existing work.

F. Ensure that anchors are correctly located and built in.

G. Install built in masonry work to match and align with existing, with joints and coursing true and level, faces plumb and in line. Build in all openings, accessories and fittings.

3.04 REPOINTING

A. Cut out loose or disintegrated mortar in joints to minimum 1/2 inch depth or until sound mortar is reached.

B. Use power tools only after test cuts determine no damage to masonry units will result.

C. Do not damage masonry units.

D. When cutting is complete, remove dust and loose material by brushing.

E. Premoisten joint and apply mortar. Pack tightly in maximum 1/4 inch layers. Form a smooth, compact concave joint to match existing.

3.05 CLEANING EXISTING MASONRY

A. High Pressure Cold Water: Cold water blast with to be determined psi pressure to brick masonry surfaces, at noted locations, providing uniform finish.

3.06 CLEANING NEW MASONRY

A. Verify mortar is fully set and cured.

B. Clean surfaces and remove large particles with wood scrapers, brass or nylon wire brushes.

C. Scrub walls with cleaning agent solution using stiff brush. Thoroughly rinse and wash off cleaning solution, dirt and mortar crumbs using clean, pressurized water.

D. Protect area below cleaning operation and keep masonry soaked with water and flushed free of acid and dissolved mortar continuously for duration of cleaning.

E. Before solution dries, rinse and remove acid solution and dissolved mortar, using clean, pressurized water.

3.07 CLEANING

A. Remove excess mortar, smears, and droppings as work proceeds and upon completion.

B. Clean surrounding surfaces.

END OF SECTION

SECTION 04 05 11

MORTAR AND MASONRY GROUT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Mortar for masonry.

1.02 RELATED REQUIREMENTS

A. Section 04 01 00 - Maintenance of Masonry: Bedding and pointing mortar for masonry restoration work.

B. Section 04 20 00 - Unit Masonry: Installation of mortar and grout.

1.03 REFERENCE STANDARDS

A. ACI 530/530.1/ERTA - Building Code Requirements and Specification for Masonry Structures and Related Commentaries.

B. ASTM C5 - Standard Specification for Quicklime for Structural Purposes.

C. ASTM C91/C91M - Standard Specification for Masonry Cement.

D. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar.

E. ASTM C150/C150M - Standard Specification for Portland Cement.

F. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes.

G. ASTM C270 - Standard Specification for Mortar for Unit Masonry.

H. ASTM C387/C387M - Standard Specification for Packaged, Dry, Combined Materials for Concrete and High Strength Mortar.

I. ASTM C979/C979M - Standard Specification for Pigments for Integrally Colored Concrete.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Include design mix using the Property specification of ASTM C 270. Also include required environmental conditions and admixture limitations.

1. Mortar: Submit reports on mortar indicating conformance of mortar to property requirements of ASTM C 270 and test and evaluation reports per ASTM C 780.

C. Samples: Submit two samples of mortar, illustrating mortar color and color range.

D. Manufacturer's Installation Instructions: Submit packaged dry mortar manufacturer's installation instructions.

1.05 QUALITY ASSURANCE

A. Comply with provisions of ACI 530/530.1/ERTA, except where exceeded by requirements of the contract documents.

B. Single-Source Responsibility - Mortar Materials: Obtain mortar ingredients of uniform quality, including color for masonry, from one manufacturer for each cementitious component and from one source and producer for each aggregate.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Maintain packaged materials clean, dry, and protected against dampness, freezing, and foreign matter.

B. Store cementitious materials off the ground, under cover, and in dry location.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided. Store different aggregates separately.

D. Deliver pre-blended, dry mortar mix in moisture-resistant containers designed for lifting and emptying into dispensing silo. Store pre-blended, dry mortar mix in delivery containers on

elevated platforms, under cover, and in a dry location or in a metal dispensing silo with weatherproof cover.

1.07 FIELD CONDITIONS

A. Cold and Hot Weather Requirements: Comply with requirements of ACI 530/530.1/ERTA or applicable building code, whichever is more stringent.

PART 2 PRODUCTS

2.01 MORTAR AND GROUT APPLICATIONS

A. At Contractor's option, mortar and grout may be field-mixed from packaged dry materials, made from factory premixed dry materials with addition of water only, or ready-mixed.

B. Mortar Color: Match existing.

C. Mortar Mix Designs: ASTM C270, Property Specification.
   1. Exterior Masonry Veneer: Type N.
   2. Engineered Masonry: Type S.
   3. Exterior, Loadbearing Masonry: Type S.
   4. Exterior, Non-loadbearing Masonry: Type N.

2.02 MATERIALS

A. Packaged Dry Material for Mortar for Unit Masonry: Premixed Portland cement, hydrated lime, and sand; complying with ASTM C387/C387M and capable of producing mortar of the specified strength in accordance with ASTM C270 with the addition of water only.
   1. Type: Types as scheduled in this section.
   2. Color: Mineral pigments added as required to produce approved color sample.

B. Packaged Dry Material for Mortar for Repointing: Premixed Portland cement, hydrated lime, and graded sand; capable of producing mortar in accordance with ASTM C270 with the addition of water only.
   1. Color: Mineral pigments added as required to produce approved color sample.

C. Portland Cement: ASTM C150/C150M.
   1. Type: Type I - Normal; ASTM C150/C150M.
   2. Color: Color as required to produce approved color sample.

D. Hydrated Lime: ASTM C207, Type S.

E. Quicklime: ASTM C5, non-hydraulic type.

F. Mortar Aggregate: ASTM C144.

G. Pigments for Colored Mortar: Pure, concentrated mineral pigments specifically intended for mixing into mortar and complying with ASTM C979/C979M.
   1. Color(s): To match existing.
   2. Manufacturers:
      a. Solomon Colors; Solomon Colors Concentrated A, H, and X Series: www.solomoncolors.com/#sle.
      b. Davis Colors: www.daviscolors.com/#sle.
      c. Lambert Corporation: www.lambertusa.com/#sle.
      d. Substitutions: See Section 01 60 00 - PRODUCT REQUIREMENTS.

H. Water: Clean and potable.

I. Masonry Cement: The use of masonry cement is strictly forbidden in all masonry construction.

2.03 MORTAR MIXING

A. Thoroughly mix mortar ingredients using mechanical batch mixer, in accordance with ASTM C270 and in quantities needed for immediate use.

B. Maintain sand uniformly damp immediately before the mixing process.

C. Do not use anti-freeze compounds to lower the freezing point of mortar.

D. If water is lost by evaporation, re-temper only within two hours of mixing.

E. Use mortar within two hours after mixing at temperatures at or above 90 degrees F, or two-and-one-half hours at temperatures under 40 degrees F.

PART 3 EXECUTION

3.01 PREPARATION

A. Plug clean-out holes for grouted masonry with block masonry units. Brace masonry to resist wet grout pressure.

3.02 INSTALLATION

A. Install mortar to requirements of section(s) in which masonry is specified.

3.03 GROUTING

A. Perform all grouting by means of low-lift technique. Do not employ high-lift grouting.

B. Do not displace reinforcement while placing grout.

C. Low-Lift Grouting:
   1. Limit height of pours to 60 inches.
   2. Limit height of masonry to 8 inches above each pour.
   3. Pour grout only after vertical reinforcing is in place; place horizontal reinforcing as grout is poured. Prevent displacement of bars as grout is poured.
   4. Place grout for each pour continuously and consolidate immediately; do not interrupt pours for more than 1-1/2 hours.

3.04 FIELD QUALITY CONTROL

A. An Independent Testing Agency, retained by Hoffman will perform construction field tests, in accordance with provisions of Section 01 40 00.

END OF SECTION

SECTION 04 20 00

UNIT MASONRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Concrete block.

B. Reinforcement and anchorage.

C. Flashings.

D. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 04 01 00 - Maintenance of Masonry.

B. Section 04 05 11 - Mortar and Masonry Grout.

C. Section 07 62 00 - Sheet Metal Flashing and Trim: Through-wall masonry flashings.

D. Section 07 92 00 - Joint Sealants: Sealing control and expansion joints.

1.03 PRICE AND PAYMENT PROCEDURES

A. See Section 01 21 00 - ALLOWANCES, for cash allowances affecting this section.

1.04 REFERENCE STANDARDS

A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

B. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.

C. ASTM A641/A641M - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.

D. ASTM C62 - Standard Specification for Building Brick (Solid Masonry Units Made From Clay or Shale).

E. ASTM C90 - Standard Specification for Loadbearing Concrete Masonry Units.

F. ASTM C129 - Standard Specification for Nonloadbearing Concrete Masonry Units.

G. ASTM C140/C140M - Standard Test Methods of Sampling and Testing Concrete Masonry Units and Related Units.

H. ASTM C744 - Standard Specification for Prefaced Concrete and Calcium Silicate Masonry Units.

I. ASTM C780 - Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry.

J. ASTM C979/C979M - Standard Specification for Pigments for Integrally Colored Concrete.

K. ASTM E514/E514M - Standard Test Method for Water Penetration and Leakage Through Masonry.

L. BIA Technical Notes No. 7 - Water Penetration Resistance – Design and Detailing.

M. BIA Technical Notes No. 13 - Ceramic Glazed Brick Exterior Walls.

N. BIA Technical Notes No. 28B - Brick Veneer/Steel Stud Walls.

O. BIA Technical Notes No. 46 - Maintenance of Brick Masonry.

P. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures.

Q. UL (FRD) - Fire Resistance Directory.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section.

1. Attendance:

a. Hoffman Field Project Manager.
b. Architect/Engineer (optional)
c. Testing Laboratory retained by Hoffman.
d. Mason contractor representative including foreman.
e. Grout and mortar supplier representative (optional).

2. Review the following as a minimum:
   a. Schedule.
   b. Methods and procedures related to reinforcement placement, grouting, and tooling of joints.
   c. Installation and placement of mechanical/electrical components within walls.
   d. Temporary shoring and bracing guidelines.
   e. Flashing locations and installation details.
   f. Control joint requirements and details for interior and exterior masonry walls.
   g. Warm and cold weather requirements when appropriate.
   h. Cleaning and protection procedures.
   i. Grout and mortar testing procedures.
   j. Governing regulations and standards for safety, fall protection, and scaffolding.
   k. Review requirements for any code-required special inspections.

1.06 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data for masonry units, fabricated wire reinforcement, and masonry accessories.
   1. Manufacturer's Certificate: Certify that masonry units meet or exceed specified requirements, included required fire ratings.

C. Samples: Submit four samples of facing brick units to illustrate color, texture, and extremes of color range.

1.07 QUALITY ASSURANCE

A. Comply with provisions of ACI 530/530.1/ERTA, except where exceeded by requirements of the contract documents.
   1. Maintain one copy of each document on project site.

B. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section with minimum three years of documented experience.

C. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

D. Single-Source Responsibility - Masonry Units: Obtain masonry units of uniform texture and color, or of a uniform blend with the ranges accepted for these characteristics, from one manufacturer for each different product required for each surface or visually related surface.

1.08 MOCK-UP

A. Construct a masonry wall as a mock-up panel sized at least 4 feet long by 4 feet high; include mortar and accessories, structural backup, wall openings, flashings, and wall insulation in mock-up.

B. Make panel large enough to include all anticipated masonry or stone types, banding, special features, etc.

C. Locate where directed.

D. Mock-up may remain as part of the Work.

1.09 DELIVERY, STORAGE, AND HANDLING

A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.

B. All brick and clay products must be covered during transport and delivery to the project.

C. Cover materials when necessary to protect from the elements.

PART 2 PRODUCTS

2.01 CONCRETE MASONRY UNITS

A. Concrete Block: Comply with referenced standards and as follows:
   1. Size: Standard units with nominal face dimensions of 16 by 8 inches and nominal depths as indicated on drawings for specific locations. Pre-Faced units nominal 4 by 4 by 16 inches at exterior building wall veneer, 8 by 8 by 16 inches at exterior landscaping walls, and 4 by 8 by 16 below grade.
   2. Special Shapes: Provide non-standard blocks configured for corners, lintels, headers, control joint edges, and other detailed conditions.
      a. Provide bullnose units for outside corners.
      b. Bullnose all exposed corners to 7'-4" above finished floor, unless noted otherwise.
   3. Fire-rated Units: As indicated on drawings.
   4. Load-Bearing Units: ASTM C90, medium weight.
      a. Hollow block.
      b. Exposed Faces: Manufacturer's standard color and texture where indicated.
   5. Non-Loadbearing Units: ASTM C129.
      a. Hollow block, as indicated.
      b. Medium weight.
   6. Pre-Faced Units: ASTM C90, hollow block, with smooth resinous facing complying with ASTM C744.
      a. Colors and styles: As indicated on drawings.
      b. Manufacturers:
         1) Echelon - Trendstone; Supplied by Hockers Brick & Tile Co Inc.

2.02 MORTAR AND GROUT MATERIALS

A. Mortar and Grout: As specified in Section 04 05 11.

2.03 REINFORCEMENT AND ANCHORAGE

A. Manufacturers:
   1. Blok-Lok Limited: www.blok-lok.com/#sle.
   2. Hohmann & Barnard, Inc: www.h-b.com/#sle.
   3. WIRE-BONDwww.wirebond.com/#sle.
   4. Substitutions: See Section 01 60 00 - PRODUCT REQUIREMENTS.

B. Flexible Anchors: 2-piece anchors that permit differential movement between masonry and building frame, sized to provide not less than 5/8 inch of mortar coverage from masonry face.
   1. Steel frame: Crimped wire anchors for welding to frame, 0.25 inch thick, with trapezoidal wire ties 0.1875 inch thick, hot dip galvanized to ASTM A 153/A 153M, Class B.

C. Two-Piece Wall Ties: Formed steel wire, 0.1875 inch thick, adjustable, eye and pintle type, hot dip galvanized to ASTM A 153/A 153M, Class B, sized to provide not less than 5/8 inch of mortar coverage from masonry face and to allow vertical adjustment of up to 1-1/4 in.

D. Masonry Veneer Anchors: 2-piece anchors that permit differential movement between masonry veneer and structural backup, hot dip galvanized to ASTM A 153/A 153M, Class B.
   1. Anchor plates: Not less than 0.075 inch thick, designed for fastening to structural backup through sheathing by two fasteners; provide design with legs that penetrate sheathing and insulation to provide positive anchorage.
   2. Wire ties: Triangular shape, 0.1875 inch thick.
   3. Vertical adjustment: Not less than 3-1/2 inches.
   4. Fasteners: Self-tapping or self-piercing, corrosion resistant coating, with bonded EPDM washer with vulcanized bonding.

2.04 FLASHINGS

A. Metal Flashing Materials:

1. Prefabricated Metal Flashing: Smooth fabricated 26 ga, 0.0747 inch stainless steel (type 304) flashing for thru-wall conditions.
    a. Manufacturers:
        1) Hohmann & Barnard, Inc: www.h-b.com/#sle.
        2) Substitutions: See Section 01 60 00 - PRODUCT REQUIREMENTS.

B. Membrane Asphaltic Flashing Materials:
1. Rubberized Asphalt Flashing: Self-adhering polymer modified asphalt sheet; 40 mils (0.040 inch) minimum total thickness; 8 mil cross-laminated polyethylene bonded to adhesive rubberized asphalt, with a removable release liner.
    a. Manufacturers:
        1) Heckmann Building Products, Inc: www.heckmannbuildingprods.com/#sle
        2) WIRE-BOND; AquaFlash 500: www.wirebond.com/#sle.
        3) Substitutions: See Section 01 60 00 - PRODUCT REQUIREMENTS.

C. Flashing Sealant/Adhesives: Silicone, polyurethane, or silyl-terminated polyether/polyurethane or other type required or recommended by flashing manufacturer; type capable of adhering to type of flashing used.

2.05 ACCESSORIES

A. Joint Filler: Closed cell polyvinyl chloride; oversized 50 percent to joint width; self expanding; 3/8 inch wide by maximum lengths available.
1. Manufacturers:
    a. Hohmann & Barnard, Inc: www.h-b.com.
    b. WIRE-BOND; Expansion Joint 3000: www.wirebond.com.

B. Cavity Mortar Control: Semi-rigid polyethylene or polyester mesh panels, sized to thickness of wall cavity, and designed to prevent mortar droppings from clogging weeps and cavity vents and allow proper cavity drainage.
1. Mortar Diverter: Semi-rigid mesh designed for installation at flashing locations.
    a. Manufacturers:
        1) Mortar Net Solutions: www.mortarnet.com.
        2) Substitutions: See Section 01 60 00 - PRODUCT REQUIREMENTS.

C. Weeps and Vents:
1. Type: Molded PVC grilles, insect resistant.
2. Color(s): As selected by Hoffman from manufacturer's full range.
    a. Manufacturers:
        1) Blok-Lok Limited: www.blok-lok.com.
        2) Hohmann & Barnard, Inc: www.h-b.com/sle.
        3) Mortar Net Solutions: www.mortarnet.com/#sle.
        4) WIRE-BOND: www.wirebond.com.
        5) Substitutions: See Section 01 60 00 - PRODUCT REQUIREMENTS.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive masonry.

B. Verify that related items provided under other sections are properly sized and located.

C. Verify that built-in items are in proper location, and ready for roughing into masonry work.

3.02 PREPARATION

A. Direct and coordinate placement of metal anchors supplied for installation under other sections.

B. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.

3.03 COLD AND HOT WEATHER REQUIREMENTS

A. Comply with requirements of ACI 530/530.1/ERTA or applicable building code, whichever is more stringent.

3.04 GENERAL

A. Build masonry construction to the full thickness shown, using units of nominal thickness indicated.

B. Erect walls to comply with specified construction tolerances, with courses accurately spaced and coordinated with other construction.

C. During erection, cover tops of walls, projections, and sills with waterproof sheathing at end of each days work. Cover partially completed masonry when construction is not in progress.
   1. Extend cover a minimum of 24 inches down both sides and hold securely in place.
   2. Where one wythe of a multiple wythe masonry wall is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to non-constructed wythe and hold cover in place.

D. Do not apply floor or roof loads until masonry has obtained design strengths unless allowed by Engineer-of-record.

3.05 COURSING

A. Establish lines, levels, and coursing indicated. Protect from displacement.

B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.

C. Concrete Masonry Units:
   1. Bond: Running, 1/2 bond.
   2. Mortar Joints: Concave, 3/8 inch thickness.

3.06 PLACING AND BONDING

A. Buttering corners of joints or excessive furrowing of mortar joints is not permitted.

B. Remove excess mortar and mortar smears as work progresses.

C. Remove excess mortar with water repellent admixture promptly. Do not use acids, sandblasting or high pressure cleaning methods.

D. Interlock intersections and external corners.

E. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.

F. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.

G. Cut mortar joints flush where liquid-applied weather barriers are indicated, wall tile is scheduled, resilient base is scheduled, or bitumen dampproofing is applied.

H. Stain Prevention:
   1. Prevent grout, mortar, reinforcing, and soil from staining the faces of masonry to be left exposed or painted. Immediately remove materials that come in contact with such masonry.
   2. Protect base of walls from water-splashed mud and mortar splatter by ground and/or wall coverings.
   3. Protect sills, ledges and projections from mortar droppings.
   4. Protect surfaces of window and door frames as well as similar products with painted and integral finishes, from mortar or grout droppings.
   5. Protect exposed metal and/or rubber flashings from staining and damage during construction.

3.07 TOOLING

A. Tool joints when "thumb-print" hard with a v-groove jointer to match existing, slightly larger than width of joint.

B. Uniformly tool all joints to be smooth and free of irregularities.

3.08 WEEPS/CAVITY VENTS

A. Install weeps in veneer and cavity walls at 24 inches on center horizontally on top of through-wall flashing above shelf angles and lintels and at bottom of walls.

B. Install cavity vents in veneer and cavity walls at 32 inches on center horizontally below shelf angles and lintels and near top of walls.

3.09 CAVITY MORTAR CONTROL

A. Do not permit mortar to drop or accumulate into cavity air space or to plug weep/cavity vents.

B. For cavity walls, build inner wythe ahead of outer wythe to accommodate accessories.

C. Install cavity mortar diverter at base of cavity and at other flashing locations as recommended by manufacturer to prevent mortar droppings from blocking weep/cavity vents.

3.10 REINFORCEMENT AND ANCHORAGE - CAVITY WALL MASONRY

A. Fasten anchors to structural framing and embed in masonry joints as masonry is laid. Unless otherwise indicated on drawings or closer spacing is indicated under specific wall type, space anchors at maximum of 24 inches horizontally and 16 inches vertically.

3.11 REINFORCEMENT AND ANCHORAGE - MASONRY VENEER

A. Masonry Back-Up: Embed anchors to bond veneer at maximum 16 inches on center vertically and 16 inches on center horizontally. Place additional anchors at perimeter of openings and ends of panels, so maximum spacing of anchors is 8 inches on center.

3.12 MASONRY FLASHINGS

A. Install flexible flashings to dry surfaces at air temperatures of 25 degrees F and above in accordance with manufacturer's recommendations.

B. Remove all deleterious materials from surfaces to be flashed.

C. Apply primer or surface conditioner by spray, brush, or roller at rate recommended by the manufacturer, prior to flashing installation.

D. Whether or not specifically indicated, install masonry flashing to divert water to exterior at all locations where downward flow of water will be interrupted.
   1. Extend flashings full width at such interruptions and at least 6 inches, minimum, into adjacent masonry or turn up flashing ends at least 1 inch, minimum, to form watertight pan at non-masonry construction.
   2. Remove or cover protrusions or sharp edges that could puncture flashings.
   3. Seal lapped ends and penetrations of flashing before covering with mortar.

E. Apply a bead or trowel coat of mastic along flexible flashing top edge, seams, cuts and penetrations.

F. Extend metal flashings through exterior face of masonry and terminate in an angled drip with hemmed edge. Install joint sealer below drip edge to prevent moisture migration under flashing.

G. Install metal through-wall flashings, receivers and reglets where noted on drawings.

H. Extend laminated flashings to within 1/4 inch of exterior face of masonry.

I. Lap end joints of flashings at least 6 inches, minimum, and seal watertight with flashing sealant/adhesive.

3.13 CONTROL AND EXPANSION JOINTS

A. Size control joint in accordance with Section 07 90 05 for sealant performance.

B. Form expansion joint as detailed on drawings.

C. Space control joints at a maximum spacing of 20 feet on center unless otherwise noted on drawings.

3.14 TOLERANCES

A. Maximum Variation from Alignment of Columns: 1/4 inch.

B. Maximum Variation From Unit to Adjacent Unit: 1/16 inch.

C. Maximum Variation from Plane of Wall: 1/4 inch in 10 ft and 1/2 inch in 20 ft or more.

D. Maximum Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.

E. Maximum Variation from Level Coursing: 1/8 inch in 3 ft and 1/4 inch in 10 ft; 1/2 inch in 30 ft.

F. Maximum Variation of Mortar Joint Thickness: Head joint, minus 1/4 inch, plus 3/8 inch.

G. Maximum Variation from Cross Sectional Thickness of Walls: 1/4 inch.

3.15 CUTTING AND FITTING

A. Cut and fit for chases, pipes, conduit, and sleeves. Coordinate with other sections of work to provide correct size, shape, and location.

B. Obtain approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3.16 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in Section 01 40 00 - Quality Requirements.

B. A Special Inspection Agency will perform code-required special inspections when required.

C. Mortar Tests: Test each type of mortar in accordance with ASTM C780, testing with same frequency as masonry samples.

3.17 REPAIRING, POINTING AND CLEANING

A. Remove excess mortar and mortar droppings.

B. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged, or if units do not match adjoining units, or mock-up panel.
   1. Install new units to mach adjoining units; install fresh mortar or grout, pointed to eliminate evidence of replacement.

C. During tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction to provide a neat, uniform appearance.

D. Replace defective mortar. Match adjacent work.

E. Final Cleaning:
   1. Remove large particles by hand with wooden paddles and non-metallic tools.
   2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
   3. Protect adjacent stone and non-masonry surfaces from contact with cleaners.
   4. Use cleaners in strict accordance with manufacturer's written recommendations and instructions.
   5. Clean soiled surfaces with cleaning solution, then rinse thoroughly with clear water.
   6. Prepare all joints and block surfaces for painting or finishing.

3.18 PROTECTION

A. Without damaging completed work, provide protective boards at exposed external corners that are subject to damage by construction activities.

END OF SECTION

SECTION 04 72 00

CAST STONE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Units required are indicated on drawings as "cast stone".

1.02 RELATED REQUIREMENTS

A. Section 04 05 11 - Mortar and Masonry Grout: Mortar for setting cast stone.

B. Section 04 20 00 - Unit Masonry: Installation of cast stone in conjunction with masonry.

C. Section 07 92 00 - Joint Sealants: Sealing joints indicated to be left open for sealant.

1.03 REFERENCE STANDARDS

A. ACI 318 - Building Code Requirements for Structural Concrete and Commentary.

B. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.

C. ASTM A767/A767M - Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement.

D. ASTM A884/A884M - Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement.

E. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.

F. ASTM C33/C33M - Standard Specification for Concrete Aggregates.

G. ASTM C150/C150M - Standard Specification for Portland Cement.

H. ASTM C270 - Standard Specification for Mortar for Unit Masonry.

I. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete.

J. ASTM C979/C979M - Standard Specification for Pigments for Integrally Colored Concrete.

K. ASTM C1364 - Standard Specification for Architectural Cast Stone.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: To include the following:
   1. Piece numbers.
   2. Setting sequence, stone sizes and shapes.
   3. Joint locations and arrangement.
   4. Bonding details.
   5. Anchor and insert types and connections to supporting structure.
   6. Installation and anchoring methods.

C. Submit reviewed shop drawings and design data to authorities having jurisdiction for approval.
   1. Indicate welded connections by AWS standard symbols. Detail loose and cast-in hardware, lifting and erection inserts, connections, and joints.
   2. Indicate locations, tolerances and details of anchorage devices to be embedded in or attached to structure or other construction.
   3. Indicate plans and/or elevations showing member locations with all openings larger than 8 inches shown and located.
   4. Design Data: Submit design data reports indicating calculations for loadings and stresses of fabricated, designed framing.

5. Provide Design Engineer's stamp on shop drawings.

D. Mortar Color Selection Samples.

E. Verification Samples: Pieces of actual cast stone components not less than 6 inches square, illustrating range of color and texture to be anticipated in components furnished for the project.

1.06 QUALITY ASSURANCE

A. Design Engineer Qualifications: Design structural cast stone units under direct supervision of a Professional Structural Engineer experienced in design of precast concrete and licensed in State in which project is located.

B. Manufacturer Qualifications:
1. A firm with a minimum of 5 years experience producing cast stone of types required for project.
2. Current producer member of the Cast Stone Institute or the Architectural Precast Association.
3. Adequate plant capacity to furnish quality, sizes, and quantity of cast stone required without delaying progress of the work.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver cast stone components secured to shipping pallets and protected from damage and discoloration. Protect corners from damage.

B. Number each piece individually to match shop drawings and schedule.

C. Store cast stone components and installation materials in accordance with manufacturer's instructions.

D. Store cast stone components on pallets with nonstaining, waterproof covers. Ventilate under covers to prevent condensation. Prevent contact with dirt.

E. Protect cast stone components during handling and installation to prevent chipping, cracking, or other damage.

F. Store mortar materials where contamination can be avoided.

G. Schedule and coordinate production and delivery of cast stone components with unit masonry work to optimize on-site inventory and to avoid delaying the work.

1.08 MOCK-UP

A. Mock-Up: Provide full size cast stone components for installation in mock-up of exterior wall.
1. Approved mock-up will become standard for appearance and workmanship.
2. Mock-up may not remain as part of the completed work.
3. Remove mock-up not incorporated into the work and dispose of debris.

B. Locate where directed.

1.09 ENVIRONMENTAL REQUIREMENTS

A. Cold and Hot Weather Requirements: Comply with requirements of ACI 530.1/ASCE 6/TMS 602 or applicable building code, whichever is more stringent.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Architectural Cast Stone:
1. Any current producer member of the Architectural Precast Association.

B. Sealers:
1. Euclid Chemical Company.
2. Master Builders.
3. ProSoCo.
4. Sika.

2.02 ARCHITECTURAL CAST STONE

A. Cast Stone: Architectural concrete product manufactured to simulate appearance of natural limestone, complying with ASTM C1364.
   1. Compressive Strength: As specified in ASTM C1364; calculate strength of pieces to be field cut at 80 percent of uncut piece.
   2. Freeze-Thaw Resistance: Demonstrated by laboratory testing in accordance with ASTM C1364.
   3. Surface Texture: Fine grained texture, with no bugholes, air voids, or other surface blemishes visible from distance of 20 feet.
   4. Color: Selected by Hoffman from manufacturer's full range.
   5. Color Variation:
      a. Viewing Conditions: Compare in direct sunlight at 10 feet, between components of similar age, subjected to comparable weathering conditions.
   6. Maximum Variation: ASTM D 2244:
      a. Hue: 2 units.
      b. Lightness, Chroma and Hue Combined: 6 units.
   7. Remove cement film from exposed surfaces before packaging for shipment.

B. Shapes: Provide shapes indicated on drawings.
   1. Variation from Any Dimension, Including Bow, Camber, and Twist: Maximum of plus/minus 1/8 inch or length divided by 360, whichever is greater, but not more than 1/4 inch.
   2. Unless otherwise indicated on drawings, provide:
      a. Wash or slope of 1:12 on exterior horizontal surfaces.
      b. Drips on projecting components, wherever possible.
      c. Raised fillets at back of sills and at ends to be built in.

C. Reinforcement: Provide reinforcement as required to withstand handling and structural stresses; comply with ACI 318.

2.03 MATERIALS

A. Portland Cement: ASTM C150/C150M.
   1. For Units: Type I, white or gray as required to match Hoffman 's sample.

B. Coarse Aggregate: ASTM C33/C33M, except for gradation; granite, quartz, or limestone.

C. Fine Aggregate: ASTM C33/C33M, except for gradation; natural or manufactured sands.

D. Pigments: ASTM C979, inorganic iron oxides; do not use carbon black.

E. Admixtures: ASTM C494/C494M.

F. Air Entrainment: Comply with ASTM C 260. Wet-cast mixtures shall contain 6% (+/-) 1% air entrainment where surfaces are exposed to freeze-thaw conditions.

G. Water: Potable.

H. Reinforcing Bars: ASTM A615/A615M deformed bars, galvanized.
   1. Galvanized in accordance with ASTM A767/A767M, Class I.

I. Steel Welded Wire Reinforcement: ASTM A1064/A1064M, galvanized or ASTM A884/A884M, epoxy coated.

J. Embedded Anchors, Dowels, and Inserts: Type 304 stainless steel, of type and size as required for conditions.

K. Mortar: Portland cement-lime, as specified in Section 04 05 11; do not use masonry cement.

L. Cleaner: General-purpose cleaner designed for removing mortar and grout stains, efflorescence, and other construction stains from new masonry surfaces without discoloring or damaging masonry surfaces; approved for intended use by cast stone manufacturer and by cleaner manufacturer for use on cast stone and adjacent masonry materials.

2.04 FABRICATION

A. Factory Fabrication: Comply with Cast Stone Institute recommended fabricating practices.

B. Tolerances: Comply with Cast Stone Institute recommendations and the following:
   1. Height and Width: Plus 1/16 inch; minus 1/8 inch.
   2. Length:
      a. Up to 2 feet, 0 inches: Plus 1/16 inch; minus 1/8 inch.
      b. From 2 feet, 0 inches to 5 feet 0 inches: Plus 1/8 inch; minus 1/8 inch.
      c. From 5 feet, 0 inches to 10 feet 0 inches: Plus 1/8 inch; minus 3/16 inch.

C. Design Mix: Compressive strength of 6,500 psi at 28 days, maximum 6 percent absorption.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine construction to receive cast stone components. Notify Hoffman if construction is not acceptable.

B. Do not begin installation until unacceptable conditions have been corrected.

3.02 INSTALLATION

A. Install cast stone components in conjunction with masonry, complying with requirements of Section 04 20 00.

B. Mechanically anchor cast stone units indicated; set remainder in mortar.

C. Setting:
   1. Drench cast stone components with clear, running water immediately before installation.
   2. Set units in a full bed of mortar unless otherwise indicated.
   3. Fill vertical joints with mortar.
   4. Fill dowel holes and anchor slots completely with mortar or non-shrink grout.

3.03 INSTALLATION TOLERANCES:

A. Variation from Plumb: Not more than 1/8 inch in 10 feet or 1/4 inch in 20 feet or more.

B. Variation from Level: Not more than 1/8 inch in 10 feet or 1/4 inch in 20 feet, or 3/8 inch maximum.

C. Variation in Joint Width: Not more than 1/8 inch in 36 inches or 1/4 of nominal joint width, whichever is less.

D. Variation in Plane Between Adjacent Surfaces (Lipping): Not more than 1/16 inch difference between planes of adjacent units or adjacent surfaces indicated to be flush with units.

3.04 FIELD QUALITY CONTROL

A. Remove and replace work that does not meet the specified tolerances and appearance requirements.

B. Any cast stone that is broken, chipped, stained, or otherwise damaged; work that does not match approved samples or mock-up; and any work containing defective joints shall be removed and replaced.

3.05 CLEANING

A. Clean completed exposed cast stone after mortar is thoroughly set and cured.
   1. Wet surfaces with water before applying cleaner.
   2. Apply cleaner to cast stone in accordance with manufacturer's instructions.
   3. Remove cleaner promptly by rinsing thoroughly with clear water.
   4. Do not use acidic cleaners.

3.06 PROTECTION

A. Protect completed work from damage.
   1. Clean, repair, or restore damaged or mortar-splashed work to condition of new work.

END OF SECTION

SECTION 05 12 00
STRUCTURAL STEEL FRAMING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Structural steel framing members.

B. Structural steel support members.

C. Base plates and shims.

D. Anchor rods, nuts and washers.

E. Expansion and adhesive anchors.

F. Grouting under base plates.

G. Furnish and install elevator hoist beam or eyebolt.

H. Installation of elevator pit ladder(s), furnished by Section 05 50 00.

1.02 RELATED REQUIREMENTS

A. Section 01 45 33 - Code-Required Special Inspections

B. Section 05 21 00 - Steel Joist Framing.

C. Section 05 31 00 - Steel Decking: Support framing for small openings in deck.

D. Section 05 40 00 - Cold-Formed Metal Framing.

E. Section 05 50 00 - Metal Fabrications: Steel fabrications affecting structural steel work.

1.03 REFERENCE STANDARDS

A. AISC (MAN) - Steel Construction Manual.

B. AISC 303 - Code of Standard Practice for Steel Buildings and Bridges.

C. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.

D. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

E. ASTM A108 - Standard Specification for Steel Bar, Carbon and Alloy, Cold Finished.

F. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.

G. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.

H. ASTM A514/A514M - Standard Specification for High-Yield-Strength, Quenched and Tempered Alloy Steel Plate, Suitable for Welding.

I. ASTM A563 - Standard Specification for Carbon and Alloy Steel Nuts.

J. ASTM A563M - Standard Specification for Carbon and Alloy Steel Nuts (Metric).

K. ASTM A572/A572M - Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel.

L. ASTM A992/A992M - Standard Specification for Structural Steel Shapes.

M. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions.

N. ASTM F436/F436M - Standard Specification for Hardened Steel Washers Inch and Metric Dimensions.

O. ASTM F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength.

P. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination.

Q. AWS D1.1/D1.1M - Structural Welding Code - Steel.

R. RCSC (HSBOLT) - Specification for Structural Joints Using High-Strength Bolts; Research Council on Structural Connections.

S. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer.

T. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic").

U. SSPC-SP 3 - Power Tool Cleaning.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week before starting work of this section.

B. Review the following as a minimum:
   1. Status of shop drawings and submittals.
   2. Project schedule and sequence.
   3. Local, state, and federal safety regulations.
   4. Installation requirements for specified materials.
   5. Testing requirements and procedures.
   6. Coordination with other trades.
   7. Review any code-required special inspections that will be required.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit manufacturers' data sheets showing compliance with specified requirements for the following products.
   1. Anchors and adhesives.
   2. Grout.

C. Shop Drawings:
   1. Indicate profiles, sizes, spacing, locations of structural members, openings, attachments, and fasteners.
   2. Connections.
   3. Expansion and adhesive anchors.
   4. Indicate cambers.
   5. Paint and primers.
   6. Yield stress of steel.
   7. Indicate welded connections with AWS A2.4 welding symbols. Indicate net weld lengths.

1.06 QUALITY ASSURANCE

A. Fabricate structural steel members in accordance with AISC (MAN) "Steel Construction Manual."

B. Fabricator: Company specializing in performing the work of this section with minimum five years of documented experience.

C. Erector: Company specializing in performing the work of this section with minimum five years of documented experience.

D. All shop and field welding shall conform to all requirements of the "Structural Welding Code - Steel, AWS D1.1.

E. Welder Certification: All shop and field welders shall be certified according to AWS procedures for the welding process and welding position used.

F. Welder Certificates shall be made available upon request for welders employed on the project.

G. Design connections not detailed on drawings under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in Wisconsin.

1.07 REGULATORY REQUIREMENTS

A. Conform to local, state, and federal regulations for use of domestically produced materials when required.

B. Fabrication and erection of all products and components specified under this section shall be done in strict accordance with all current local, state, and federal regulations.

1.08 DELIVERY, STORAGE AND HANDLING

A. Handle steel with care to avoid bending, twisting or other damage.

B. Unload under supervision of Contractor.

C. Place on blocking to keep steel of ground.

D. Store steel to allow drainage of water from all parts.

PART 2 PRODUCTS

2.01 MATERIALS

A. Steel Angles, Plates, and Channels: ASTM A36/A36M.

B. Steel W Shapes and Tees: ASTM A992/A992M.

C. Rolled Steel Structural Shapes: ASTM A992/A992M.

D. Cold-Formed Structural Tubing: ASTM A500/A500M, Grade B.

E. Pipe: ASTM A53/A53M, Grade B, Finish black.

F. Shear Stud Connectors: Made from ASTM A 108 Grade 1015 bars, AWS D1.1, Type B.

G. High-Strength Structural Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, with matching compatible ASTM A563 or ASTM A563M nuts and ASTM F436/F436M washers.
   1. Nuts: ASTM A563, Grade C, heavy hex nuts.
   2. Washers: ASTM F436, Type 1 washers.

H. Unheaded Anchor Rods: ASTM F1554, Grade 36, plain, with matching ASTM A563 or ASTM A563M nuts and ASTM F436/F436M Type 1 washers.
   1. Nuts: ASTM A563, Grade A, heavy-hex nuts.

I. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

J. Grout: ASTM C1107/C1107M; Non-shrink; premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents.
   1. Minimum Compressive Strength at 72 Hours: 4,300 pounds per square inch.

K. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

L. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.02 ACCESSORIES

A. Expansion Anchors:
   1. Wedge Anchors: Wedge type, torque-controlled, non-bottom bearing type complete with required nuts and washers.
   2. Sleeve Anchors: Single piece steel expansion sleeve providing 360-degree contact, non-bottom bearing type complete with required nuts and washers.
   3. Anchor Finish: Based on location shall be one of the following:
      a. Interior Use: Unless otherwise noted on drawings or as noted below, provide carbon steel anchors with electroplated zinc finish.
         1) Provide hot dip galvanized or electroplated zinc finish as required by code for anchors in contact with fire treated or preservative treated lumber.
      b. Exterior Use: Unless otherwise noted on drawings, provide AISA Type 304 stainless steel provided with stainless steel nuts and washers of matching alloy group.

B. Cartridge Injection Adhesive Anchors: Cartridge type, two-component, solid epoxy based system dispensed and mixed through a static mixing nozzle supplied by the manufacturer. The adhesive shall meet the minimum requirements of ASTM C 881 Type I, II, IV and V, Grade 3, Class B and C. Verify acceptable installation and performance temperature requirements with manufacturer prior to installation.

1. Interior Use: Unless otherwise indicated on drawings, provide carbon steel threaded rods conforming to ASTM A36 with zinc plating in accordance with ASTM B633, Type III.
    a. Provide hot dip galvanized or electroplated zinc finish as required by code for anchors in contact with fire treated or preservative treated lumber.
2. Exterior Use: Unless otherwise indicated on drawings, provide chisel-pointed stainless steel anchors, AISI Type 304 provided with stainless steel nuts and washers of matching alloy group.

C. Capsule Anchors: Threaded steel rod, inserts and reinforcing dowels with 45 degree chisel point, complete with nuts, washers, glass or foil capsule anchor system containing polyvinyl or urethane methacrylate-based resin and accelerator.
1. Interior Use: Unless otherwise indicated on drawings, provide chisel-pointed carbon steel rods conforming to ASTM A36 with zinc plating in accordance with ASTM B633, Type III.
    a. Provide hot dip galvanized or electroplated zinc finish as required by code for anchors in contact with fire treated or preservative treated lumber.
2. Exterior Use: Unless otherwise indicated on drawings, provide chisel-pointed stainless steel anchors, AISI Type 304 provided with stainless steel nuts and washers of matching alloy group.

D. Screw Anchors: Manufactured from carbon steel, heat treated meeting the following:
1. General: Shall have 360-degree contact with the base material and shall not require oversized holes for installation.
2. Finish: Zinc plated in accordance with ASTM B633 or mechanically galvanized in accordance with ASTM B695.
3. Screw anchors shall be similar to Hilti Kwik HUS-EZ anchors as manufactured by Hilti.

E. Eyebolt: Hot dipped galvanized steel eyebolt, 10,000 pound vertical capacity, 2 inch diameter eye, without shoulder, similar to Eyebolt with Nut, 3016T87 as manufactured by McMaster-Carr.

2.03 FABRICATION

A. Shop fabricate to greatest extent possible.

B. Continuously seal joined members by continuous welds. Grind exposed welds smooth.

C. Fabricate connections for bolt, nut, and washer connectors.

D. If not shown, provide connections to support the maximum allowable web shear or the computed end reaction shown on the drawings, using the tables for "Allowable Uniform Loads on Beam", Part 2, AISC Manual, Ninth Edition.

E. Clip angle lengths must not be less than one-half the T-Dimension of the framing members. For minimum length clip angles, provide fasteners at 3 inch on center or continuous welds.

F. Welds shall fully develop strength of the materials being welded, unless noted otherwise, except that fillet welds shall be a minimum 3/16".

G. Welded connections shall be made by approved certified welders using filler metal conforming to E70XX.

H. Fabricate pipe and tube columns with minimum 1/4 inch thick cap plates unless noted otherwise on plans.

I. Fabricate anchor rods as detailed on drawings or threaded both ends with double nut at the bottom.

2.04 FINISH

A. Prepare structural component surfaces in accordance with SSPC-SP 3.

B. Shop prime structural steel members. Do not prime surfaces that will be fireproofed, field welded, in contact with concrete, or high strength bolted.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that conditions are appropriate for erection of structural steel and that the work may properly proceed.

3.02 ERECTION

A. Erect structural steel in compliance with AISC 303.

B. Allow for erection loads, and provide sufficient temporary bracing to maintain structure in safe condition, plumb, and in true alignment until completion of erection and installation of permanent bracing.

C. Field weld components and shear studs indicated on shop drawings.

D. Use carbon steel bolts only for temporary bracing during construction, unless otherwise specifically permitted on drawings. Install high-strength bolts in accordance with RCSC (HSBOLT) "Specification for Structural Joints Using High-Strength Bolts".

E. Do not field cut or alter structural members without written approval of Hoffman.

F. After erection, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete.

G. Grout solidly between column plates and bearing surfaces, complying with manufacturer's instructions for nonshrink grout. Trowel grouted surfaces smooth, splaying neatly to 45 degrees.

3.03 ANCHOR INSTALLATION

A. Install anchors in accordance with manufacturer's written instructions.

B. Screw anchors are not to be reused after initial installation.

C. Anchor finish shall be as required by manufacturer and code for substrate and materials being anchored.

3.04 TOLERANCES

A. Erect structural steel within tolerances in the AISC Code of Standard Practice, Section 7.11.

3.05 FIELD QUALITY CONTROL

A. An Independent Testing Agency will perform field quality control tests, as specified in Section 01 40 00.

B. High-Strength Bolts: Provide testing and verification of field-bolted connections in accordance with RCSC (HSBOLT) "Specification for Structural Joints Using High-Strength Bolts".

C. Defective welds shall be replaced and retested at the expense of the Contractor.

D. Contractor shall assume all costs for repair or replacement of work that has been rejected for non-conformance to the requirements including the cost of any additional testing or retesting.

END OF SECTION

SECTION 05 21 00
STEEL JOIST FRAMING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Open web steel joists and shear stud connectors, with bridging, attached seats and anchors.

B. Loose bearing members, such as plates or angles, and anchor bolts for site placement.

C. Supplementary framing for roof openings greater than 18 inches.

1.02 RELATED REQUIREMENTS

A. Section 05 12 00 - Structural Steel Framing: Superstructure framing.

B. Section 05 31 00 - Steel Decking: Bearing plates and angles.

1.03 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.

B. ASTM A108 - Standard Specification for Steel Bar, Carbon and Alloy, Cold Finished.

C. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

D. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength.

E. ASTM A563 - Standard Specification for Carbon and Alloy Steel Nuts.

F. ASTM A563M - Standard Specification for Carbon and Alloy Steel Nuts (Metric).

G. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions.

H. ASTM F436/F436M - Standard Specification for Hardened Steel Washers Inch and Metric Dimensions.

I. AWS D1.1/D1.1M - Structural Welding Code - Steel.

J. SJI 100 - Catalog of Standard Specifications Load Tables and Weight Tables for Steel Joists and Joist Girders.

K. SJI Technical Digest No. 9 - Handling and Erection of Steel Joists and Joist Girders.

L. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer.

M. SSPC-SP 2 - Hand Tool Cleaning.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate standard designations, joist coding, configurations, sizes, spacings, cambers, locations of joists, joist leg extensions, bridging, connections, and attachments.

C. After final shop drawing approval, submit 3 sets of plans and calculations to Architect, stamped by a professional Engineer for submittal to State of Wisconsin, Department of Safety & Professional Services when required by code.
   1. Contractor to include all fees and costs associated with component submittals.
   2. Provide Design Engineer's stamp on shop drawings.
   3. Provide calculations for loadings and stresses of special joists and joist girders, stamped by a Professional Structural Engineer.

1.05 QUALITY ASSURANCE

A. Design connections not detailed on drawings under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in Wisconsin.

B. Perform Work, including that for headers and other supplementary framing, in accordance with SJI 100 Standard Specifications Load Tables and SJI Technical Digest No. 9.

C. Manufacturer Qualifications: Company specializing in performing the work of this section with minimum five years documented experience.

D. Erector Qualifications: Company specializing in performing the work of this section with minimum five years documented experience.

E. All shop and field welding shall conform to requirements of the "Structural Welding Code - Steel, AWS D1.1.

F. Welder Certification: All shop and field welders shall be certified according to AWS procedures for the welding process and welding position used.

G. Welder Certificates shall be made available upon request for welders employed on the project.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Transport, handle, store, and protect products to SJI requirements.

B. Reject damaged, deteriorated or distorted material and immediately remove from site. Replace rejected materials with new members at no cost to Owner or Hoffman.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Steel Joists:
   1. Canam Group Inc: www.canam-steeljoists.ws
   2. Nucor-Vulcraft Group: www.vulcraft.com/#sle.
   3. New Millennium: www.newmill.com
   4. Substitutions: See Section 01 60 00 - PRODUCT REQUIREMENTS.

2.02 MATERIALS

A. Open Web Joists: SJI Type K Joists:
   1. Provide bottom and top chord extensions as indicated.
   2. Minimum End Bearing on Steel Supports: Comply with referenced SJI standard.
   3. Minimum End Bearing on Concrete or Masonry Supports: Comply with referenced SJI standard.
   4. Finish: Shop primed.

B. Anchor Bolts, Nuts and Washers: ASTM A307, hot-dip galvanized per ASTM A153/A153M, Class C.

C. High-Strength Structural Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, with matching compatible ASTM A563 or ASTM A563M nuts and ASTM F436/F436M washers.

D. Shear Stud Connectors: Made from ASTM A108 Grade 1015 bars.

E. Structural Steel For Supplementary Framing and Joist Leg Extensions: ASTM A 36/A 36M.

F. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

G. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

2.03 FINISH

A. Shop prime joists as specified.
   1. Do not prime surfaces that will be fireproofed.

B. Prepare surfaces to be finished in accordance with SSPC-SP 2.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions prior to beginning work.

3.02 ERECTION

A. Erect joists with correct bearing on supports.

B. Allow for erection loads. Provide sufficient temporary bracing to maintain framing safe, plumb, and in true alignment.

C. Coordinate the placement of anchors for securing loose bearing members furnished as part of the work of this section.

D. After joist alignment and installation of framing, field weld joist seats to steel bearing surfaces.

E. Position and field weld joist chord extensions and wall attachments as detailed.

F. Install supplementary framing for floor and roof openings greater than 18 inches.

G. Do not permit erection of decking until joists are braced, bridged, and secured or until completion of erection and installation of permanent bridging and bracing.

H. Do not field cut or alter structural members without approval of joist manufacturer.

I. After erection, prime welds and damaged shop primer, except surfaces specified not to be primed.

3.03 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch.

B. Maximum Offset From True Alignment: 1/4 inch.

3.04 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in Section 01 40 00 - Quality Requirements.

END OF SECTION

SECTION 05 31 00

STEEL DECKING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Roof deck and accessories.

B. Bearing plates and angles.

1.02 RELATED REQUIREMENTS

A. Section 01 45 33 - Code-Required Special Inspections.

B. Section 04 20 00 - Unit Masonry: Placement of anchors for bearing plates embedded in unit masonry assemblies.

C. Section 05 12 00 - Structural Steel Framing: Support framing for openings larger than 18 inches.

D. Section 05 21 00 - Steel Joist Framing: Support framing for openings larger than 18 inches.

1.03 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.

B. ASTM A510/A510M - Standard Specification for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel, and Alloy Steel.

C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

D. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel.

E. ICC-ES AC43 - Acceptance Criteria for Steel Deck Roof and Floor Systems; ICC Evaluation Service, Inc.

F. ICC-ES AC70 - Acceptance Criteria for Fasteners Power Driven into Concrete, Steel and Masonry Elements; ICC Evaluation Service, Inc.

G. SDI (DM) - Publication No.30, Design Manual for Composite Decks, Form Decks, and Roof Decks.

H. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer.

I. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic").

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section.

1. Review the following as a minimum:
    a. Status of shop drawings and submittals.
    b. Project schedule and sequence.
    c. Local, state, and federal safety regulations.
    d. Installation requirements for specified materials.
    e. Coordination with other trades.
    f. Review requirements for any code-required special inpsections

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittals procedures.

B. Product Data: Provide deck profile characteristics, dimensions, structural properties, and finishes.

C. Shop Drawings: Indicate deck plan, support locations, projections, openings, pertinent details, and accessories.

1. Include details for accessories.

1.06 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing the work of this Section with minimum five years of experience.

B. All shop and field welding shall conform to all requirements of the "Structural Welding Code - Steel, AWS D1.1.

C. Welder Certification: All shop and field welders shall be certified according to AWS procedures for the welding process and welding position used.

D. Welder Certificates shall be made available upon request for welders employed on the project.

1.07 REGULATORY REQUIREMENTS

A. Erection of all products specified in this section shall be done in strict accordance with all local, state, and federal regulations.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Cut plastic wrap to encourage ventilation.

B. Store deck on dry wood sleepers; slope for positive drainage.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Steel Deck:
   1. Canam Steel Corporation: www.canam-steeljoists.ws.
   2. Nucor-Vulcraft Group: www.vulcraft.com.
   3. New Millennium: www.newmill.com
   4. Substitutions: See Section 01 60 00 - PRODUCT REQUIREMENTS.

2.02 STEEL DECK

A. Roof Deck: Non-composite type, fluted steel sheet:
   1. Galvanized Steel Sheet: ASTM A653/A653M, Structural Steel (SS) Grade 33/230, with G90/Z275 galvanized coating.
   2. Primer: Shop coat of manufacturer's standard primer paint over cleaned and phosphatized substrate.
   3. Span Design: Multiple (minimum 3 spans).
   4. Minimum Base Metal Thickness: 22 gage, 0.0299 inch.
   5. Nominal Height: 1-1/2 inch.
   6. Profile: Fluted; SDI WR.
   7. Side Joints: Lapped and fastened as noted on drawings.
   8. End Joints: Lapped and fastened as noted on drawings.

2.03 MATERIALS

A. Bearing Plates and Angles: ASTM A36/A36M steel, unfinished.

B. Fasteners: Galvanized hardened steel, self tapping.

C. Powder Actuated Mechanical Fasteners: Steel; with knurled shank and forged ballistic point. Comply with applicable requirements of ICC-ES AC70.
   1. Design Requirements: Provide number and type of fasteners that comply with the applicable requirements of SDI (DM) design method for roof deck and floor deck applications and ICC-ES AC43.
   2. Material: Steel; ASTM A510/A510M, Grade 1077.
      a. Hardness: Rockwell C 54.5, minimum.
      b. Tensile Strength: 285 kips per square inch, minimum.
      c. Shear Strength: 175 kips per square inch, minimum.
      d. Washers:
         1) Steel Bar Joist Framing Applications: 0.472 inch diameter, minimum.
      e. Corrosion Resistance:

1) Steel Bar Joist Framing Applications: ASTM B633, SC1, Type III zinc electroplate..

3. Products:
   a. Hilti; X-ENP or X-HSN24 dependent on steel thickness.
   b. Substitutions: See Section 01 60 00 - PRODUCT REQUIREMENTS.

D. Mechanical Fasteners: Steel; hex washer head, self-drilling, self-tapping.
   1. Design Requirements for Sidelap Connections: Provide number and type of fasteners that comply with the applicable requirements of SDI (DM)SDI design method for roof deck and floor deck applications and ICC-ES AC43.
   2. Fasteners for Steel Roof Decks Protected with Waterproofing Membrane: ASTM B633, SC1, Type III zinc electroplate.

E. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

F. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, complying with VOC limitations of authorities having jurisdiction.

G. Flute Closures: Closed cell foam rubber, 1 inch thick; profiled to fit tight to the deck.

2.04 FABRICATED DECK ACCESSORIES

A. General: Provide accessory materials for steel deck that comply with requirements indicated and recommendations of the steel deck manufacturer.

B. Sheet Metal Deck Accessories: Metal closure strips, wet concrete stops, and cover plates, 22 gage, 0.0299 inch thick sheet steel; of profile and size as indicated; finished same as deck.

C. Pour Stops and Girder Fillers: Steel sheet, of same material as deck panels, size and profile as required, thickness in accordance with SDI Pour Stop Selection Table.

D. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material and thickness as deck panels, unless otherwise noted.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions prior to beginning work.

B. Examine support framing and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance of work of this section.

3.02 INSTALLATION

A. Erect metal deck in accordance with SDI Design Manual and manufacturer's instructions. Align and level.

B. Place deck in accordance with approved placement plans.

C. Do not place deck panels on concrete support structure until concrete has cured and is dry.

D. Place deck panels on structural supports and adjust to final position with ends aligned. Attach firmly to the supports immediately after placement in order to form a safe working platform. Provide bearing as follows:
   1. On concrete and masonry surfaces provide minimum 4 inch bearing.
   2. On steel supports provide minimum 1-1/2 inch bearing.

E. Fasten deck to steel support members at ends and intermediate supports as noted on drawings.

F. Locate deck bundles to prevent overloading of support members.

G. Fasten side laps as noted on drawings.

H. Drive mechanical sidelap connectors completely through adjacent lapped sheets; positively engage adjacent sheets with minimum three-thread penetration.

I. Fasten pour stops and girder fillers to supporting structure according to manufacturer's recommendations.

J. Fasten column closures, cell closures, and Z closures to deck to provide tight fitting closures at open ends of ribs and sides of decking. Fasten cell closures at changes of direction of deck units unless otherwise directed.

K. At deck openings from 6 inches to 18 inches in size, provide minimum 3 x 3 x 5/16 inch steel angle reinforcement or as noted on drawings. Place angles perpendicular to flutes spanning between framing members and mechanically attach to deck at each flute.

L. At deck openings greater than 18 inches in size, provide steel angle reinforcement. as specified in Section 05 12 00.

M. Where deck changes direction, install 6 inch minimum wide sheet steel cover plates, of same thickness as deck. Mechanically fasten 12 inches on center maximum.

N. At floor edges, install concrete stops upturned to top surface of slab, to contain wet concrete. Provide stops of sufficient strength to remain stationary without distortion.

O. At openings between deck and walls, columns, and openings, provide sheet steel closures and angle flashings to close openings to within 1/4 inch maximum width.

P. Do not cut unscheduled openings through the deck without the approval of the Engineer; reinforce openings as directed.

Q. Close openings above walls and partitions perpendicular to deck flutes with single row of foam cell closures.

R. Immediately after welding deck and other metal components in position, coat welds, burned areas, and damaged surface coating, with touch-up primer.

3.03 PROTECTION

A. Do not use deck units for storage or working platform until permanently secured in position.

B. Construction loads must not exceed carrying capacity of deck.

END OF SECTION

SECTION 05 40 00

COLD-FORMED METAL FRAMING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Formed steel stud exterior wall framing.
   1. Exterior walls - non axially loaded.

B. Exterior wall sheathing.

C. Water-resistive barrier over sheathing.

D. Bridging, bracing, clips, accessories, fasteners and other materials.

E. Sealants.

1.02 RELATED REQUIREMENTS

A. Section 0145 33 - Code-Required Special Inspections.

B. Section 04 20 00 - Unit Masonry: Veneer masonry supported by wall stud metal framing.

C. Section 06 10 00 - Rough Carpentry: Wood blocking and miscellaneous framing.

D. Section 07 21 00 - BOARD AND BATT INSULATION: Insulation within framing members.

E. Section 07 25 00 - WEATHER BARRIERS: Weather barrier over sheathing.

F. Section 07 92 00 - Joint Sealants.

G. Section 09 21 16 - Gypsum Board Assemblies: Lightweight, non-load bearing metal stud framing.

H. Section 09 21 16 - Gypsum Board Assemblies: Gypsum-based sheathing.

1.03 REFERENCE STANDARDS

A. AISI S100-12 - North American Specification for the Design of Cold-Formed Steel Structural Members; American Iron and Steel Institute.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

D. ASTM C955 - Standard Specification for Load-Bearing (Transverse and Axial) Steel Studs, Runners (Tracks), and Bracing or Bridging for Screw Application of Gypsum Panel Products and Metal Plaster Bases.

E. ASTM C1007 - Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories.

F. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.

G. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.

H. AWS D1.1/D1.1M - Structural Welding Code - Steel.

I. AWS D1.3/D1.3M - Structural Welding Code - Sheet Steel.

J. PS 1 - Structural Plywood.

K. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic").

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate with work of other sections that is to be installed in or adjacent to the metal framing system, including but not limited to structural anchors, cladding anchors, utilities, insulation, and firestopping.

B. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section.
   1. Review the following as a minimum:
      a. Status of shop drawings and submittals.
      b. Project schedule and sequence.
      c. Local, state, and federal safety regulations.
      d. Attachment of studs to structural framing systems.
      e. Attachment of gypsum wall sheathing.
      f. Coordination with other trades.
      g. Installation requirements for specified materials.
      h. Review requirements for any code-required special inspections.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on standard framing members; describe materials and finish, product criteria, limitations.
   1. Provide manufacturer's data on factory-made framing connectors, showing compliance with requirements.

C. Shop Drawings: Indicate component details, framed openings, bearing, anchorage, loading, and welds, and accessories or items required of related work.
   1. Indicate stud and framing component layout.
   2. Describe method for securing studs to tracks and for welded framing connections.
   3. Provide Design Engineer's stamp on shop drawings.
   4. Calculations for loadings and stresses of specially fabricated framing, signed and sealed by a professional structural engineer.
   5. Details of vertical movement devices and connection to framing and structure.
   6. Methods of fastening framing members to each other and to adjacent materials and structure.
   7. Bearing and anchor points and anchor details.
   8. Accessory products required for complete installation.
   9. Prefabricated assemblies and special details.

D. After final shop drawing approval, submit 3 sets of plans and calculations to Architect, stamped by a professional Engineer for submittal to State of Wisconsin, Department of Safety & Professional Services.

1.06 QUALITY ASSURANCE

A. Designer Qualifications: Design framing system under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in Wisconsin.
   1. Designer shall include all attachments of framing members to supporting structures.

B. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, and with minimum five years of documented experience.

C. Installer Qualifications: Company specializing in performing the work of this section with minimum five years documented experience and approved by manufacturer.

D. All shop and field welding shall conform to all requirements of the "Structural Welding Code - Steel, AWS D1.1.

E. Welder Certification: All shop and field welders shall be certified according to AWS procedures for the welding process and welding position used.

F. Welder Certificates shall be made available upon request for welders employed on the project.

G. Code Requirements: Comply with pertinent codes and regulations of agencies having jurisdiction.

1. Fastening requirements for exterior gypsum sheathing shall comply with all requirements for listed U.L. Assemblies where those requirements are more stringent than specified fastener spacings and materials.

1.07 MOCK-UP

A. Provide mock-up of exterior framed wall, including components specified elsewhere, such as insulation, sheathing, window frame, door frame, exterior wall finish, and interior wall finish.

B. Location: As directed.

C. Mock-up may not remain as part of the Work.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

B. Store materials protected from exposure to rain, snow or other harmful weather conditions, at temperature and humidity conditions.

1.09 PROJECT CONDITIONS

A. Verify that field measurements are as indicated on the drawings.

B. Coordinate work of this section with the placement of components within the stud framing system.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Framing Connectors and Accessories:
   1. Same manufacturer as metal framing.
   2. ClarkDietrich Building Systems: www.clarkdietrich.com.
   3. Simpson Strong Tie: www.strongtie.com.
   4. Hilti.
   5. Substitutions: See Section 01 60 00 - PRODUCT REQUIREMENTS.

2.02 FRAMING SYSTEM

A. Provide primary and secondary framing members, bridging, bracing, plates, gussets, clips, fittings, reinforcement, and fastenings as required to provide a complete framing system.

B. Design Requirements: Provide completed framing system having the following characteristics:
   1. Design: Calculate structural characteristics of cold-formed steel framing members according to AISI S100-12.
   2. Structural Performance: Design, engineer, fabricate, and erect to withstand specified design loads for project conditions within required limits.
   3. Design Loads: As indicated on the drawings.
   4. Live load deflection meeting the following, unless otherwise indicated:
      a. Exterior Walls: Maximum horizontal deflection under wind load of 1/600 of span.
      b. Design non-axial loadbearing framing to accommodate not less than 3/4 in vertical deflection.
   5. Able to tolerate movement of components without damage, failure of joint seals, undue stress on fasteners, or other detrimental effects when subject to seasonal or cyclic day/night temperature ranges.
   6. Able to accommodate construction tolerances, deflection of building structural members, and clearances of intended openings.

C. Deliver to site in largest practical sections.

D. Behind masonry veneer, studs shall be minimum 18 gage and 16 inches on center.

2.03 FRAMING MATERIALS

A. Studs and Track: ASTM C955; studs formed to channel, "C", or "Sigma" shape with punched web; U-shaped track in matching nominal width and compatible height.

1. Gage and depth: As required to meet specified performance levels, and as indicated on drawings.
    a. 18 gage and lighter: Minimum yield strength 33,000 psi.
    b. 16 gage and heavier: Minimum yield strength 50,000 psi.
2. Galvanized in accordance with ASTM A653/A653M, G90/Z275 coating.
3. Studs to be continuously formed from single sections. No welded studs are permitted.

2.04 FASTENERS

A. Self-Drilling, Self-Tapping Screws, Bolts, Nuts and Washers: Hot dip galvanized per ASTM A153/A153M.

B. Anchorage Devices: Powder actuated.

C. Welding: Comply with AWS D1.1/D1.1M.

2.05 WALL SHEATHING

A. Plywood; PS 1, Grade C-D, Exposure I.

B. Wall Sheathing: Glass mat faced gypsum; ASTM C 1177/C 1177M, water-resistant core, square long edges, 5/8 inch Type X fire-resistant.
    1. Manufacturers:
        a. DensGlass Gold as manufactured by Georgia Pacific.
        b. GlasRoc as manufactured by BPB America, Inc.
        c. Securock Glass Mat Sheathing as manufactured by USG.
    2. Size: Minimum 4'x8' panels.
    3. Flame Spread: ASTM E 84; 0 maximum.
    4. Smoke Developed: ASTM E 84; 0 maximum.
    5. Warranty: Exposure to weather; 6 months, and manufacturing defects; 5 years.

C. Polyisocyanurate (ISO) foam board insulation; ASTM C1289, Type I - Faced with aluminum foil on both major surfaces of core foam, and Class 1 - Non-reinforced core foam; 3/4 inch thick.

2.06 ACCESSORIES

A. Bracing, Furring, Bridging: Formed sheet steel, thickness determined for conditions encountered; finish to match framing components.

B. Plates, Gussets, Clips: Formed Sheet Steel, thickness determined for conditions encountered; finish to match framing components.

C. Breakaway Fire Wall Anchors: Manufactured from rolled strip zinc alloy, type 710.
    1. Manufacturer: Heckmann Building Products Inc.
    2. Size and Thickness: As noted on drawings.
    3. Substitutions: See Section 01 60 00 - PRODUCT REQUIREMENTS.

D. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

E. Water-Resistive Barrier: As specified in Section 07 25 00.

F. Sill Gasket on Top of Foundation Wall: 1/4 inch thick, track width, closed cell plastic foam from continuous rolls.

G. Grout: Commercial, non-shrink cement grout; apply to bearing surfaces to ensure full contact of bearing flanges or track webs on supporting concrete or masonry surfaces.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine supporting substrates and abutting structural framing for compliance with requirements, including installation tolerances and other conditions affecting performance of framing members.

B. Verify that work by other trades is complete and accurate to the point where installation of the framing can begin.

C. Verify that field measurements are as indicated in the drawings. Notify Hoffman in writing of any deviation between the drawings and actual conditions prior to starting work.

D. Immediately notify Hoffman of any discrepancies in the work, on the drawings or in the specification that will interfere with the work.

E. Correct conditions detrimental to the timely and proper completion of the work.

F. Do not proceed with installation until unsatisfactory conditions have been corrected.

G. Verify that substrate surfaces are ready to receive work.

3.02 INSTALLATION - GENERAL

A. Install components in accordance with requirements of Contract Documents, the manufacturer's instructions and recommendations, and approved shop drawings.

B. Install framing to support design loads and to accommodate movement of the primary building structure and clearances of intended openings.

C. Cut framing members by sawing or shearing; do not torch cut.
   1. Cut framing members square for attachment to perpendicular members.

D. Field Welding: In accordance with AWS D1.3, and the following:
   1. Stud-to-track connections: 1/2 inch fillet weld, full length of inside flange dimension, inside each flange of stud onto track web, unless otherwise noted.
   2. All other connections: Flat, plug, butt, or seam.
   3. Minimum steel thickness for welded connections: 18 gage.

E. Field Fastening: Use minimum 2 self-tapping metal screws per connection, unless otherwise indicated.

F. Framing: Install components in accordance with manufacturer's instructions, shop drawings, and requirements of ASTM C 1007.
   1. Provide for erection stresses; provide temporary bracing as construction activities progress.
   2. Erect load bearing components in single piece full length; splicing of load bearing components is prohibited.
   3. Brace and reinforce load bearing assemblies as indicated or required for full design strength.

G. Do not bridge building expansion joints and control joints with framing members; frame both sides of joints independently.

H. Coordinate placement of insulation in multiple stud spaces made inaccessible after erection.

I. Touch up damaged coating surfaces; use specified primer.

3.03 STUD WALLS - GENERAL

A. Install components in accordance with manufacturers' instructions and ASTM C1007 requirements.

B. Align floor and ceiling tracks; locate to wall layout. Secure in place with fasteners at maximum 24 inches on center, using fastening methods specified in manufacturer's printed installation instructions for substrate types.

C. Splice abutting lengths of track or butt weld or securely attach each length to supporting structure as indicated.

D. Wall Openings Larger Than Stud Spacing: Frame with headers and supporting studs as indicated on approved shop drawings.
   1. Install double studs at wall openings, door and window jambs.
   2. Install headers so that they lie entirely within the width of the wall.
   3. Install king studs, jack studs and cripple studs below window sills, above window and door heads, and elsewhere as necessary to support openings, securely attached to adjacent supporting members.
   4. Design studs above openings to support all imposed loads.

E. Seat studs in track square with track flange, with stud end maximum 1/16 inch from surface of track web.

F. Install load bearing studs full length in one piece. Splicing of studs is not permitted.

G. Install load bearing studs, brace, and reinforce to develop full strength and achieve design requirements.

H. Coordinate placement of insulation in multiple stud spaces made inaccessible after erection.

I. Install intermediate studs above and below openings to align with wall stud spacing.

J. Provide deflection allowance in stud track, directly below horizontal building framing at non-load bearing framing.

K. Attach cross studs to studs for attachment of fixtures anchored to walls.

L. Install framing between studs for attachment of mechanical and electrical items, and to prevent stud rotation.

M. Touch-up field welds and damaged galvanized surfaces with primer.

3.04 EXTERIOR WALLS - NON-AXIALLY LOADED

A. Install horizontal bridging, using the following:
   1. Cold-rolled steel channel, fastened to web of stud by a piece of angle of same thickness as the framing member.

B. Space bridging as indicated but not less than 48 inches on center if no supporting calculations are provided.

C. Structural Movement Isolation: Isolate wall framing from building structure to prevent transfer of vertical loads while providing lateral support, using one of the following methods attached to continuous angles or supplementary framing anchored to the building structure:
   1. Vertical slide clips.
   2. Deep leg slip track.

3.05 INSTALLATION OF WALL SHEATHING

A. Install sheathing in accordance with ASTM C 1280 and manufacturer's written instructions.

B. Install wall sheathing with long dimension perpendicular to wall studs, with ends over firm bearing and staggered, using self-tapping screws.
   1. Provide steel diagonal bracing at corners with foam insulation or gypsum board wall sheathing.

C. Secure gypsum wall sheathing with specified screws, at the minimum following spacings:
   1. Panel Edges: 7 inches on center.
   2. Intermediate Supports: 7 inches on center.

D. Apply fasteners so screw heads bear tightly against face of sheathing boards but do not cut into facing.

E. Fit boards tightly against each other and around openings.

F. Install solid metal blocking where end joints do not bear against framing sills or plates.

3.06 CLEANUP

A. Cleanup, remove from the site, and legally dispose of all materials related to work in this section.

3.07 TOLERANCES

A. Variation from Plumb: Maximum 1/8 inch in 10 feet.

B. Variation from Level: Maximum 1/8 inch in 10 feet.

C. Variation from True Plane: Maximum 1/8 inch in 10 feet.

D. Maximum Variation from True Position: 1/4 inch.

END OF SECTION

SECTION 05 50 00
METAL FABRICATIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Shop fabricated steel, aluminum, and accessory items.

B. Prefabricated ladders and ship ladders.

C. Downspout boots.

D. Permanent fall arrest roof anchors.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - CAST-IN-PLACE CONCRETE: Placement of metal fabrications in concrete.

B. Section 04 20 00 - Unit Masonry: Placement of metal fabrications in masonry.

C. Section 05 12 00 - Structural Steel Framing: Structural steel column anchor bolts.

D. Section 05 21 00 - Steel Joist Framing: Structural joist bearing plates, including anchorage.

E. Section 05 31 00 - Steel Decking: Bearing plates for metal deck bearing, including anchorage.

F. Section 05 51 00 - Metal Stairs.

G. Section 05 52 13 - Pipe and Tube Railings.

H. Section 09 91 13 - Exterior Painting: Paint finish.

I. Section 09 91 23 - Interior Painting: Paint finish.

1.03 REFERENCE STANDARDS

A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum.

B. ANSI A14.3 - American National Standard for Ladders -- Fixed -- Safety Requirements.

C. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.

D. ASTM A48/A48M - Standard Specification for Gray Iron Castings.

E. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

F. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

G. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

H. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates.

I. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.

J. ASTM B211M - Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold-Finished Bar, Rod, and Wire (Metric).

K. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

L. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric).

M. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination.

N. AWS D1.1/D1.1M - Structural Welding Code - Steel.

O. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel; International Accreditation Service, Inc.

P. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer.

Q. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic").

R. SSPC-SP 2 - Hand Tool Cleaning.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on anchors, fall arrest anchors; describe materials and finish, product criteria.

C. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.

1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.

1.05 QUALITY ASSURANCE

A. Conform to local, state and federal regulations fro use of domestically produced materials when required.

B. All shop and field welding shall conform to all requirements of the "Structural Welding Code - Steel, AWS D1.1.

C. Qualify welding processes and welding operations in accordance with AWS D1.1 and D1.3.

D. Welder Certification: All shop and field welders shall be certified according to AWS procedures for the welding process and welding position used.

E. Welder Certificates shall be made available upon request for welders employed on the project.

F. Fabricator Qualifications: A qualified steel fabricator that is accredited by IAS AC172.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in original unopened packaging.

B. Store materials in a protected area and in a manner to prevent damage.

C. Do not install damaged materials. Remove damaged materials immediately from site.

1.07 PROJECT CONDITIONS

A. Check actual locations of walls and other construction to which metal fabrications must fit, by accurate field measurements before fabrication; show recorded measurements on final shop drawings.

B. Coordinate fabrication schedule with construction progress to avoid delay of work.

C. Where field measurements cannot be made without delaying the work, guarantee dimensions and proceed with fabrication of products without field measurements. Coordinate construction to ensure that actual opening dimensions correspond to guaranteed dimensions. Allow for trimming and fitting.

PART 2 PRODUCTS

2.01 MATERIALS - STEEL

A. Steel Sections: ASTM A36/A36M.

B. Steel Tubing: ASTM A501/A501M hot-formed structural tubing.

C. Plates: ASTM A283/A283M.

D. Pipe: ASTM A53/A53M, Grade B Schedule 40, black finish.

E. Bolts, Nuts, and Washers: ASTM A325 (ASTM A325M), Type 1, galvanized to ASTM A153/A153M where connecting galvanized components.

1. Nuts: ASTM A563, Grade C, heavy hex nuts, finish to match bolts.
2. Washers: ASTM F436, Type 1 washers, finish to match bolts.

F. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

G. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

H. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.02 ACCESSORIES

A. Expansion Anchors:
   1. Wedge Anchors: Wedge type, torque-controlled, non-bottom bearing type complete with required nuts and washers.
   2. Sleeve Anchors: Single piece steel expansion sleeve provding 360 degree contact, non-bottom bearing type complete with required nuts and washers.
   3. Anchor Finish: Based on location shall be one of the following:
      a. Interior Use: Unless otherwise noted on drawings, provide carbon steel anchors with electroplated zinc finish.
      b. Exterior Use: Unless otherwise noted on drawings, provide AISA Type 304 stainless steel provided with stainless steel nuts and washers of matching alloy group.

B. Cartridge Injection Adhesive Anchors: Cartridge type, two component, solid epoxy based system dispensed and mixed through a static mixing nozzle supplied by the manufacturer. The adhesive shall meet the minimum requirements of ASTM C 881 Type I, II, IV and V, Grade 3, Class B and C. Verify acceptable installation and performance temperature requirements with manufacturer prior to installation.
   1. Interior Use: Unless otherwise noted on drawings, provide chisel point carbon steel rods conforming to ASTM A 36 with zinc plating in accordance with ASTM B633, Type III.
   2. Exterior Use: Unless otherwise noted on drawings, provide AISA Type 304 stainless steel chisel point anchors provided with stainless steel nuts and washers of matching alloy group.

C. Capsule Anchors: Threaded steel rod, inserts and reinforcing dowels with 45-degree chisel point, complete with nuts, washers, glass or foil capsule anchor system containing polyvinyl or urethane methacrylate-based resin and accelerator.
   1. Interior Use: Unless otherwise noted on drawings, provide chisel point carbon steel rods conforming to ASTM A 36 with zinc plating in accordance with ASTM B633, Type III.
   2. Exterior Use: Unless otherwise noted on drawings, provide AISA Type 304 stainless steel chisel point anchors provided with stainless steel nuts and washers of matching alloy group.

2.03 MATERIALS - ALUMINUM

2.04 FABRICATION

A. Fit and shop assemble items in largest practical sections, for delivery to site.

B. Fabricate items with joints tightly fitted and secured.

C. Continuously seal joined members by continuous welds.

D. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

E. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.

F. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.05 FABRICATED ITEMS

A. Ladders: Steel; in compliance with ANSI A14.3; with mounting brackets and attachments; prime paint finish.
   1. Rungs: one inch diameter solid round bar spaced 12 inches on center.
   2. Space rungs 7 inches from wall surface.

B. Bollards: Steel pipe, concrete filled, crowned cap, as detailed; prime paint finish.

C. Lintels: As detailed; prime paint finish.

2.06 PREFABRICATED ROOF ANCHORS

A. Permanent Fall Arrest Anchors: Assembly to support current OSHA and ANSI regulations at time of installation.

B. Steep Slope Permanent Roof Anchor (SSPRA - RDG): Type 304 stainless steel stamping with zinc plated steel D-rings at each end meeting all the requirements of OSHA/ANSI for roof anchors, similar to Miller RA40 Permanent Roof Anchor.

C. Steep Slope Permanent Roof Anchor (SSPRA - RDG2): Type 304 stainless steel stamping with zinc plated steel D-rings at one end meeting all the requirements of OSHA/ANSI for roof anchors, similar to Miller RA41 Permanent Roof Anchor.

D. Steep Slope Permanent Roof Anchor (SSPRA - TRS): Truss fitted permanent roof anchor with 2 inch stainless steel tab, similar to Trus-T Anchor as manufactured by Guardian.

E. Low Slope Permanent Roof Anchor (LSPRA - FW): Field weld installed permanent roof anchor, hot dip galvanized, with interior of post filled with urethane foam insulation.
   1. Type SM-4 Weld to Beam Roof Anchor, as manufactured by Summit Anchor Company, Inc.
   2. CB-12 or CB-18 Weld On Post as manufactured by Guardian Fall Protection
   3. Substitutions: See Section 01 60 00 - Product Requirements.

F. Low Slope Permanent Roof Anchor (LSPRA - FB): Bolt around type with stainless steel threaded rods and under-beam plate, hot-dip galvanized, with interior of post filled with urethane foam insulation.
   1. SM-1, SM-TRA, SM-PLT Roof Anchor as manufactured by Summit Anchor Company, Inc.
   2. Substitutions: See Section 01 60 00 - Product Requirements.

G. Low Slope Permanent Roof Anchor (LSPRA - SDM); Rivet attached permanent roof anchor, epoxy finished suitable for mounting to steel decking.
   1. Similar to Permanent Roof Top Anchor 2100071 as manufactured by DBI/SALA.
   2. Substitutions: See Section 01 60 00 - Product Requirements.

2.07 PREFABRICATED LADDERS

A. Prefabricated Ladder: Welded metal unit complying with ANSI A14.3; factory fabricated to greatest degree practical and in the largest components possible.
   1. Components: Manufacturer's standard rails, rungs, treads, handrails. returns, platforms and safety devices complying with the requirements of the MATERIALS article of this section.
   2. Materials: Aluminum; ASTM B221 (ASTM B221M), 6063 alloy, T52 temper.
   3. Finish: Mill finish aluminum.

B. Prefabricated Ship Ladder: Welded metal unit complying with ANSI A14.3; factory fabricated to greatest degree practical and in the largest components possible.
   1. Components: Manufacturer's standard rails, rungs, treads, handrails. returns, platforms and safety devices complying with the requirements of the MATERIALS article of this section.
   2. Materials: Aluminum; ASTM B221 (ASTM B221M), 6063 alloy, T52 temper.

2.08 DOWNSPOUT BOOTS

A. Downspout Boots: Smooth interior without boxed corners or choke points; include integral lug slots, integral cleanout, cleanout cover, and tamper proof fasteners.
   1. Configuration: Angular.
   2. Material: Cast iron; ASTM A48/A48M; casting thickness 3/8 inch (9.5 mm), minimum.
   3. Finish: Manufacturer's standard factory applied powder coat finish.
   4. Color: To be selected by Hoffman from manufacturer's standard range.

2.09 FINISHES - STEEL

A. Prime paint all interior steel items.
   1. Exceptions: Do not prime surfaces in direct contact with concrete, where field welding is required, and items to be covered with sprayed fireproofing.

B. Hot dip galvanize exterior steel items including bollards and exterior ladders.
   1. Exceptions: Exterior steel lintels scheduled to pe painted.

C. Prepare surfaces to be primed in accordance with SSPC-SP2.

D. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

E. Prime Painting: One coat.

F. Galvanizing of Structural Steel Members: Galvanize after fabrication to ASTM A123/A123M requirements. Provide minimum 2.0 oz/sq ft galvanized coating.

2.10 FINISHES - ALUMINUM

A. Exterior Aluminum Surfaces: Class I color anodized.

B. Interior Aluminum Surfaces: Class I natural anodized.

C. Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41 Clear anodic coating not less than 0.7 mils thick.

2.11 FABRICATION TOLERANCES

A. Squareness: 1/8 inch maximum difference in diagonal measurements.

B. Maximum Offset Between Faces: 1/16 inch.

C. Maximum Misalignment of Adjacent Members: 1/16 inch.

D. Maximum Bow: 1/8 inch in 48 inches.

E. Maximum Deviation From Plane: 1/16 inch in 48 inches.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.

B. Supply setting templates to the appropriate entities for steel items required to be cast into concrete or embedded in masonry.

3.03 INSTALLATION

A. Install items plumb and level, accurately fitted, free from distortion or defects.

B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

C. Field weld components as indicated on drawings.

D. Perform field welding in accordance with AWS D1.1/D1.1M.

E. Obtain approval prior to site cutting or making adjustments not scheduled.

F. After erection, prime welds, abrasions, and surfaces not shop primed or galvanized, except surfaces to be in contact with concrete.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

C. Maximum Out-of-Position: 1/4 inch.

END OF SECTION

SECTION 05 51 00

METAL STAIRS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Stairs with concrete treads.

B. Structural steel stair framing and supports.

C. Handrails and guards.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - CAST-IN-PLACE CONCRETE: Concrete fill in stair pans; mesh reinforcement for landings.

B. Section 04 20 00 - Unit Masonry: Placement of metal fabrications in masonry.

C. Section 05 50 00 - Metal Fabrications.

D. Section 05 52 13 - Pipe and Tube Railings: Metal handrails and balusters other than specified in this section.

E. Section 09 91 23 - Interior Painting: Paint finish.

1.03 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design.

B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.

C. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

D. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

E. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.

F. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.

G. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable.

H. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.

I. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions.

J. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination.

K. AWS D1.1/D1.1M - Structural Welding Code - Steel.

L. SSPC-SP 6 - Commercial Blast; Society for Protective Coatings (Part of Steel Structures Painting Manual, Vol. Two).

M. SSPC-SP 2 - Hand Tool Cleaning.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on components, anchors, and accessories.

C. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories.

1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
2. Submit manufacturer's data on shop primer.
3. Include the design engineer's seal and signature on each sheet of shop drawings.

1.05 QUALITY ASSURANCE

A. Perform design and prepare shop drawings under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in Wisconsinin the State of Wisconsin.

B. Welder Qualifications: Make welder certificates available upon request shwoing certification of welders employed on the Work, verifying AWS qualification within the previous 12 months.

C. All shop and field welding shall conform to all requirements of the "Structural Welding Code - Steel, AWS D1.1.

D. Welder Certification: All shop and field welders shall be certified according to AWS procedures for the welding process and welding position used.

E. Welder Certificates shall be made available upon request for welders employed on the project.

F. A company specializing in manufacturing products specified in this section, with not less than ten years of documented experience.

1.06 DELIVERY, STORAGE,AND HANDLING

A. Deliver materials to project site in good condition and properly protected against damage to finished surfaces.

B. Store materials in a protected area and in a manner to prevent damage.

C. Do not install damaged materials. Remove damaged materials from site.

1.07 PROJECT CONDITIONS

A. Check actual locations of walls and other construction to which metal fabrications must fit, by accurate field measurements before fabrication; show recorded measurements on final shop drawings.

B. Coordinate fabrication schedule with construction progress to avoid delay of work.

C. Where field measurements cannot be made without delaying the work, guarantee dimensions and proceed with fabrication of products without field measurements. Coordinate construction to ensure that actual opening dimensions correspond to guaranteed dimensions. Allow for trimming and fitting.

PART 2 PRODUCTS

2.01 METAL STAIRS - GENERAL

A. Metal Stairs: Provide stairs of the design specified, complete with landing platforms, vertical and horizontal supports, railings, and guards, fabricated accurately for anchorage to each other and to building structure.
   1. Regulatory Requirements: Provide stairs and railings complying with the most stringent requirements of local, state, and federal regulations; where requirements of the contract documents exceed those of regulations, comply with the contract documents.
   2. Handrails: Comply with applicable accessibility requirements of ADA Standards.
   3. Structural Design: Provide complete stair and railing assemblies complying with drawings and the applicable local code.
      a. Deflection of Stringer or Landing Framing: Not to exceed 1/240 of span.
   4. Dimensions: As indicated on approved shop drawings.
   5. Shop assemble components; disassemble into largest practical sections suitable for transport and access to site.
   6. No sharp or rough areas on exposed travel surfaces and surfaces accessible to touch.
   7. Separate dissimilar metals using paint or permanent tape.

B. Metal Jointing and Finish Quality Levels:
   1. Architectural: All joints as inconspicuous as possible, whether welded or mechanical.

a. Welded Joints: Continuously welded and ground smooth and flush.
b. Mechanical Joints: Butted tight, flush, and hairline; concealed fastenings only.
c. Exposed Edges and Corners: Eased to small uniform radius.
d. Metal Surfaces to be Painted: Sanded or ground smooth, suitable for highest quality gloss finish.

C. Fasteners: Same material or compatible with materials being fastened; type consistent with design and specified quality level.

D. Anchors and Related Components: Same material and finish as item to be anchored, except where specifically indicated otherwise; provide all anchors and fasteners required.

2.02 METAL STAIRS WITH CONCRETE TREADS

A. Jointing and Finish Quality Level: Architectural, as defined above.

B. Risers: Closed.

C. Treads: Metal pan with field-installed concrete fill.
1. Concrete Depth: 1-1/2 inches, minimum.
2. Tread Pan Material: Steel sheet.
3. Tread Pan Thickness: As required by design; 14 gage, 0.075 inch minimum.
4. Pan Anchorage to Stringers: Welded or bolted to carrier angles welded or bolted to stringers.
5. Concrete Reinforcement: None.
6. Concrete Finish: For resilient floor covering.

D. Risers: Same material and thickness as tread pans.
1. Riser/Nosing Profile: Sloped riser with rounded nosing of minimum radius.
2. Nosing Depth: Not more than 1-1/2 inch overhang.
3. Nosing Return: Flush with top of concrete fill, not more than 1/2 inch wide.

E. Stringers: Rolled steel channels.
1. Stringer Depth: 12 inches.
2. End Closure: Sheet steel of same thickness as risers welded across ends.

F. Landings: Same construction as treads, supported and reinforced as required to achieve design load capacity.

G. Railings: Steel pipe railings.

H. Finish: Shop- or factory-prime painted.

2.03 HANDRAILS AND GUARDS

A. Wall-Mounted Rails: Round pipe unless otherwise indicated.
1. Outside Diameter: 1-1/4 inch, minimum, to 1-1/2 inches, maximum.

B. Guards:
1. Top Rails: Round pipe unless otherwise indicated.
a. Outside Diameter: 1-1/4 inch, minimum, to 1-1/2 inches, maximum.
2. Infill at Pipe Railings: Pipe rails sloped parallel to stair.
a. Outside Diameter: 1 inch.
b. Material: Steel pipe.
c. Vertical Spacing: Maximum 4 inches on center.
d. Jointing: Welded and ground smooth and flush.
3. End and Intermediate Posts: Same material and size as top rails.
a. Horizontal Spacing: As indicated on drawings.
b. Mounting: Welded to top surface of stringer.

2.04 MATERIALS

A. Steel Sections: ASTM A 36/A 36M.

B. Steel Tubing: ASTM A500/A500M or ASTM A501/A501M structural tubing, round and shapes as indicated.

C. Pipe: ASTM A 53/A 53M, Grade B Schedule 40, black finish.

D. Ungalvanized Steel Sheet: Hot- or cold-rolled, except use cold-rolled where finished work will be exposed to view.
   1. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, Designation CS (commercial steel).
   2. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Designation CS (commercial steel).

E. Concrete Fill: Type specified in Section 03 30 00.

2.05 ACCESSORIES

A. Steel Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, and galvanized to ASTM A153/A153M where connecting galvanized components.

B. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

C. Shop and Touch-Up Primer: High solids, rust-inhibitive, interior-exterior alkyd primer, 51% solids by volume, similar to Devguard 4160 as manufactured by ICI Devoe Coatings.

2.06 SHOP FINISHING

A. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

B. Do not prime surfaces in direct contact with concrete or where field welding is required.

C. Prime Painting: Use specified shop- and touch-up primer.
   1. Preparation of Steel: In accordance with SSPC-SP 2, Hand Tool Cleaning.
   2. Number of Coats: One.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

B. Do not proceed with work of this section until unsatisfactory conditions have been corrected in a manner acceptable to Installer and Architect.

3.02 PREPARATION

A. When field welding is required, clean and strip primed steel items to bare metal.

3.03 INSTALLATION

A. Install components plumb and level, accurately fitted, free from distortion or defects.

B. Allow for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

C. Provide welded field joints where specifically indicated on drawings. Perform field welding in accordance with AWS D1.1/D1.1M.

D. Other field joints may be either welded or bolted provided the result complies with the limitations specified for jointing quality levels.

E. Obtain written approval prior to site cutting or creating adjustments not scheduled.

F. After erection, prime welds, abrasions, and surfaces not shop primed or galvanized, except surfaces to be in contact with concrete.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

END OF SECTION

SECTION 05 52 13
PIPE AND TUBE RAILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wall mounted handrails.

B. Stair railings and guardrails.

C. Free-standing railings at steps.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - CAST-IN-PLACE CONCRETE: Placement of anchors in concrete.

B. Section 04 20 00 - Unit Masonry: Placement of anchors in masonry.

C. Section 05 51 00 - Metal Stairs: Handrails other than those specified in this section.

D. Section 09 91 13 - Exterior Painting: Paint finish.

E. Section 09 91 23 - Interior Painting: Paint finish.

1.03 REFERENCE STANDARDS

A. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

C. ASTM E985 - Standard Specification for Permanent Metal Railing Systems and Rails for Buildings.

D. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination.

E. SSPC-SP6 - Commercial Blast; The Society for Protective Coatings; 1991 (Part of Steel Structures Painting Manual, Vol. Two).

F. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic").

G. SSPC (PM2) - Painting Manual, Vol 2; Steel Structures Painting Council.

1.04 DESIGN REQUIREMENTS

A. Design, fabricate, and test railing assemblies in accordance with the most stringent requirements of ASTM E 985 and applicable codes.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.

1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.

1.06 QUALITY ASSURANCE

A. Structural Designer Qualifications: Professional Structural Engineer experienced in design of this work and licensed in Wisconsin, or personnel under direct supervision of such an engineer.

B. Welder Qualifications: Show certification of welders employed on the Work, verifying AWS qualification within the previous 12 months.

C. All shop and field welding shall conform to all requirements of the "Structural Welding Code - Steel, AWS D1.1.

D. Welder Certification: All shop and field welders shall be certified according to AWS procedures for the welding process and welding position used.

E. Welder Certificates shall be made available upon request for welders employed on the project.

PART 2 PRODUCTS

2.01 RAILINGS - GENERAL REQUIREMENTS

A. Design, fabricate, and test railing assemblies in accordance with the most stringent requirements of ASTM E985 and applicable local code.

B. Allow for expansion and contraction of members and building movement without damage to connections or members.

C. Dimensions: See drawings for configurations and heights.

D. Provide anchors and other components as required to attach to structure, made of same materials as railing components unless otherwise indicated; where exposed fasteners are unavoidable provide flush countersunk fasteners.

E. Provide slip-on non-weld mechanical fittings to join lengths, seal open ends, and conceal exposed mounting bolts and nuts, including but not limited to elbows, T-shapes, splice connectors, flanges, escutcheons, and wall brackets.

2.02 STEEL RAILING SYSTEM

A. Pipe: ASTM A 53/A 53M, Grade B Schedule 40, black finish, 1-1/4 inch diameter, unless noted otherwise on drawings.

B. Non-Weld Mechanical Fittings: Slip-on, galvanized malleable iron castings, for Schedule 40 pipe, with flush setscrews for tightening by standard hex wrench, no bolts or screw fasteners.

C. Fittings: Elbows, T-shapes, wall brackets, escutcheons; cast steel.

D. Mounting: Brackets and flanges, with steel inserts for casting in concrete.

E. Exposed Fasteners: Flush countersunk screws or bolts; consistent with design of railing.

F. Straight Splice Connectors: Steel concealed spigots.

G. Galvanizing: In accordance with requirements of ASTM A123/A123M.

H. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic.

I. Shop and Touch-Up Primer: High solids, rust-inhibitive, interior-exterior alkyd primer, 51% solids by volume, similar to Devguard 4160 as manufactured by ICI Devoe Coatings.

2.03 FABRICATION

A. Accurately form components to suit specific project conditions and for proper connection to building structure.

B. Fit and shop assemble components in largest practical sizes for delivery to site.

C. Fabricate components with joints tightly fitted and secured. Provide spigots and sleeves to accommodate site assembly and installation.

D. Provide anchors and plates required for connecting railings to structure.

E. Exposed Mechanical Fastenings: Provide flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.

F. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

G. Accurately form components for proper connection to building structure.

H. Accommodate for expansion and contraction of members and building movement without damage to connections or members.

2.04 FINISHES - STEEL

A. Prime paint all interior steel items.

B. Galvanize all exterior steel items unless specifically noted to be primed and painted on drawings.

C. Prepare surfaces to be primed in accordance with SSPC-SP6.

D. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

E. Prime Painting: One coat, 2.0-2.5 mils dry, 4.0-5.0 mils wet.

F. Galvanizing: Provide minimum 2.0 oz/sq.ft. galvanized coating on steel components.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.

B. Supply items required to be cast into concrete or embedded in masonry with setting templates, for installation as work of other sections.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install components plumb and level, accurately fitted, free from distortion or defects, with tight joints.

C. Anchor railings securely to structure.

D. Field weld anchors as indicated on drawings. Touch-up welds with primer. Grind welds smooth.

E. Conceal anchor bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.

F. Assemble with spigots and sleeves to accommodate tight joints and secure installation.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per floor level, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

C. Maximum Out-of-Position: 1/4 inch.

END OF SECTION

SECTION 05 53 05

METAL GRATINGS AND FLOOR PLATES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Formed metal floor gratings.

B. Perimeter closure.

1.02 RELATED REQUIREMENTS

A. Section 05 12 00 - Structural Steel Framing.

B. Section 05 50 00 - Metal Fabrications.

C. Section 05 51 00 - Metal Stairs: Framing for grating and stair treads.

D. Section 07 95 13 - Expansion Joint Cover Assemblies.

E. Section 09 91 13 - Exterior Painting: Field paint finish.

1.03 REFERENCE STANDARDS

A. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination.

B. NAAMM MBG 531 - Metal Bar Grating Manual.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide span and deflection tables.

C. Shop Drawings: Indicate details of component supports, openings, perimeter construction details, and tolerances.

1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.

1.05 QUALITY ASSURANCE

A. Designer Qualifications: Design gratings and plates under direct supervision of a Professional Structural Engineer experienced in design of this type of work and licensed in Wisconsin.

B. All shop and field welding shall conform to all requirements of the "Structural Welding Code - Steel, AWS D1.1.

C. Welder Certification: All shop and field welders shall be certified according to AWS procedures for the welding process and welding position used.

D. Welder Certificates shall be made available upon request for welders employed on the project.

PART 3 EXECUTION

2.01 EXAMINATION

A. Verify that field measurements are as indicated on drawings.

B. Verify that opening sizes and dimensional tolerances are acceptable.

C. Verify that supports are correctly positioned.

2.02 INSTALLATION

A. Install components in accordance with manufacturer's instructions.

B. Place frames in correct position, plumb and level.

C. Mechanically cut galvanized finish surfaces. Do not flame cut.

D. Install gratings with cross bars in alignment.

E. Anchor by bolting through saddle clips.

F. Set perimeter closure flush with top of grating and surrounding construction.

G. Secure to prevent movement.

H. Repair damaged galvanized steel grating surfaces and apply galvanizing repair paint in accordance with ASTM A 780.

2.03 TOLERANCES

A. Comply with NAAMM MBG 531.

2.04 PROTECTION

A. Protect installed metal gratings and fasteners from damage during construction.

SECTION 10 14 00
SIGNAGE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Emergency evacuation maps.

B. Traffic signs.

1.02 RELATED REQUIREMENTS

A. Section 22 05 53 - Identification for Plumbing Piping and Equipment.

B. Section 26 05 53 - Identification for Electrical Systems.

1.03 REFERENCE STANDARDS

A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines.

B. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design.

C. ICC A117.1 - Accessible and Usable Buildings and Facilities.

D. ATBCB ADAAG - Americans with Disabilities Act Accessibility Guidelines.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's printed product literature for each type of sign, indicating sign styles, font, foreground and background colors, locations, overall dimensions of each sign.
   1. Manufacturer's Installation Instructions: Include installation templates and attachment devices.
   2. Signage Schedule: Provide information sufficient to completely define each sign for fabrication, including room number, room name, other text to be applied, sign and letter sizes, fonts, and colors.
      a. When room numbers to appear on signs differ from those on drawings, include the drawing room number on schedule.
      b. When content of signs is indicated to be determined later, request such information from Owner through Hoffman at least 2 months prior to start of fabrication; upon request, submit preliminary schedule.
      c. Submit for approval by Owner through Hoffman prior to fabrication.
   3. Samples: Submit two samples of each type of sign, of size similar to that required for project, illustrating sign style, font, and method of attachment.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Package signs as required to prevent damage before installation.

PART 2 PRODUCTS

2.01 SIGNAGE APPLICATIONS

A. Accessibility Compliance: Signs are required to comply with ADA Standards and ICC A117.1, unless otherwise indicated; in the event of conflicting requirements, comply with the most comprehensive and specific requirements.

B. Emergency Evacuation Maps:
   1. Allow for one map per elevator lobby.
   2. Map content to be provided by Owner.
   3. Use clear plastic panel silk-screened on reverse, in brushed aluminum frame, screw-mounted.

2.02 SIGN TYPES

A. Color and Font: Unless otherwise indicated:
   1. Character Font: Helvetica.
   2. Character Case: Upper case only.
   3. Background Color: As selected by Architect.
   4. Character Color: Contrasting color.

2.03 ACCESSORIES

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install neatly, with horizontal edges level.

C. Protect from damage until Substantial Completion; repair or replace damaged items.

END OF SECTION

SECTION 10 21 13.19
PLASTIC TOILET COMPARTMENTS

PART 1 GENERAL

1.01 SCOPE

A. This specification section has USGBC LEED point ramifications. Contractor(s) will execute all work in full compliance to LEED requirements associated with this and related specification sections. The LEED project manual has been included as a part of the general and special requirements of this specification and applies to this and all other sections of the specification. Where discrepancies exist between specification references, the most stringent shall apply.

1.02 SECTION INCLUDES

A. Solid plastic toilet compartments.

B. Urinal and vestibule screens.

1.03 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Blocking and supports.

B. Section 10 28 00 - Toilet, Bath, and Laundry Accessories.

1.04 REFERENCE STANDARDS

A. NFPA 286 - Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate the work with placement of support framing and anchors in walls and ceilings.

1.06 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on panel construction, hardware, and accessories.
   1. Shop Drawings: Indicate partition plan, elevation views, dimensions, details of wall supports, door swings.
   2. Samples: Submit two samples of partition panels, 24 by 24 inch in size illustrating panel finish, color, and sheen.
   3. Manufacturer's Installation Instructions: Indicate special procedures.

1.07 DELIVERY, STORAGE AND HANDLING

A. Store compartment components in unopened cartons in vertical position until installation, with adequate support to ensure flatness and to prevent damage to prefinished surfaces.

1.08 ENVIRONMENTAL REQUIREMENTS

A. Do not deliver materials or begin construction activities of this section until building is enclosed, with complete protection from outside weather, and building temperature maintained at a minimum of 60 degrees F.

1.09 WARRANTY

A. See Section 01 78 00 - CLOSEOUT SUBMITTALS, for additional warranty requirements.

B. Manufacturer's standard fifteen (15) year warranty from date of substantial completion for coated steel products.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Solid Plastic Toilet Compartments:
   1. Ampco Products, Inc: www.ampco.com/#sle.
   2. Scranton Products (Santana/Comtec/Capital): www.scrantonproducts.com/#sle.
   3. Substitutions: Section 01 60 00 - PRODUCT REQUIREMENTS.

2.02 PLASTIC TOILET COMPARTMENTS

A. Solid Plastic Toilet Compartments: Factory fabricated doors, pilasters, and divider panels made of solid molded high density polyethylene (HDPE), tested in accordance with NFPA 286; floor-mounted unbraced.
   1. Color: As Selected by Hoffman.

B. Doors:
   1. Thickness: 1 inch.
   2. Width: 24 inch.
   3. Width for Handicapped Use: 36 inch, out-swinging.
   4. Height: 55 inch.

C. Panels:
   1. Thickness: 1 inch.
   2. Height: 55 inch.

D. Pilasters:
   1. Thickness: 1 inch.
   2. Width: As required to fit space; minimum 3 inch.

E. Screens: Without doors; to match compartments; mounted to wall with two panel brackets.

2.03 ACCESSORIES

A. Pilaster Shoes: Formed chromed steel with polished finish, 3 inches high, concealing floor fastenings.
   1. Provide adjustment for floor variations with screw jack through steel saddles integral with pilaster.
   2. Provide ceiling attachment using two adjustable hanging studs, attached to above-ceiling framing.

B. Head Rails: Hollow chrome plated steel tube, 1 x 1-5/8 inch size, with anti-grip strips and cast socket wall brackets.

C. Attachments, Screws, and Bolts: Stainless steel, tamper proof type.
   1. For attaching panels and pilasters to brackets: Through-bolts and nuts; tamper proof.

D. Hinges: Stainless steel, manufacturer's standard finish.
   1. Pivot hinges, gravity type, adjustable for door close positioning; two per door.

E. Door Hardware: Stainless steel, manufacturer's standard finish.
   1. Door Latch: Slide type with exterior emergency access feature.
   2. Door Strike and Keeper with Rubber Bumper: Mount on pilaster in alignment with door latch.
   3. Provide door pull for outswinging doors.

F. Coat Hook: One per compartment, mounted on door.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify correct spacing of and between plumbing fixtures.

C. Verify correct location of built-in framing, anchorage, and bracing.

3.02 INSTALLATION

A. Install partitions secure, rigid, plumb, and level in accordance with manufacturer's instructions.

B. Maintain 1/4 inch to 3/8 inch space between wall and panels and between wall and end pilasters.

C. Attach panel brackets securely to walls using anchor devices.

D. Attach panels and pilasters to brackets. Locate head rail joints at pilaster center lines.

3.03 TOLERANCES

A. Maximum Variation From True Position: 1/4 inch.

B. Maximum Variation From Plumb: 1/8 inch.

3.04 ADJUSTING

A. Adjust and align hardware to uniform clearance at vertical edge of doors, not exceeding 3/16 inch.

B. Adjust hinges to position doors in partial opening position when unlatched. Return out-swinging doors to closed position.

C. Adjust adjacent components for consistency of line or plane.

END OF SECTION

SECTION 10 26 00
WALL AND DOOR PROTECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Handrails.

B. Corner guards.

1.02 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Blocking for wall and corner guard anchors.

B. Section 08 71 00 - Door Hardware: Standard protection plates and trim.

C. Section 09 21 16 - Gypsum Board Assemblies: Placement of supports in stud wall construction.

1.03 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design.

B. ASTM D256 - Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics.

C. ASTM D543 - Standard Practices for Evaluating the Resistance of Plastics to Chemical Reagents.

D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

E. ASTM F476 - Standard Test Methods for Security of Swinging Door Assemblies.

F. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.

G. ICC A117.1 - Accessible and Usable Buildings and Facilities.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Indicate physical dimensions, features, wall mounting brackets with mounted measurements, anchorage details, and rough-in measurements.

C. Samples: Submit samples illustrating component design, configurations, joinery, color and finish.

D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project:
   1. See Section 01 60 00 - PRODUCT REQUIREMENTS, for additional provisions.
   2. Extra Stock Materials: One of each kind of minimum 96 inches long unit of covers for corner guards and handrails.

E. Maintenance Data: For each type of product . Include information regarding recommended and potentially detrimental cleaning materials and methods.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver wall and door protection items in original, undamaged protective packaging. Label items to designate installation locations.

B. Protect work from moisture damage.

C. Protect work from UV light damage.

D. Do not deliver products to project site until areas for storage and installation are fully enclosed, and interior temperature and humidity are in conformance with manufacturer's recommendations for each type of item.

E. Store products in either horizontal or vertical position, in conformance with manufacturer's instructions.

1.06 WARRANTY

A. See Section 01 78 00 - CLOSEOUT SUBMITTALS, for additional warranty requirements.

B. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

C. Correct defective Work within a one year period after Date of Substantial Completion.

D. Provide manufacturer's limited lifetime warranty against material and manufacturing defects.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Protective Corridor Handrails and Corner Guards:
   1. Inpro: www.inprocorp.com/#sle.
   2. Substitutions: See Section 01 60 00 - PRODUCT REQUIREMENTS.

2.02 PERFORMANCE CRITERIA

A. Impact Strength: Unless otherwise noted, provide protection products and assemblies that have been successfully tested for conformance to applicable provisions of ASTM D256 and/or ASTM F476.

B. Chemical and Stain Resistance: Unless otherwise noted, provide protection products and assemblies with chemical and stain resistance conforming to applicable provisions of ASTM D543.

C. Fungal Resistance: Unless otherwise noted, provide protection products and assemblies which pass ASTM G21 testing.

2.03 PRODUCT TYPES

A. Corridor Handrails:
   1. Surface mounted IPC Style 800W with preformed end caps and internal and external corners.
   2. Comply with accessibility requirements of ICC A117.1 and ADA Standards.
   3. Performance of Installed Assembly:
      a. Support vertical live load of 100 lb/lineal ft with deflection not to exceed 1/50 of span between supports.
      b. Resist lateral force of 250 lbs at any point without damage or permanent set.
   4. Retainer: Continuous aluminum retainer, 0.080 inch thickness, fabricated from 6063-T5 aluminum with mill finish.
   5. Material: High impact vinyl, color as selected from manufacturer's standard colors.
   6. Surface Burning Characteristics: Provide assemblies with flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
   7. Fire Rating: 1 hour.
   8. Handrail: 5 1/2" h high x 1 1/2" gripping diameter extends 3 inches from wall. Handrail has full-wrap wood grain pattern snap on covers. Returns and corners include reveals.
   9. Mounting: Surface.
   10. Return rail to wall.
   11. Mounting Brackets and Attachment Hardware: Appropriate to component and substrate.

B. Corner Guards - Surface Mounted:
   1. Surface mounted, IPC Style 150 BN BlueNose Corner Guards.
   2. Material: High impact vinyl with full height extruded aluminum retainer.
   3. Performance: Resist lateral impact force of 100 lbs at any point without damage or permanent set.
   4. Surface Burning Characteristics: Provide assemblies with flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
   5. Fire Rating: 1 hour.
   6. Width of Wings: 3 inches.
   7. Corner: Radiused.
   8. Color: As selected from manufacturer's standard colors.
   9. Length: One piece.
   10. Preformed end caps.

11. Mounting Brackets and Attachment Hardware: Appropriate to component and substrate.

2.04 FABRICATION

A. Fabricate components with tight joints, corners and seams.

B. Pre-drill holes for attachment.

C. Form end trim closure by capping and finishing smooth.

2.05 SOURCE QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Provide wall and door protection systems of each type from a single source and manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that rough openings, concealed blocking, and anchors are correctly sized and located.

B. Verify that field measurements are as indicated on drawings.

C. Verify that substrate surfaces for adhered items are clean and smooth.

D. Start of installation constitutes acceptance of project conditions.

3.02 INSTALLATION

A. Install components in accordance with manufacturer's instructions, level and plumb, secured rigidly in position to supporting construction.

B. Position top of corridor hand rail 36 inches from finished floor.

C. Position corner guards above floor base.

D. Spacing of handrail brackets is to be a maximum of 32 inches and as recommended by handrail system manufacturer.

3.03 TOLERANCES

A. Maximum Variation From Required Height: 1/4 inch.

B. Maximum Variation From Level or Plane For Visible Length: 1/4 inch.

3.04 CLEANING

A. See Section 01 74 19 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL, for additional requirements.

B. Clean wall and door protection items of excess adhesive, dust, dirt, and other contaminants.

3.05 SCHEDULE

A. Provide corner guards at all gypsum board outside corners.

B. Provide handrails in all public corridors and as indicated on drawings.

END OF SECTION

SECTION 10 28 00

TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Commercial toilet accessories.

B. Residential toilet, shower, and bath accessories.

C. Diaper changing stations.

D. Utility room accessories.

1.02 RELATED REQUIREMENTS

A. Section 10 21 13.13 - Metal Toilet Compartments.

B. Section 10 21 13.19 - Plastic Toilet Compartments.

1.03 REFERENCE STANDARDS

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

B. ASTM A269/A269M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.

C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

D. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.

E. ASTM B456 - Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium.

F. ASTM C1036 - Standard Specification for Flat Glass.

G. ASTM C1503 - Standard Specification for Silvered Flat Glass Mirror.

H. GSA CID A-A-3002 - Mirrors, Glass; U.S. General Services Administration.

I. FS DD-M-411 - Mirrors, Glass; Federal Specifications and Standards; Revision C, 1990.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the work with the placement of internal wall reinforcement, concealed ceiling supports, and reinforcement of toilet partitions to receive anchor attachments.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.

C. Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Commercial Toilet, Shower, and Bath Accessories:
   1. ASI - American Specialties, Inc: www.americanspecialties.com.
   2. Bobrick Washroom Equipment, Inc.
   3. Bradley Corporation: www.bradleycorp.com/#sle.

B. Substitutions: Section 01 60 00 - PRODUCT REQUIREMENTS.

C. Provide products of each category type by single manufacturer.

2.02 MATERIALS

A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.
   1. Grind welded joints smooth.
   2. Fabricate units made of metal sheet of seamless sheets, with flat surfaces.

B. Keys: Provide 2 keys for each accessory to Owner; master key lockable accessories.

C. Stainless Steel Sheet: ASTM A666, Type 304.

D. Stainless Steel Tubing: ASTM A269/A269M, Grade TP304 or TP316.

E. Galvanized Sheet Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M, with G90/Z275 coating.

F. Mirror Glass: Annealed float glass, ASTM C1036 Type I, Class 1, Quality Q2, with silvering, protective and physical characteristics complying with ASTM C1503.

G. Adhesive: Two component epoxy type, waterproof.

H. Fasteners, Screws, and Bolts: Hot dip galvanized; tamper-proof; security type.

I. Expansion Shields: Fiber, lead, or rubber as recommended by accessory manufacturer for component and substrate.

2.03 FINISHES

A. Stainless Steel: Satin finish, unless otherwise noted.

B. Galvanizing for Items Other than Sheet: Comply with ASTM A123/A123M; galvanize ferrous metal and fastening devices.

C. Back paint components where contact is made with building finishes to prevent electrolysis.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify exact location of accessories for installation.

C. Verify that field measurements are as indicated on drawings.

D. See Section 06 10 00 for installation of blocking, reinforcing plates, and concealed anchors in walls.

3.02 PREPARATION

A. Deliver inserts and rough-in frames to site for timely installation.

B. Provide templates and rough-in measurements as required.

3.03 INSTALLATION

A. Install accessories in accordance with manufacturers' instructions in locations indicated on drawings.

B. Install plumb and level, securely and rigidly anchored to substrate.

C. Mounting Heights: As required by accessibility regulations, unless otherwise indicated.
   1. Mirrors: Bottom of mirrors as indicated on drawings.
   2. Other Accessories: As indicated on drawings.

3.04 PROTECTION

A. Protect installed accessories from damage due to subsequent construction operations.

END OF SECTION

SECTION 10 44 00
FIRE PROTECTION SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fire extinguishers.

B. Fire extinguisher cabinets.

C. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Wood blocking product and execution requirements.

1.03 REFERENCE STANDARDS

A. ASTM E814 - Standard Test Method for Fire Tests of Through-Penetration Fire Stops.

B. NFPA 10 - Standard for Portable Fire Extinguishers.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide extinguisher operational features, color and finish, and anchorage details.
   1. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
   2. Shop Drawings: Indicate locations of cabinets, cabinet physical dimensions, rough-in measurements for recessed cabinets, mounting measurements for wall bracket, installation procedures, and accessories required for complete installation.
   3. Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.

C. Maintenance Data: Include test, refill or recharge schedules and re-certification requirements.

1.05 FIELD CONDITIONS

A. Do not install extinguishers when ambient temperature may cause freezing of extinguisher ingredients.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fire Extinguishers:
   1. Ansul, a Tyco Business: www.ansul.com/#sle.
   2. Substitutions: See Section 01 60 00 - PRODUCT REQUIREMENTS.

2.02 FIRE EXTINGUISHERS

A. Fire Extinguishers - General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.
   1. Provide extinguishers labeled by 1 for purpose specified and as indicated.

B. Multipurpose Dry Chemical Type Fire Extinguishers: Carbon steel tank, with pressure gauge.
   1. UL rating: 4A-60B:C
   2. Finish: Baked polyester powder coat, color as selected.

C. Dry Chemical Type Fire Extinguishers: Stainless steel tank, with pressure gauge.
   1. Class: K type.
   2. Size and classification as scheduled.
   3. Finish: Polished stainless steel.
   4. Temperature range: Minus 20 degrees F to 120 degrees F.

2.03 FIRE EXTINGUISHER CABINETS

A. Fire Rating: Listed and labeled in accordance with ASTM E814 requirements for fire resistance rating of walls where being installed.

B. Cabinet Construction: Non-fire rated.
   1. Formed primed steel sheet; 0.036 inch thick base metal.

C. Fire Rated Cabinet Construction: match rating of wall.
   1. Steel; double wall or outer and inner boxes with 5/8 inch thick fire barrier material.
   2. Provide fire rated cabinets at all fire rated walls.

D. Cabinet Configuration: Semi-Recessed or Surface Mounted type.
   1. Size to accommodate accessories.
   2. Trim: Rolled Edge 2 1/2" Projection

E. Door: Manufacturer's standard thickness, reinforced for flatness and rigidity; latch. Hinge doors for 180 degree opening with continuous piano hinge. Provide roller type catch.

F. Door Glazing: Float glass, clear, 1/8 inch thick, and set in resilient channel glazing gasket.

G. Cabinet Mounting Hardware: Appropriate to cabinet, with pre-drilled holes for placement of anchors.

H. Weld, fill, and grind components smooth.

I. Finish of Cabinet Exterior Trim and Door: Baked enamel, color as selected.

J. Finish of Cabinet Interior: White colored enamel.

2.04 ACCESSORIES

A. Extinguisher Brackets: Formed steel, chrome-plated.

B. Graphic Identification: Silk Screen or Thermal Die Cut.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify rough openings for cabinet are correctly sized and located.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install cabinets plumb and level in wall openings, 30 inches from finished floor to inside bottom of cabinet.

C. Secure rigidly in place.

D. Place extinguishers in cabinets.

3.03 SCHEDULES

A. See Plans for locations

END OF SECTION

SECTION 10 51 13
METAL LOCKERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Metal lockers.

B. Locker benches.

1.02 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Wood base construction.

1.03 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design.

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

C. ICC A117.1 - Accessible and Usable Buildings and Facilities.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's published data on locker construction, sizes and accessories.
   1. Shop Drawings: Indicate locker plan layout, numbering plan and combination lock code.
   2. Manufacturer's Installation Instructions: Indicate component installation assembly.

C. Samples: Submit two samples 3 by 3 inches in size showing color and finish of metal locker material.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Protect locker finish and adjacent surfaces from damage.

1.06 WARRANTY

A. See Section 01 78 00 - CLOSEOUT SUBMITTALS, for additional warranty requirements.

B. Provide manufacturer's warranty against defects in materials or workmanship for a period of two from Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Metal Lockers:
   1. Lyon Workspace Products: www.lyonworkspace.com/#sle.
   2. Penco Products, Inc: www.pencoproducts.com/#sle.
   3. Republic Storage Systems Co: www.republicstorage.com/#sle.
   4. Substitutions: See Section 01 60 00 - PRODUCT REQUIREMENTS.

2.02 LOCKER APPLICATIONS

A. Locker Benches: Stationary type; bench top of laminated birch; painted steel pedestals.
   1. Accessibility: Comply with ICC A117.1 and ADA Standards.
   2. Benches: Manufacturer's standard 1-piece units top approximately 9-1/2 inches wide by 1-1/4 inches thick. Round all corners, sand smooth, and apply manufacturer's standard transparent sealer coating.
   3. Height: 17" inch.
   4. Length: As indicated on Drawings inch.

2.03 METAL LOCKERS

A. Accessibility: Comply with ICC A117.1 and ADA Standards.

B. Lockers: Factory assembled, made of formed sheet steel, ASTM A653/A653M SS Grade 33/230, with G60/Z180 coating, stretcher leveled; metal edges finished smooth without burrs; baked enamel finished inside and out.

1. Where ends or sides are exposed, provide flush panel closures.
2. Provide filler strips where indicated, securely attached to lockers.
3. Color: To be selected by Hoffman; allow for contrasting colors for locker bodies and doors.

C. Locker Body: Formed and flanged; with steel stiffener ribs; electric spot welded.
1. Body and Shelves: 24 gage, 0.0239 inch.

D. Frames: Formed channel shape, welded and ground flush, welded to body, resilient gaskets and latching for quiet operation.
1. Door Frame: 16 gage, 0.0598 inch, minimum.

E. Doors: Hollow double pan, sandwich construction with acoustic insulation fill, 1-3/16 inch thick; welded construction, channel reinforced top and bottom with intermediate stiffener ribs, grind and finish edges smooth.
1. Door Outer Face: 18 gage, 0.0478 inch, minimum.
2. Door Inner Face: 20 gage, 0.0359 inch, minimum.
3. Form recess for operating handle and locking device.

F. Hinges: Heavy duty, 7-knuckle type; two for doors under 42 inches high; three for doors over 42 inches high.

G. Sloped Top: 20 gage, 0.0359 inch, with closed ends.

H. Trim: 20 gage, 0.0359 inch.

I. Coat Hooks: Stainless steel or zinc-plated steel.

J. Number Plates: Provide oval shaped aluminum plates. Form numbers 1/2 inch high of block font style with ADA designation, in contrasting color.

K. Accessories For Each Locker: Three single prong wall hooks, hat shelf and rubber bumper.

2.04 FINISHING

A. Surface Preparation: Solvent-clean surfaces complying with SSPC-SP 1 to remove dirt, oil, grease, and other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel complying with SSPC-SP 5 (White Metal Blast Cleaning) or SSPC SP 8 (Pickling), and phosphatized.

B. Baked-Enamel Finish: Immediately after cleaning and pre treating, apply manufacturer's standard baked-enamel finish consisting of a thermosetting topcoat. Comply with paint manufacturer's instructions for application and baking to achieve a minimum dry film thickness of 1.1 mils (0.028 mm) on doors, frames, and legs, and 0.7 mil (0.018 mm) elsewhere.

C. Paint locker units as selected from standard colors.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that prepared bases are in correct position and configuration.

B. Verify bases and embedded anchors are properly sized.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Place and secure on prepared base.

C. Install lockers plumb and square.

D. Secure lockers with anchor devices to suit substrate materials. Minimum Pullout Force: 100 pounds.

E. Bolt adjoining locker units together to provide rigid installation.

F. Install end panels, filler panels, and sloped tops.

G. Install fittings if not factory installed.

H. Replace components that do not operate smoothly.

3.03 CLEANING

A. Clean locker interiors and exterior surfaces.

3.04 SCHEDULE

A. Locker Unit - Types L1, L2, L3:
   1. Size:
      a. As indicated on Drawings.
   2. Configuration: single tier.
   3. Mounting: Surface mounted.
   4. Base: Fabricate for wood base.
      a. Base Height: 4 inch.
   5. Top: Sloped metal with closures, where indicated.
   6. Locking: Equipped for padlock hasps.
   7. Ventilation Method: Door louvers.
   8. Class: Conventional.

END OF SECTION

SECTION 10 56 17

WALL MOUNTED STANDARDS AND SHELVING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Shelf standards, brackets, and accessories.

B. Closet rods for mounting on brackets.

C. Wood shelves and cleats.

D. See drawings for locations and configurations.

1.02 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Wood blocking in walls for attachment of standards.

1.03 REFERENCE STANDARDS

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used.
   1. Manufacturer's Installation Instructions: Indicate component installation assembly.

C. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.

D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - PRODUCT REQUIREMENTS, for additional provisions.
   2. Extra Brackets: Ten of each size of standard straight bracket.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store products under cover and elevated above grade.

B. Store products in manufacturer's unopened packaging until ready for installation.

PART 2 PRODUCTS

2.01 MATERIALS

A. Regular-Duty Shelf Standards and Brackets: Single-slotted channel standards for brackets adjustable in 1 inch increments along entire length of standard, drilled and countersunk for screws.
   1. Acceptable Product: KV 70.
   2. Load Capacity: Recommended by manufacturer for loading of 120 to 320 pounds per pair of standards.
   3. Material: 16 gage, 0.0598 inch sheet steel.
   4. Lengths: As indicated on drawings.
   5. Finish: Zinc coated.
   6. Brackets: 16 gage, 0.0598 inch sheet steel, reinforced, locking into slots; size to suit shelves; same finish as standards, 4" to 12" brackets.
   7. Brackets: 14 gage, 0.0747 inch sheet steel, locking into slots; size to suit shelves; same finish as standards
   8. Bracket Quantity: Provide one bracket for each 12 inches of standard length.

B. Shelf Standard Accessories:
   1. Provide other accessories as indicated.

C. Wood Shelves: Solid board shelves, with edges sanded and eased.
   1. Species: S-P-F, B Select Grade.
   2. Thickness: 3/4 inch, nominal.

3. Length: As indicated on drawings.
4. Finish: Polyurethane varnish.

D. Fasteners: Screws as recommended by manufacturer for intended application or as otherwise required by project conditions.

E. Shelf Cleats: 3/4 x 3-1/2 inch boards, same species and grade indicated above for wood shelves.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Hoffman of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Mount standards to solid backing capable of supporting intended loads.

C. Install brackets, shelving, and accessories.

D. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch.

3.04 CLEANING

A. Clean shelves, hardware, fittings, and fixtures.

3.05 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 10 75 00
FLAGPOLES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Aluminum Flagpoles.

B. Concrete foundation base.

1.02 RELATED REQUIREMENTS

A. Section 31 23 23 - Fill: Sand to fill foundation tube sleeve.

1.03 REFERENCE STANDARDS

A. AASHTO M 36 - Standard Specification for Corrugated Steel Pipe, Metallic-Coated, for Sewers and Drains.

B. ASTM B241/B241M - Standard Specification for Aluminum and Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube.

C. NAAMM FP 1001 - Guide Specifications for Design Loads of Metal Flagpoles.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on pole, accessories, and configurations.
   1. Shop Drawings: Indicate detailed dimensions, base details, anchor requirements, and imposed loads.
   2. Operation Data: Provide operating data for the controller and timer.

C. Maintenance Data: Provide lubrication and periodic maintenance requirement schedules and requirements.

1.05 QUALITY ASSURANCE

A. Designer Qualifications: Design flagpole foundation under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed Wisconsin.

B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Spiral wrap flagpole with protective covering and pack in protective shipping tubes or containers.

B. Protect flagpole and accessories from damage or moisture.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Flagpoles:
   1. Adams Flagpole.
   2. American Flagpole: www.americanflagpole.com/#sle.
   3. Concord Industries, Inc: www.concordindustries.com/#sle.
   4. Ewing.

B. Substitutions: See Section 01 60 00 - PRODUCT REQUIREMENTS.

2.02 FLAGPOLES

A. Flagpoles: Designed in accordance with NAAMM FP 1001.
   1. Material: Aluminum.
   2. Design: Straight shaft.
   3. Mounting: Ground mounted type.
   4. Outside Butt Diameter: 6 inches.
   5. Outside Tip Diameter: 3-1/2 inches.

6. Nominal Wall Thickness: 0.188 inches.
7. Nominal Height: 30 ft; measured from nominal ground elevation.
8. Halyard: Interior type .

2.03 POLE MATERIALS

A. Aluminum: ASTM B 241/B 241M, 6063 alloy, T6 temper.

2.04 ACCESSORIES

A. Finial Ball: Stainless steel, 6 inch diameter.

B. Truck Assembly: Cast aluminum; revolving, stainless steel ball bearings, non-fouling.

C. Cleats: 9 inch size, aluminum with galvanized steel fastenings, two per halyard.

D. Halyard: 5/16 inch diameter polypropylene, braided, white.

E. Concrete: Concrete as specified in Section 32 13 13.

2.05 MOUNTING COMPONENTS

A. Ground Sleeve: AASHTO M 36M, corrugated 16 gage steel, galvanized, minimum depth of 60 inches, with a steel base plate whose square dimension is at least the internal diameter of the sleeve plus 4" with steel centering wedges. A setting plate 6" square shall be securely welded to the ground spike at least 6" below the base plate. The ground spike shall be 3/4" diameter, not less than 18" long.

2.06 FINISHING

A. Metal Surfaces in Contact With Concrete: Asphaltic paint.

B. Aluminum: Mill finish.

C. Finial: Spun finish.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that concrete foundation is ready to receive work and dimensions are as indicated on shop drawings.

3.02 PREPARATION

A. Coat metal sleeve surfaces below grade and surfaces in contact with dissimilar materials with asphaltic paint.

3.03 INSTALLATION

A. Install flagpole, base assembly, and fittings in accordance with manufacturer's instructions.

B. Place concrete foundation per design and requirements of manufacturer.

C. Install foundation plate and centering wedges for flagpoles base set in concrete base and fasten.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1 inch.

3.05 ADJUSTING

A. Adjust operating devices so that halyard and flag function smoothly.

END OF SECTION

SECTION 06 10 00
ROUGH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Non-structural dimension lumber framing.

B. Rough opening framing for doors, windows, and roof openings.

C. Sheathing.

D. Roof-mounted curbs.

E. Roofing nailers.

F. Preservative treated wood materials.

G. Fire retardant treated wood materials.

H. Communications and electrical room mounting boards.

I. Concealed wood blocking, nailers, and supports.

J. Miscellaneous wood nailers, furring, and grounds.

K. Accessories and flashings at openings.

L. Sill seal insulation.

M. Framing anchors and fasteners.

1.02 RELATED REQUIREMENTS

A. Section 01 45 33 - Code-Required Special Inspections.

B. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.

C. Section 03 30 00 - CAST-IN-PLACE CONCRETE: Setting anchors in concrete.

D. Section 04 20 00 - Unit Masonry.

E. Section 05 12 00 - Structural Steel Framing: Prefabricated beams and columns for support of wood framing.

F. Section 05 50 00 - Metal Fabrications: Miscellaneous steel connectors and support angles for wood framing.

G. Section 07 62 00 - Sheet Metal Flashing and Trim: Sill flashings.

H. Section 09 21 16 - Gypsum Board Assemblies: Gypsum-based sheathing.

1.03 REFERENCE STANDARDS

A. ANSI A208.1 - American National Standard for Particleboard.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

D. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.

E. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.

F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

G. AWPA U1 - Use Category System: User Specification for Treated Wood.

H. PS 1 - Structural Plywood.

I. PS 20 - American Softwood Lumber Standard.

J. WCLIB (GR) - Standard Grading Rules for West Coast Lumber No. 17.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.
   1. Review requirements for any code-required special inspections.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide technical data on the following products.
   1. Structural Composite Lumber: Submit manufacturer's published structural data including span tables, marked to indicate which sizes and grades are being used; if structural composite lumber is being substituted for dimension lumber or timbers, submit grading agency structural tables marked for comparison.
   2. Wood treatment data.
   3. Engineered wood products.
   4. Sheathing and underlayment.
   5. Metal framing anchors.
   6. Construction adhesives.
   7. Flashings and accessories.

1.06 QUALITY ASSURANCE

1.07 DELIVERY, STORAGE, AND HANDLING

A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.

B. For lumber and plywood pressure treated with waterborne chemicals, spacers shall be placed between each bundle to provide air circulation.

C. Fire Retardant Treated Wood: Prevent exposure to precipitation during shipping, storage, or installation.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
   1. Species: Spruce-Pine-Fir (South), unless otherwise indicated.
   2. If no species is specified, provide any species graded by the agency specified; if no grading agency is specified, provide lumber graded by any grading agency meeting the specified requirements.
   3. Grading Agency: Any grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee (www.alsc.org) and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.
   4. Lumber of other species or grades is acceptable provided structural and appearance characteristics are equivalent to or better than products specified.

B. Lumber fabricated from old growth timber is not permitted.

2.02 DIMENSION LUMBER FOR CONCEALED APPLICATIONS

A. Grading Agency: West Coast Lumber Inspection Bureau; WCLIB (GR).

B. Sizes: Nominal sizes as indicated on drawings, S4S.

C. Moisture Content: S-dry or MC19.

D. Stud Framing (2 by 2 through 2 by 6):
   1. Species: Spruce-Pine-Fir.
   2. Grade: Stud.
      a. Fb-single (minimum extreme fiber stress in bending): 675 psi.
      b. E (minimum modulus of elasticity): 1,200,000 psi.
      c. Fc (compressive stress parallel to grain): 675 psi.

d. Fcp (compressive stress perpendicular to grain): 425 psi.

E. Plates and Sills (2 x 2 through 2 x 6):
1. Species: Spruce-Pine-Fir.
2. Grade: Stud.
a. Fb-single (minimum extreme fiber stress in bending): 675 psi.
b. E (minimum modulus of elasticity): 1,200,000 psi.
c. Fc (compressive stress parallel to grain): 725 psi.
d. Fcp (compressive stress perpendicular to grain): 425 psi.

F. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
1. Lumber: S4S, No. 2 or Standard Grade.
2. Boards: No. 2.

2.03 CONSTRUCTION PANELS

A. Roof Sheathing: Oriented strand board wood structural panel; PS 2.
1. Grade: Structural 1 Sheathing.
2. Bond Classification: Exposure 1.
3. Performance Category: 5/8 PERF CAT.
4. Span Rating: 40/20.
5. Edges: Square.

B. Wall Sheathing: Plywood, PS 1, Grade C-D, Exposure I.

C. Wall Sheathing: Glass mat faced gypsum, ASTM C1177/C1177M, 5/8 inch Type X fire resistant.
1. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
2. Manufacturers:
a. CertainTeed Corporation; GlasRoc Brand: www.certainteed.com/#sle.
b. Georgia-Pacific Gypsum; DensGlass Sheathing: www.gpgypsum.com/#sle.
c. Substitutions: See Section 01 60 00 - PRODUCT REQUIREMENTS.

D. Communications and Electrical Room Mounting Boards: PS 1 A-D plywood, or medium density fiberboard; 3/4 inch thick; flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84.

2.04 ACCESSORIES

A. Fasteners and Anchors:
1. General: All fasteners, anchors and connectors in contact with fire-retardant treated or preservative-treated wood shall meet current governing codes.
2. Metal and Finish: Hot-dipped galvanized steel per ASTM A153/A153M or stainless steel for high humidity and preservative-treated wood locations, unfinished steel elsewhere.

B. Nails: FS FF-N-105.

C. Wood Screws: ANSI B18.6.1.

D. Gypsum Sheathing Fasteners: Roofing nails, 1-3/4" long, galvanized, 11 gage, with 7/16" heads, unless otherwise noted on drawings or schedules.

E. Drywall Screws: Bugle head, hardened steel, power driven type, length three times thickness of sheathing.

F. Bolts:
1. Lag Bolts: ANSI B18.2.1.
2. Anchor Bolts: Steel bolts, galvanized, complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and flat washers where indicated.

G. Expansion Anchors:
1. Wedge Anchors: Wedge type, torque-controlled, non-bottom bearing type complete with required nuts and washers.
2. Sleeve Anchors: Single piece steel expansion sleeve providing 360-degree contact, non-bottom bearing type complete with required nuts and washers.

3. Anchor Finish: Based on location shall be one of the following unless noted otherwise on drawings:
    a. Interior Use: Carbon steel anchors with electroplated zinc finish.
    b. Exterior Use: Provide AISA Type 304 stainless steel provided with stainless steel nuts and washers of matching alloy group.

H. Capsule Anchors: Threaded steel rod, inserts and reinforcing dowels with 45 degree chisel point, complete with nuts, washers, glass or foil capsule anchor system containing polyvinyl or urethane methacrylate-based resin and accelerator. Based on location shall be one of the following unless otherwise indicated on drawings:
    1. Interior Use: Provide carbon steel anchors with electroplated zinc finish.
    2. Exterior Use: Provide chisel-pointed stainless steel anchors, AISI Type 304 provided with stainless steel nuts and washers of matching alloy group.

I. Cartridge Injection Adhesive Anchors: Cartridge type, two-component, solid epoxy based system dispensed and mixed through a static mixing nozzle supplied by the manufacturer. The adhesive shall meet the minimum requirements of ASTM C 881 Type I, II, IV and V, Grade 3, Class B and C. Verify acceptable installation and performance temperature requirements with manufacturer prior to installation. Based on location shall be one of the following unless otherwise indicated on drawings:
    1. Interior Use: Provide chisel-pointed carbon steel rods conforming to ASTM A36 with zinc plating in accordance with ASTM B633, Type III, with matching nuts and washers.
    2. Exterior Use: Provide chisel-pointed stainless steel anchors, AISI Type 304 provided with stainless steel nuts and washers of matching alloy group.

J. Heavy Duty Screw Anchors: Self-tapping anchors shall have 360-degree contact with the base material and shall not require oversized or undersized holes for installation.
    1. Material: Carbon steel, heat treated.
    2. Finish: Zinc plated in accordance with ASTM B633 or mechanically galvanized in accordance with ASTM B695, Class 65, Type 1.
    3. Product: Similar to Titen HD anchors as manufactured by Simpson Strong-Tie.

K. Heavy Duty Screws: Similar to SDS Heavy Duty Connector as manufactured by Simpson.

L. Drive Anchors: Pre-expanded anchors with minimum 7/16 inch diameter flat heads, similar to Powers Drive, lengths as required for noted embedment.

M. Die-Stamped Connectors: Hot dipped galvanized steel, sized to suit framing conditions.
    1. For contact with preservative treated wood in exposed locations, provide minimum G185 galvanizing per ASTM A653/A653M or as required by code.

N. Wind Tie down Anchor: Similar to Simpson H-3, standard 18 gauge galvanized steel, 320 pound wind uplift capacity, 105 pound maximum horizontal load.

O. Plywood Roof Clips: "H" type extruded aluminum or 20 gauge galvanized steel, sized for sheathing thickness.

P. Breakaway Fire Wall Anchors: Manufactured from rolled strip zinc alloy, type 710.
    1. Manufacturer: Heckmann Building Products Inc.
    2. Size and Thickness: As noted on drawings.
    3. Substitutions: See Section 01 60 00 - PRODUCT REQUIREMENTS.

Q. Opening Flashings:
    1. Straight Flashing - Self-Adhering: Self-adhering, butyl adhesive with textured polyethylene laminate barrier, 30 mil thickness, with 1 piece siliconized release paper, width as required.
        a. Similar to StraightFlash as manufactured by DuPont.
    2. Flexible Flashing - Self-Adhering: Self-adhering, butyl adhesive with conformable textured polyethylene laminate barrier, 70 mil thickness, with 2 piece siliconized release paper, width as required.
        a. Similar to FlexWrap as manufactured by DuPont.
    3. Flashing Primer: Provide flashing manufacturer recommended primer to assist in adhesion between substrate and flashing.

2.05 FACTORY WOOD TREATMENT

A. Treated Lumber and Plywood: Comply with requirements of AWPA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.
   1. Fire-Retardant Treated Wood: Mark each piece of wood with producer's stamp indicating compliance with specified requirements.
   2. Preservative-Treated Wood: Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWPA standards.

B. Fire Retardant Treatment:
   1. Manufacturers:
      a. Lonza Group: www.wolmanizedwood.com.
      b. Hoover Treated Wood Products, Inc: www.frtw.com/#sle.
      c. _____.
      d. Substitutions: See Section 01 60 00 - PRODUCT REQUIREMENTS.
   2. Interior Type A: AWPA U1, Use Category UCFA, Commodity Specification H, low temperature (low hygroscopic) type, chemically treated and pressure impregnated; capable of providing a maximum flame spread index of 25 when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 minutes.
      a. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.
      b. Treat rough carpentry items as indicated .
      c. Do not use treated wood in applications exposed to weather or where the wood may become wet.

C. Preservative Treatment:
   1. Manufacturers:
      a. Lonza Group: www.wolmanizedwood.com.
      b. Substitutions: See Section 01 60 00 - PRODUCT REQUIREMENTS.

D. Preservative Pressure Treatment of Lumber Above Grade: AWPA U1, Use Category UC3B, Commodity Specification A using waterborne preservative.
   1. Kiln dry lumber after treatment to maximum moisture content of 19 percent.
      a. Treat lumber exposed to weather.
      b. Treat lumber in contact with roofing, flashing, or waterproofing.
      c. Treat lumber in contact with masonry or concrete.
      d. Treat lumber less than 18 inches above grade.
      e. Treat lumber in other locations as indicated.
   2. Preservative Pressure Treatment of Plywood Above Grade: AWPA U1, Use Category UC2 and UC3B, Commodity Specification F using waterborne preservative.
      a. Kiln dry plywood after treatment to maximum moisture content of 15 percent.

E. Preservative Pressure Treatment of Lumber in Contact with Soil: AWPA U1, Use Category UC4A, Commodity Specification A using waterborne preservative.
   1. Preservative for Field Application to Cut Surfaces: As recommended by manufacturer of factory treatment chemicals for brush-application in the field.
   2. Restrictions: Do not use lumber or plywood treated with chromated copper arsenate (CCA) in exposed exterior applications subject to leaching.
   3. Kiln dry lumber after treatment to maximum moisture content of 19 percent, and 15 percent for plywood.
   4. Treat wood in the following locations:
      a. Treat wood in contact with ground.
      b. Treat wood in contact with fresh water.
      c. Treat wood used as posts, landscaping timbers, retaining walls, piers, or docks.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate and adjacent materials are ready to receive work of this section.

B. Verify substrate surfaces are flat and free of irregularities that would affect work of this section.

3.02 INSTALLATION - GENERAL

A. Select material sizes to minimize waste.

B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.

C. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

D. Discard units of material with defects that impair quality of rough carpentry and that are too small to use with minimum number of joints or optimum joint arrangement.

E. Fit rough carpentry to other construction; scribe and cope as required for accurate fit. Correlate location of furring, nailers, blocking, grounds, and similar supports to allow attachment of other construction.

3.03 FASTENERS AND FRAMING DEVICES

A. Nails and Spikes:
   1. Use hot-dip galvanized or stainless steel nails where rough carpentry is exposed to weather, in ground contact, or in areas of high humidity.
   2. Countersink nail heads on exposed carpentry work and fill holes with wood filler.
   3. Use coated, common wire nails, unless otherwise noted. Use finishing nails for finish work.
   4. Select fasteners of size and length that will not fully penetrate members where opposite side will be exposed to view, or that will receive finish materials.
   5. Install fasteners without splitting wood; predrill as required.

B. Lag Screws:
   1. When installing lag screws in a wood member, pre-drill hole as required.
   2. Lag screws, which bear in wood, shall be fitted with standard steel plate washers under head. Lag screws shall be screwed and not driven into place.

C. Bolts:
   1. Lumber and timber to be fastened together with bolts shall be clamped together with holes for bolts bored true to line.
   2. Bolts shall be fitted with steel plates or standard cut washers under heads and nuts. Bolts shall be tightened when installed and again before completion of the work of this section.

D. Wood Screws: When installing wood screws, pre-drill holes as required.

3.04 BLOCKING, NAILERS, AND SUPPORTS

A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.

B. In framed assemblies that have concealed spaces, provide solid wood fireblocking as required by applicable local code, to close concealed draft openings between floors and between top story and roof/attic space; other material acceptable to code authorities may be used in lieu of solid wood blocking.

C. In metal stud walls, provide continuous blocking around door and window openings for anchorage of frames, securely attached to stud framing.

D. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.

E. Where ceiling-mounting is indicated, provide blocking and supplementary supports above ceiling, unless other method of support is explicitly indicated.

F. Except as otherwise noted, blocking and backing in walls and ceilings shall be nominal 2-inch thick material of a depth as needed to support finishes, fixtures, specialty items, and trim.

G. Blocking shall fit snugly and shall be spiked or screwed into the supporting members.

H. Coordinate locations and installation with other trades.

I. Attach blocking to substrates to support applied loading. Bolts and nuts shall be recessed flush with surfaces, unless otherwise indicated.

J. Provide the following specific non-structural framing and blocking:
   1. Cabinets and shelf supports.
   2. Wall brackets.
   3. Handrails.
   4. Grab bars.
   5. Towel and bath accessories.
   6. Wall-mounted door stops.
   7. Chalkboards and marker boards.
   8. Wall paneling and trim.
   9. Joints of rigid wall coverings that occur between studs.

3.05 ROOF-RELATED CARPENTRY

A. Coordinate installation of roofing carpentry with deck construction, framing of roof openings, and roofing assembly installation.

B. Provide wood curb at all roof openings except where prefabricated curbs are specified and where specifically indicated otherwise. Form corners by alternating lapping side members.

C. Anchor wood nailers as follows unless otherwise noted on drawings:
   1. Masonry block walls: 1/2 inch diameter heavy duty screw anchors at 48 inch centers, 24 inch centers for 8'-0" each way at corners, minimum 4-1/2 inch embedment. Anchors to be furnished and installed by 06 10 00 contractor.
   2. Steel framing: 3/8" diameter galvanized carriage bolts at 32 inch centers, 16 inch centers for 8'-0" each way at corners. Bolts to be furnished and installed by 06 10 00 contractor.
   3. Metal decking: Two rows of No. 10 galvanized steel metal screws at 24 inch centers. Install with 5/8" diameter washer under screw heads.

D. Install nailers to match thickness of roof insulation unless otherwise indicated.

3.06 INSTALLATION - CONSTRUCTION PANELS

A. Roof Sheathing: Secure panels perpendicular to framing members, with ends staggered and sheet ends over firm bearing. Install panels with end and edge gaps recommended by the panel manufacturer.
   1. At long edges use sheathing clips where joints occur between roof framing members.
   2. Screw panels to framing; staples are not permitted. Spaced as follows:
      a. Panel Edges: 6 inches on center.
      b. Intermediate Supports: 12 inches on center.

B. Wall Sheathing: Secure with long dimension perpendicular to wall studs, with ends over firm bearing and staggered, using nails, screws, or staples.

C. Plywood Wall Sheathing: Secure with long dimension perpendicular to wall studs, with ends over firm bearing and staggered.
   1. Nail panels to framing; staples are not permitted. Nails to be 8d minimum or as noted or scheduled on drawings, spaced as follows:
      a. Panel Edges: 6 inches on center.
      b. Intermediate Supports: 12 inches on center.

D. Gypsum Wall Sheathing: Secure with long dimension perpendicular to wall studs, with ends over firm bearing and staggered.

1. Fastening Panels:
    a. Nail panels to framing; staples are not permitted. Fasten as follows:
    b. Panel Edges: 4 inches on center.
    c. Intermediate Supports: 7 inches on center.
2. Install gypsum sheathing in accordance with ASTM C 1280 and manufacturer's written instructions.
3. Fit boards tightly against each other and around openings.

E. Communications and Electrical Room Mounting Boards: Secure with screws to studs with edges over firm bearing; space fasteners at maximum 16 inches on center on all edges and into studs in field of board.
1. At fire-rated walls, install board over wall board indicated as part of the fire-rated assembly.
2. Where boards are indicated as full floor-to-ceiling height, install with long edge of board parallel to studs.
3. Install adjacent boards without gaps.
4. Size and Location: As indicated on drawings.

3.07 INSTALLATION - OPENING FLASHINGS

A. Flanged Windows Installed After Air Barrier:
1. Cover horizontal sill with flexible flashing aligning inside edge with edge of rough opening. Adhere to rough opening across sill and up jambs a minimum of 6 inches. Secure flashing tightly into corners by working in along the sill before adhering up the jambs.
2. Fan flexible flashing at bottom corners onto face of wall. Firmly press in place. Mechanically fasten fanned edges.

B. Non-Flanged Windows Installed After Air Barrier:
1. Cover horizontal sill with flexible flashing aligning inside edge with edge of rough opening. Adhere to rough opening across sill and up jambs a minimum of 6 inches. Secure flashing tightly into corners by working in along the sill before adhering up the jambs.
2. Fan flexible flashing at bottom corners onto face of wall. Firmly press in place. Mechanically fasten fanned edges.
3. Apply 9-inch wide strips of straight flashing at jambs. Align flashing with interior edge of jamb framing. Start flashing at head of opening and lap sill flashing down to sill.
4. Spray-apply primer to top 6 inches of jambs and exposed sheathing.
5. Install flexible flashing at opening head using same installation procedures used at sill. Overlap jamb flashing a minimum of 2 inches.

3.08 TOLERANCES

A. Variation from Plumb: Maximum 1/8 inch in 10 feet.

B. Variation from Level: Maximum 1/8 inch in 10 feet.

C. Variation from Plane (Other than Floors): 1/8 inch in 10 feet maximum, and 1/4 inch in 30 feet maximum.

3.09 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Coordinate with Special Inspector for any inspections related to High Load Diaphragms and wind resistance systems where required.

3.10 CLEANING

A. Waste Disposal: Comply with the requirements of Section 01 74 19 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL.
1. Comply with applicable regulations.
2. Do not burn scrap on project site.
3. Do not burn scraps that have been pressure treated.
4. Do not send materials treated with pentachlorophenol, CCA, or ACA to co-generation facilities or “waste-to-energy” facilities.

B. Do not leave any wood, shavings, sawdust, etc. on the ground or buried in fill.

C. Prevent sawdust and wood shavings from entering the storm drainage system.

END OF SECTION

SECTION 07 01 50.19
PREPARATION FOR RE-ROOFING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Replacement of existing ballasted and adhered SPM roofing systems` in preparation for new roofing system in designated areas as indicated on drawings.

B. Removal of existing flashing and counterflashings.

C. Temporary roofing protection.

1.02 RELATED REQUIREMENTS

A. Section 07 53 00 - Elastomeric Membrane Roofing.

B. Section 07 62 00 - Sheet Metal Flashing and Trim: Replacement of flashing and counterflashings.

1.03 PRICE AND PAYMENT PROCEDURES

A. See Section 01 22 00 - Unit Prices, for additional unit price requirements.

B. Repair Existing Roof Metal Decking:
   1. Basis of Measurement: By the square foot.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate with affected mechanical and electrical work associated with roof penetrations.

B. Preinstallation Meeting: Convene one week before starting work of this section.
   1. Attendees:
      a. Hoffman.
      b. Contractor.
      c. Owner.
   2. Meeting Agenda: Provide agenda to participants prior to meeting in preparation for discussions on the following:
      a. Removal and installation schedule.
      b. Necessary preparatory work.
      c. Protection before, during, and after roofing system installation.
      d. Removal of existing roofing system.
      e. Installation of new roofing system.
      f. Temporary roofing and daily terminations.
      g. Transitions and connection to and with other work.
      h. Inspections and testing of installed systems.

C. Schedule work to coincide with commencement of installation of new roofing system.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit for each type of material.

1.06 QUALITY ASSURANCE

A. Materials Removal Firm Qualifications: Company specializing in performing the work of this section with minimum five years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Ensure storage and staging of materials does not exceed static and dynamic load-bearing capacities of roof decking.

B. Locate materials on site where directed by Hoffman.

1.08 FIELD CONDITIONS

A. Existing Roofing System: EPDM single-ply roofing.

B. Do not remove existing roofing membrane when weather conditions threaten the integrity of building contents or intended continued occupancy.

C. Maintain continuous temporary protection prior to and during installation of new roofing system.

D. Provide notice at least three days before starting activities that will affect normal building operations.

E. Verify that occupants have been evacuated from building areas when work on structurally impaired roof decking is scheduled to begin.

F. Owner will occupy building areas directly below re-roofing area.
   1. Provide Hoffman with at least 48 hours written notice of roofing activities that may affect Owner operations and to allow them to prepare for upcoming activities as necessary
   2. Do not disrupt Owner's operations or activities.
   3. Maintain access of Owner's personnel to corridors, existing walkways, and adjacent buildings.

1.09 WARRANTY

A. See Section 01 78 00 - CLOSEOUT SUBMITTALS, for additional warranty requirements.

B. Existing Warranties: Perform this work using methods and materials that will maintain existing roof system warranties.
   1. Notify existing roof system warrantor prior to starting this work and obtain written instructions for procedures necessary to maintain this existing warranty.
   2. Upon completion of this work, notify warrantor of reroofing completion and obtain documentation to verify that existing roofing system has been inspected and warranty is still in effect.
      a. Submit documentation upon project closeout.

PART 2 PRODUCTS

2.01 COMPONENTS

A. Refer to following sections for additional information on components relating to this work:
   1. Replacement and removal of existing roofing system in preparation for new roofing system in designated areas as indicated on drawings, refer to Section 07 53 00.
   2. Remove existing flashing and counterflashings in preparation for replacement of these materials as part of this work, refer to Section 07 62 00 for material requirements.

2.02 MATERIALS

A. Temporary Roofing Protection Materials:
   1. Contractor's responsibility to select appropriate materials for temporary protection of roofing areas as determined necessary for this work.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that existing roof surface has been cleared of materials being removed from existing roofing system and ready for next phase of work as required.

3.02 PREPARATION

A. Sweep roof surface clean of loose matter.

B. Remove loose refuse and dispose of properly off-site.

3.03 MATERIAL REMOVAL

A. Remove only existing roofing materials that can be replaced with new materials the same day.

B. Remove metal counter flashings.

C. Remove roofing membrane, perimeter base flashings, flashings around roof protrusions, pitch pans and pockets.

D. Repair existing metal deck surface to provide smooth working surface for new roof system.

3.04 INSTALLATION

A. Coordinate scope of this work with requirements for installation of new roofing system, refer to Section 07 53 00 for additional requirements.

3.05 FIELD QUALITY CONTROL

A. Independent agency inspection and testing will be provided under provisions of Section 01 40 00.

3.06 PROTECTION

A. Provide temporary protective sheeting over uncovered deck surfaces.

B. Turn sheeting up and over parapets and curbing. Retain sheeting in position with temporary fasteners or weights as required.

C. Provide for surface drainage from sheeting to existing drainage facilities.

END OF SECTION

SECTION 07 05 53

FIRE AND SMOKE ASSEMBLY IDENTIFICATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Cash allowance for fire and smoke assembly identification.

B. Identification markings for fire and smoke rated partitions, and fire rated walls.

1.02 RELATED REQUIREMENTS

A. Section 09 91 23 - Interior Painting: Paint finish.

1.03 PRICE AND PAYMENT PROCEDURES

A. See Section 01 21 00 - ALLOWANCES, for cash allowances affecting this section.

B. Allowance amount covers purchase, delivery, and installation.

1.04 REFERENCE STANDARDS

A. ICC (IBC) - International Building Code.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's printed product literature for each type of marking, indicating font, foreground and background colors, wording, and overall dimensions.

C. Samples: Submit two samples of each type of marking proposed for use, of size similar to that required for project, illustrating font, wording, and method of application.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1.07 FIELD CONDITIONS

A. Do not install adhered markings when ambient temperature is lower than recommended by label or sign manufacturer.

B. Do not install painted markings when ambient temperature is lower than recommended by coating manufacturer.

PART 2 PRODUCTS

2.01 FIRE AND SMOKE ASSEMBLY IDENTIFICATION

A. Regulatory Requirements: Comply with "Marking and Identification" requirements of "Fire-Resistance Ratings and Fire Tests" chapter of ICC (IBC).

B. Adhered Fire and Smoke Assembly Identification Signs: Printed vinyl or paper sign with factory applied adhesive backing.

C. Applied Fire and Smoke Assembly Identification: Identification markings applied to partition with paint and a code compliant stencil. See Section 09 91 23 for products.

D. Languages: Provide sign markings in English.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.

3.02 PREPARATION

A. See Section 09 91 23 for substrate preparation for painted markings.

3.03 INSTALLATION

A. Locate markings as required by ICC (IBC). Verify marking requirements with Architect prior to beginning work of this section.

B. Install adhered markings in accordance with manufacturer's instructions.

C. Install applied markings in accordance with Section 09 91 23.

D. Install neatly, with horizontal edges level.

E. Walls, Barriers and Partitions: The following are the minimum requirements to be followed for installation of markings:
   1. Where there is an accessible concealed floor, floor-ceiling or attic space, fire walls, fire barriers, fire partitions, smoke barriers and smoke partitions or any other wall required to have protected openings or penetrations shall be effectively and permanently identified with signs or stenciling in the concealed space. Such identification shall:
      a. Be located within 15 feet of the end of each wall and at intervals not exceeding 30 feet.
      b. Include lettering not less than 3 inches in height with a minimum 3/8 inch stroke in a contrasting color.
      c. Suggested wording, "FIRE AND/OR SMOKE BARRIER - PROTECT ALL OPENINGS," or other wording shall be used.
      d. All marking and identification shall be located and installed to be code compliant.
      e. Confirm with applicable AHJ and architect for additional code compliance requirements.

F. Protect from damage until Date of Substantial Completion; repair or replace damaged markings.

END OF SECTION

SECTION 07 14 00
FLUID-APPLIED WATERPROOFING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fluid-Applied Waterproofing:
   1. Polyurethane waterproofing.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - CAST-IN-PLACE CONCRETE: Concrete substrate.

B. Section 04 20 00 - Unit Masonry: Masonry joints prepared to receive flashings.

C. Section 07 21 00 - BOARD AND BATT INSULATION: Insulation used for protective cover.

D. Section 07 62 00 - Sheet Metal Flashing and Trim: Metal parapet covers, copings, and counterflashings.

E. Section 07 90 05 - Joint Sealers DO NOT USE - : Sealant for joints in substrates.

F. Section 31 23 23 - Fill.

1.03 REFERENCE STANDARDS

A. ASTM C836/C836M - Standard Specification for High Solids Content, Cold Liquid-Applied Elastomeric Waterproofing Membrane for Use with Separate Wearing Course.

B. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension.

C. ASTM D746 - Standard Test Method for Brittleness Temperature of Plastics and Elastomers by Impact.

D. ASTM D2240 - Standard Test Method for Rubber Property--Durometer Hardness.

E. ASTM D4541 - Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers.

F. NRCA (WM) - The NRCA Waterproofing Manual.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data for warranty, membrane, surface conditioner, and joint and crack sealants.
   1. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention, and acceptable installation temperatures.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials and products in labeled packages. Store and handle in strict compliance with manufacturer's instructions, recommendations and material safety data sheets. Protect from damage from sunlight, weather, excessive temperatures and construction operations. Removed damaged material from the site and dispose of in accordance with applicable regulations.
   1. Do not double-stack pallets of waterproofing material on the job site. Provide cover on top and all sides, allowing for adequate ventilation.
   2. Store drainage composite or protection board flat and off the ground. Provide cover on top and all sides.

3. Protect waterproofing materials from freezing. In cool temperatures, store the material for several hours at room temperature to facilitate mixing and application.

B. Sequence deliveries to avoid delays, but minimize on-site storage.

1.07 PROJECT CONDITIONS

A. Perform work only when existing and forecast weather conditions are within the limits established by the manufacturer of the materials and products used.

B. Proceed with installation only when substrate construction and preparation work is complete and in condition to receive membrane waterproofing.

1.08 WARRANTY

A. See Section 01 78 00 - CLOSEOUT SUBMITTALS, for additional warranty requirements.

B. Contractor shall correct defective Work within a five year period after Date of Substantial Completion; remove and replace materials concealing waterproofing at no cost to Owner.

C. Warranty:
1. Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
2. Submit installer's certification that installation complies with warranty conditions for the waterproofing membrane.

D. Provide five year manufacturer warranty for waterproofing failing to resist penetration of water, except where such failures are the result of structural failures of building. Hairline cracking of concrete due to temperature change or shrinkage is not considered a structural failure.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Polyurethane Waterproofing:
1. AVM Industries, Inc; Aussie Membrane 520: www.avmindustries.com/#sle.
2. Carlisle Coatings & Waterproofing, Inc; ____: www.carlisleccw.com/#sle.
3. Tremco Commercial Sealants & Waterproofing; TREMproof 250GC: www.tremcosealants.com/#sle.
4. Substitutions: See Section 01 60 00 - PRODUCT REQUIREMENTS.

2.02 FLUID APPLIED WATERPROOFING MATERIALS

A. Polyurethane Waterproofing: Cold-applied one or two component polyurethane, complying with ASTM C836/C836M.
1. Cured Thickness: 60 mils, 0.060 inch, minimum.
2. Suitable for installation over concrete substrates.
3. VOC Content: None.
4. Tensile Strength: 400 psi, measured in accordance with ASTM D412.
5. Ultimate Elongation: 500 percent, measured in accordance with ASTM D412.
6. Durometer Hardness, Type A: 30, minimum, in accordance with ASTM D2240.
7. Adhesion: Greater than 150 psi, measured in accordance with ASTM D4541.
8. Brittleness Temperature: Based on minus 50 degrees F, measured in accordance with ASTM D746.
9. Products:
   a. Carlisle Coatings & Waterproofing, Inc; CCW 703 Liquiseal: www.carlisleccw.com/#sle.
   b. Substitutions: See Section 01 60 00 - PRODUCT REQUIREMENTS.

B. Flexible Flashings: Type recommended by membrane manufacturer.

2.03 ACCESSORIES

A. Protection Board: Rigid insulation specified in Section 07 21 00.

B. Miscellaneous Materials: Tape and other accessories specified or acceptable to manufacturer of fluid applied waterproofing membrane.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify substrate surfaces are free of frozen matter, dampness, loose particles, cracks, pits, projections, penetrations, or foreign matter detrimental to adhesion or application of waterproofing system.

C. Verify that substrate surfaces are smooth, free of honeycomb or pitting, and not detrimental to full contact bond of waterproofing materials.

D. Verify items that penetrate surfaces to receive waterproofing are securely installed.

E. Do not proceed with work until unsatisfactory conditions are corrected.

3.02 PREPARATION

A. Protect adjacent surfaces from damage not designated to receive waterproofing.

B. Clean and prepare surfaces to receive waterproofing in accordance with manufacturer's instructions; vacuum substrate clean.

C. Do not apply waterproofing to surfaces unacceptable to waterproofing manufacturer.

D. Seal cracks and joints with sealant using methods recommended by sealant manufacturer.

3.03 INSTALLATION

A. Install waterproofing to specified minimum thickness in accordance with manufacturers instructions and NRCA (WM) applicable requirements.

B. Apply primer or surface conditioner at a rate recommended by manufacturer, and protect conditioner from rain or frost until dry.

C. Apply extra thickness of waterproofing material at corners, intersections, and angles.

D. Flexible Flashings: Seal items watertight that penetrate through waterproofing membrane with flexible flashings.

E. Seal membrane and flashings to adjoining surfaces.

F. Basement Walls: Extend waterproofing from finish grade line to top of footing, extend over top of footing, and down minimum of 6 inches over outside face of footing. Extend minimum 12 inches onto intersecting walls and footings, without extending onto surfaces that will be exposed to view when the project is complete.

G. Elevator Pit: Extend waterproofing from finish floor line to top of footing, extend over top of footing, and down minimum of 6 inches over outside face of footing. Extend minimum 12 inches onto intersecting walls and footings.

H. Schedule installation of waterproofing to minimize exposure of membrane to elements as recommended by manufacturer.

3.04 INSTALLATION - PROTECTION BOARD

A. Place protection board directly against drainage panel; butt joints, and scribe and cut boards around projections, penetrations, and interruptions.

B. Where detailed, use below grade rigid insulation specified under section 07 21 00 in lieu of protection board.

3.05 PROTECTION

A. Do not permit traffic over unprotected or uncovered membrane.

END OF SECTION

SECTION 07 21 00
BOARD AND BATT INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Board insulation at perimeter foundation wall, underside of floor slabs, and over roof deck.

B. Batt insulation and vapor retarder in exterior wall, ceiling, and roof construction.

C. Batt insulation for filling perimeter window and door shim spaces and crevices in exterior wall and roof.

D. Polyethylene vapor retarder.

1.02 RELATED REQUIREMENTS

A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 04 20 00 - Unit Masonry: Cavity wall construction.

C. Section 05 40 00 - Cold-Formed Metal Framing: Board insulation as wall sheathing.

D. Section 06 10 00 - Rough Carpentry: Supporting construction for batt insulation.

E. Section 07 21 26 - Blown Insulation: Blown-in, gravity-held fibrous insulation.

F. Section 07 25 00 - WEATHER BARRIERS: Separate air barrier and vapor retarder materials.

G. Section 07 53 00 - Elastomeric Membrane Roofing: Insulation specified as part of roofing system.

H. Section 07 84 00 - Firestopping: Insulation as part of fire-rated through-penetration assemblies.

I. Section 09 21 16 - Gypsum Board Assemblies: Acoustic insulation inside walls and partitions.

1.03 REFERENCE STANDARDS

A. ASTM C552 - Standard Specification for Cellular Glass Thermal Insulation.

B. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.

C. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.

D. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.

E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

F. ASTM E136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace At 750 Degrees C.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.

1. Manufacturer's Installation Instructions: Include information on special environmental conditions required for installation and installation techniques.

C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

PART 2 PRODUCTS

2.01 APPLICATIONS

A. Insulation Under Concrete Slabs: Type IV, Extruded polystyrene (XPS) board

B. Insulation at Perimeter of Foundation: Type IV, Extruded polystyrene (XPS) board.

C. Insulation at exterior above grade walls:

D. Insulation Over Roof Deck: Polyisocyanurate board.

2.02 FOAM BOARD INSULATION MATERIALS

A. Extruded Polystyrene (XPS) Board Insulation: Complies with ASTM C578 with either natural skin or cut cell surfaces.
   1. Type and Compressive Resistance:
      a. Type IV, 25 psi (173 kPa), minimum.
      b. Type X, 15 psi (104 kPa), minimum.
   2. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
   3. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
   4. Type and Thermal Resistance, R-value: Type IV, 5.0 (0.88) per 1 inch thickness at 75 degrees F mean temperature.
   5. Board Size: 48 x 96 inch.
   6. Board Thickness: 2 inches or as scheduled.
   7. Board Edges: Square.
   8. Type and Water Absorption: Type IV, 0.3 percent by volume, maximum, by total immersion.

B. Polyisocyanurate (ISO) Board Insulation: Rigid cellular foam, complying with ASTM C1289.
   1. Classifications:
      a. Type II:
         1) Class 1 - Faced with glass fiber reinforced cellulosic felt facers on both major surfaces of core foam.
         2) Compressive Strength: Classes 1-2-3, Grade 1 - 16 psi (110 kPa), minimum.
         3) Thermal Resistance, R-value: 9 At 1-1/2 inch thick; Class 1, Grades 1-2-3 - 8.4 (1.48) at 75 degrees F.
   2. Board Size: 48 inch by 96 inch.
   3. Board Thickness: 1.5 inch.
   4. Tapered Board: Slope as indicated; minimum thickness 6 inch; fabricate of fewest layers possible.

2.03 BATT INSULATION MATERIALS

A. Glass Fiber Batt Insulation: Flexible preformed batt or blanket, complying with ASTM C665; friction fit.
   1. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
   2. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.
   3. Combustibility: Non-combustible, when tested in accordance with ASTM E136, except for facing, if any.
   4. Formaldehyde Content: Zero.
   5. Thermal Resistance: R-value of 19.
   6. Facing: Unfaced.
   7. Manufacturers:
      a. CertainTeed Corporation: www.certainteed.com.
      b. Johns Manville: www.jm.com.
      c. Owens Corning Corporation: www.ocbuildingspec.com/#sle.
   8. Substitutions: See Section 01 60 00 - PRODUCT REQUIREMENTS.

2.04 ACCESSORIES

A. Sheet Vapor Retarder: Clear polyethylene film for above grade application, 6 mil thick, with a maximum permeance rating of 0.06 perms.

B. Tape: Polyethylene self-adhering type, 2 inch wide.

C. Staples: Steel wire; electroplated; type and size to suit application.

D. Proper Vents: Formed plastic, matching the width of the truss spacing.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation.

B. Verify substrate surfaces are flat, free of honeycomb, fins, or irregularities.

3.02 BOARD INSTALLATION AT FOUNDATION PERIMETER

A. Install boards horizontally on foundation perimeter.
   1. Install in running bond pattern.
   2. Butt edges and ends tightly to adjacent boards and to protrusions.

B. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

3.03 BOARD INSTALLATION AT EXTERIOR WALLS

A. Install boards horizontally on walls.

B. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

3.04 BOARD INSTALLATION UNDER CONCRETE SLABS

A. Place insulation under slabs on grade after base for slab has been compacted.

B. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

C. Prevent insulation from being displaced or damaged while placing vapor retarder and placing slab.

3.05 BOARD INSTALLATION OVER LOW SLOPE ROOF DECK

3.06 BATT INSTALLATION

A. Install insulation in accordance with manufacturer's instructions.

B. Install in exterior wall and roof spaces without gaps or voids. Do not compress insulation.

C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.

D. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.

3.07 VAPOR RETARDER INSTALLATION

A. At wood framing, place vapor retarder on warm side of insulation by stapling at 6 inches on center. Lap sheet retarder joints over member face.

B. At metal framing, place vapor retarder on warm side of insulation; lap sheet retarder over member face.

C. Seal vertical joints in vapor retarders over framing by lapping not less than 2 wall studs.

D. Tape seal tears or cuts in vapor retarder.

E. Extend vapor retarder tightly to full perimeter of adjacent window and door frames and other items penetrating the plane of the membrane.

F. Seal joints caused by pipes, conduits, electrical boxes, and similar items penetrating vapor retarders with tape of type recommended by manufacturer to create an airtight seal between penetrating objects and vapor retarder.

3.08 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

3.09 PROTECTION

A. Do not permit installed insulation to be damaged prior to its concealment.

3.10 CLEANING

A. Remove loose insulation residue.

B. Remove and legally dispose of all materials related to work of this section.

END OF SECTION

SECTION 07 21 19
FOAMED-IN-PLACE INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Foamed-in-place insulation.
   1. At perimeter of windows.
   2. In exterior framed walls.
   3. In exterior wall crevices.

B. Protective intumescent coating.

1.02 RELATED SECTIONS

A. Section 09 21 16 - Gypsum Board Assemblies: Gypsum board for thermal barrier covering foam insulation.

1.03 REFERENCE STANDARDS

A. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.

B. ASTM D2842 - Standard Test Method for Water Absorption of Rigid Cellular Plastics.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

D. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials.

E. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.

F. ASTM E2178 - Standard Test Method for Air Permeance of Building Materials.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week prior to commencing work of this section.
   1. Participants: Architect/Engineer, Applicator, Field Project Manager, Independent Inspector (if required).
   2. Review wall framing assemblies for potential interferences and conflicts and coordinate layout and support provisions for interfacing work.
   3. Review spray polyurethane foam methods and procedures related to application, including manufacturer's installation guidelines.
   4. Review construction schedule and confirm availability of products, applicator personnel, equipment and facilities.
   5. Review governing regulatory requirements.
   6. Review field quality control and safety procedures.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide product description, insulation properties, overcoat properties, and preparation requirements.

C. Manufacturer's Installation Instructions: Indicate special procedures, and perimeter conditions requiring special attention.

D. Certificates: Certify that products of this section meet or exceed specified requirements.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with not less than three years of documented experience.

B. Applicator Qualifications: Company specializing in performing work of the type specified, with minimum three years documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Provide materials packaged in the manufacturer's original, tightly sealed containers or unopened packages, clearly labelled with the manufacturer's name, product identification, safety information, and batch or lot numbers where appropriate. Where materials are covered by a referenced specification, the labels shall bear the specification number, type and class, as applicable.

B. Store materials out of the weather and out of direct sunlight in locations where the temperatures are within the limits specified by the manufacturer.

C. All materials shall be stored in compliance with local fire and safety requirements.

1.08 FIELD CONDITIONS

A. Do not apply foam when temperature is below that specified by the manufacturer for ambient air and substrate.

B. Refer to appropriate Safety Data Sheets (SDS) for additional safety information.

C. Proper disposal of waste materials and containers must be done in compliance with the manufacturer's guidelines and/or federal, state and local regulatory agencies.

D. For protection against exposure to higher levels of MDI (greater than 1 ppm) or for entry into confined spaces, workers must wear either a self-contained breathing apparatus, with full face-piece, operated in a pressure-demand or other positive-pressure mode, or a combination respirator, including a Type C air-supplied respirator, with full face-piece, operated in a pressure-demand or other positive-pressure mode, or an auxiliary self-contained breathing apparatus, operated in a pressure-demand or other positive-pressure mode. See API Bulletin "MDI based Polyurethane Foam Systems: Guidelines for Safe Handling and Disposal", Stock Number AX-119.

E. Personal protective clothing must be worn. This includes the wearing of the appropriate protective clothing, including eye protection (face shield or chemical worker's goggles), gloves and coveralls. This is essential to preventing skin exposure and is strongly recommended for most individuals who work with PMDI.

F. Provide temporary enclosures to prevent spray and noxious vapors from contaminating air beyond application area.

G. Protect adjacent surfaces and equipment from damage by overspray, fall-out, and dusting of insulation materials.

H. Dispose of waste foam daily in location designated by Hoffman and decontaminate empty drums in accordance with foam manufacturer's instructions.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Foamed-In-Place Insulation:
   1. Johns Manville; JM Corbond III Closed Cell Spray Polyurethane Foam: www.jm.com.
   2. Substitutions: See Section 01 60 00 - PRODUCT REQUIREMENTS.

2.02 MATERIALS

A. Foamed-In-Place Insulation: Medium-density, rigid or semi-rigid, closed cell polyurethane foam; foamed on-site, using blowing agent of water or non-ozone-depleting gas.
   1. Regulatory Requirements: Comply with applicable code for flame and smoke, concealment, and overcoat limitations.
   2. Thermal Resistance: R-value of 7, minimum, per 1 inch thickness at 75 degrees F mean temperature when tested in accordance with ASTM C518.
   3. Water Vapor Permeance: Vapor retarder; 0.61 perm, at 1-1/2 inches, when tested at intended thickness in accordance with ASTM E96/E96M, desiccant method.
   4. Water Absorption: Less than 2 percent by volume, maximum, when tested in accordance with ASTM D2842.

5. Air Permeance: 0.04 cfm/sq ft, maximum, when tested at intended thickness in accordance with ASTM E2178 or ASTM E283 at 1.57 psf.
6. Closed Cell Content: At least 90 percent.
7. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/450, maximum, when tested in accordance with ASTM E84.

B. Insulating Foam Sealant: Low pressure type; semi-flexible soft, single-component polyurethane foam sealant.
1. Dow Chemical; Great Stuff Pro Window and Door Insulating Sealant.
2. Fomo Products, Inc.; Handi-Seal Window & Door Foam Sealant.
3. Substitutions: See Section 01 60 00 - PRODUCT REQUIREMENTS.

2.03 ACCESSORIES

A. Primer: As required by insulation manufacturer.

B. Protective Coating: Intumescent or cementitious coating of type recommended by insulation manufacturer and as required to comply with applicable codes.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify work within construction spaces or crevices is complete prior to insulation application.

B. Verify that surfaces are clean, dry, and free of matter that may inhibit insulation or overcoat adhesion.

C. Commencement of work of this section shall be deemed as acceptance of existing work and conditions.

3.02 PREPARATION

A. Mask and protect adjacent surfaces from over spray or dusting.

B. Apply primer in accordance with manufacturer's instructions.

C. Primed Steel: If the surface is free of loose scale, rust, weathered or chalking paint, it can be cleaned using vacuum equipment and hand or power tools to remove loose dirt.

3.03 APPLICATION - SPRAY INSULATION

A. Apply insulation in accordance with manufacturer's instructions.

B. Apply insulation by spray method, to a uniform monolithic density without voids.

C. Apply to achieve a thermal resistance R-value of 21.

D. Apply thermal or ignition barrier as required by applicable codes where other means of protection are not provided or indicated on the drawings.

E. Patch damaged areas, including coating.

F. Where applied to voids and gaps assure space for expansion to avoid pressure on adjacent materials that may bind operable parts.

G. Trim excess away for applied trim or remove as required for continuous sealant bead.

3.04 APPLICATION - FOAM SEALANT

A. Apply foamed-in-place sealant in strict accordance with manufacturer's installation guidelines.

B. Avoid overfilling restricted spaces, assure space for expansion to avoid pressure on adjacent materials that may bind operable parts.

C. Apply by gun or straw.

D. Apply low pressure foam sealant in gaps and cracks adjacent to door and window frames.

E. Clean overspray from adjacent surfaces and ensure a suitable substrate for subsequent work.

F. Trim excess away for applied trim or subsequent construction.

3.05 FIELD QUALITY CONTROL

A. Field inspections and tests will be performed by an independent testing agency under provisions of Section 01 40 00 - Quality Requirements.

3.06 PROTECTION

A. Do not permit subsequent construction work to disturb applied insulation.

3.07 CLEANING

A. Remove overspray from non-prescribed surfaces without causing damage to surface.

B. Remove loose insulation residue.

C. Remove and legally dispose of all materials related to work of this section.

3.08 SCHEDULES

END OF SECTION

SECTION 07 25 00
WEATHER BARRIERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Water-Resistive Barrier: Under exterior wall cladding, over sheathing or other substrate; not air tight or vapor retardant.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - CAST-IN-PLACE CONCRETE: Vapor retarder under concrete slabs on grade.

B. Section 06 10 00 - Rough Carpentry: Water-resistive barrier under exterior cladding.

C. Section 07 21 00 - BOARD AND BATT INSULATION: Vapor retarder installed in conjunction with batt insulation.

1.03 DEFINITIONS

A. Weather Barrier: Assemblies that form either water-resistive barriers, air barriers, or vapor retarders.

B. Water-Resistive Barrier: Water-shedding barrier made of material that is moisture resistant, to the degree specified, intended to be installed to shed water without sealed seams.

1.04 REFERENCE STANDARDS

A. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.

B. ASTM E2357 - Standard Test Method for Determining Air Leakage of Air Barrier Assemblies.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.

1.06 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on material characteristics, performance criteria, and limitations.

C. Manufacturer's Installation Instructions: Indicate preparation, installation methods, and storage and handling criteria.

1.07 QUALITY ASSURANCE

A. Single-Source Responsibility:
   1. Obtain air barrier materials from a single manufacturer regularly engaged in manufacturing the product.
   2. Provide products which comply with all state and local regulations controlling use of volatile organic compounds (VOCs).

1.08 MOCK-UP

A. Install air barrier and water-resistive barrier materials in mock-up specified in Section 04 20 00 - Unit Masonry.

B. Mock-up may remain as part of the work.

1.09 FIELD CONDITIONS

A. Maintain temperature and humidity recommended by the materials manufacturers before, during and after installation. Do not apply air barrier to a damp or wet substrate, unless the manufacturer specifically permits that for the product.
   1. Do not apply air barrier in snow, rain, fog, or mist.
   2. Do not apply air barrier when the temperature of substrate surfaces and surrounding air temperatures are below those recommended by the manufacturer.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to project site in original packaging with seals unbroken, labeled with manufacturer's name, product, date of manufacture, and directions for storage.

B. Store materials in their original undamaged packages in a clean, dry, protected location and within temperature range required by air barrier manufacturer. Protect stored materials from direct sunlight.

C. Avoid spillage. Immediately notify Architect if spillage occurs and start clean up procedures.

D. Clean spills and leave area as it was prior to spill.

1.11 WASTE MANAGEMENT AND DISPOSAL

A. Separate and recycle waste materials in accordance with Section 01 73 20 - Waste Management, and with the Waste Reduction Work plan.

B. Place materials defined as hazardous or toxic waste in designated containers.

C. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.12 WARRANTY

A. Material Warranty: Provide the manufacturer’s three year air barrier material warranty under provisions of Section 01 78 00 – Closeout Submittals.

PART 2 PRODUCTS

2.01 WEATHER BARRIER ASSEMBLIES

A. Water-Resistive Barrier: Provide on exterior face of sheathing.

2.02 WATER-RESISTIVE BARRIER MATERIALS (NEITHER AIR BARRIER OR VAPOR RETARDER)

A. Primary Sheet-Applied, Vapor Permeable Water Resistive Air Barrier (Basis of Design):
   1. Self-adhered vapor permeable, water resistive air barrier consisting of a reinforced, modified polyolefin tri-laminate film surface and patented permeable adhesive technology with split-back poly-release film; having the following typical physical properties:
      a. Basis of design: Henry® Blueskin® VP100 Self-Adhered Water Resistive Air Barrier
      b. Thickness: 19 mils (0.48 mm)
      c. Water Vapor Permeance (ASTM E96): 33 perms
      d. Air Permeance (ASTM E2178): Pass
      e. Nail Sealability (ASTM D1970): Pass
      f. Surface Burning Characteristics (ASTM E84):
         1) Flame Spread: Class A
         2) Smoke Development: Class A
      g. Low Application Temperature: 40 degrees F (5 degrees C)
      h. Substitutions: Section 01 60 00 - PRODUCT REQUIREMENTS.

2.03 ACCESSORIES

A. Sealants, Tapes, and Accessories for Sealing Weather Barrier and Sealing Weather Barrier to Adjacent Substrates: As specified or as recommended by weather barrier manufacturer.

B. Flexible Flashing: Self-adhesive sheet flashing complying with ASTM D1970/D1970M, except slip resistance requirement is waived if not installed on a roof.

C. Thinners and Cleaners: As recommended by material manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces and conditions are ready to accept the work of this section.

B. Inspect sheathing application for compliance with applicable requirements.

C. Report deviations in writing to Architect from the requirements of project specifications or other conditions that might adversely affect the air and moisture barrier installation. Do not start work until deviations are corrected.

3.02 PREPARATION

A. Remove projections, protruding fasteners, and loose or foreign matter that might interfere with proper installation.

B. Clean and prime substrate surfaces to receive adhesives and sealants in accordance with manufacturer's instructions.

3.03 INSTALLATION

A. Install materials in accordance with manufacturer's instructions.

B. Ensure substrate is ready to receive air barrier in accordance with Air Barrier Manufacturer's installation guide and as specified in this Section.

C. Temperature limitation:
   1. Primary air barrier:
      a. Substrate temperature must be above 20 degrees F (-7 degrees C) and rising.
   2. Auxiliary products:
      a. Temperature limitations may vary. Refer to Air Barrier Manufacturer's product TDS for product specific temperature limitations.

D. Application of flashing:
   1. Self-adhered flashing:
      a. Where required install adhesive/primer continuously at rate recommended by Air Barrier Manufacturer ensuring complete substrate coverage of anticipated flashing installation area.
         1) Allow adhesive/primer to cure to a tacky film prior to application of flashing.
         2) Primed areas not covered by end of day must be re-primed prior to installation of flashing.
      b. Measure and cut self-adhered flashing to ensure adequate length to achieve continuous coverage of desired installation.
      c. Peel protective film from self-adhered flashing and align top of membrane verifying proper positioning prior to complete film removal and flashing placement.
      d. Press self-adhered flashing firmly into place by applying hand pressure to the middle of the membrane and working the pressure to the edges; eliminating wrinkles and air bubbles.
      e. Install self-adhered flashings in shingle fashion to eliminate reverse laps.
      f. Where required, prime laps at rate recommended by Air Barrier Manufacturer to ensure complete coverage of anticipated lap installation.
      g. Lap adjoining edges a minimum of two (2) inches.
      h. Roll flashing and laps with countertop roller to obtain thorough adhesion.
      i. Seal reverse laps at self-adhered flashing with sealant. Sealant recommendations may vary due to product or sequence of construction. Refer to Air Barrier Manufacturer details for recommended sealant.
   2. Liquid-applied flashing:
      a. Apply a uniform film of aerosol spray adhesive to raw edges of gypsum sheathing at rate recommended by Air Barrier Manufacturer completely encapsulating loose gypsum core at the cut edge of gypsum sheathing.
      b. Allow adhesive to cure to a tacky film prior to application of liquid-applied flashing.
      c. Apply flashing in accordance with and at rate recommended by Air Barrier Manufacturer.
      d. Spread flashing to achieve a monolithic membrane over substrate requiring flashing.
      e. Allow flashing to cure prior to subsequent installations.

E. Detailing/Flashing:

1. Complete detailing and flashing installations per Air Barrier Manufacturer's installation guide, details, and this specification.
2. Refer to Air Barrier Manufacturer details for further clarification and installation procedures including, but not limited to, the following:
    a. Inside corners
    b. Outside corners
    c. Pipe penetrations
    d. Shelf angles
    e. Wall to foundation transitions
    f. Reverse laps
    g. Construction joints
    h. Rough openings:
        1) Install rough opening details per Window Manufacturer's installation guide details and in accordance with ASTM E2112.
        2) Wall assemblies containing a vapor retarder on the interior wall assembly:
            (a) Extend flashing into rough opening to ensure sufficient membrane for connection with vapor retarder and provide a continuous air barrier assembly.
3. Transitions:
    a. Contact Air Barrier Manufacturer to coordinate transition of self-adhered air barrier to adjacent areas including, but not limited to, the following:
        1) Roof to air barrier
        2) Air barrier to vertical or horizontal waterproofing
        3) Fastener penetrations

F. Application of Primary Sheet-Applied Vapor Permeable Water Resistive Air Barrier:
1. Where required, install adhesive/primer continuously and at rate recommended by Air Barrier Manufacturer to ensure complete substrate coverage of anticipated flashing installation area.
    a. Allow adhesive/primer to cure to a tacky film prior to application of air barrier.
    b. Primed areas not covered by end of day must be re-primed prior to installation of air barrier.
2. Peel protective film from primary air barrier and align top of verifying proper positioning prior to complete film removal and placement.
3. Press primary air barrier firmly into place by applying hand pressure to the middle of the membrane and working the pressure to the edges; eliminating wrinkles and air bubbles.
4. Install primary air barrier in shingle fashion to eliminate reverse laps.
5. For lap adhesion enhancements, install standard or low VOC adhesive continuously and at rate recommended by Air Barrier Manufacturer to ensure substrate coverage of anticipated flashing installation area.
    a. Allow adhesive/primer to cure to a tacky film prior to subsequent primary air barrier installation.
6. Horizontal applications:
    a. Horizontal seams: two (2) inch minimum.
    b. Vertical seams: three (3) inch minimum.
7. Roll primary air barrier and laps with countertop roller to obtain thorough adhesion.
8. Seal permanent reverse laps of primary air barrier with termination sealant.

G. Fastener Penetrations Through Primary Air Barrier:
1. It is the responsibility of the installer penetrating the air barrier assembly to install fasteners/assembly components in accordance with the Air Barrier Manufacturer's installation guide and as specified in this Section.
2. Installation requirements:
    a. Drill fasteners/assembly components with sufficient compression to maintain continuity in the air barrier assembly.
    b. Refer to "Self-tapping fasteners" and/or "Pre-drilled fasteners".

3. Supplemental sealant:
    a. Penetrations that do not meet installation requirements require the addition of termination sealant at point of insertion through the air barrier to maintain continuity in the air barrier assembly.
4. Self-tapping fasteners:
    a. Fastener head/assembly component must be larger in diameter than the fastener shank.
    b. Install fastener head/assembly component to provide a continuous compression firmly against the air barrier creating a gasketing seal without damaging the membrane.
    c. Do not install fastener head/assembly components through the air barrier over unsupported areas of the substrate such as sheathing joints.
    d. Remove overdriven fasteners, improperly installed fasteners, defective/broken fasteners, or fasteners not properly fastened into the building structure beyond the air barrier membrane and seal the vacated hole with termination sealant prior to the installation of the exterior cladding.
5. Pre-drilled fastening assemblies:
    a. Fastening head/assembly component must be larger in diameter than predrilled hole.
    b. Install fastening head/assembly component to provide a continuous compression firmly against the air barrier creating a gasketing seal without damaging the membrane.
    c. Do not install fastening head/assembly components through air barrier over unsupported areas of the substrate such as sheathing joints.
    d. Seal improperly drilled and/or vacated holes with termination sealant prior to the installation of the exterior cladding.

3.04 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Coordination of ABAA Tests and Inspections:
    1. Provide testing and inspection required by ABAA QAP.
    2. Notify ABAA in writing of schedule for air barrier work, and allow adequate time for testing and inspection.
    3. Cooperate with ABAA testing agency.
    4. Allow access to air barrier work areas and staging.
    5. Do not cover air barrier work until tested, inspected, and accepted.

C. Obtain approval of installation procedures by the weather barrier manufacturer based on a mock-up installed in place, prior to proceeding with remainder of installation.

3.05 CLEANING

A. Clean spillage and soiling form adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

3.06 PROTECTION AND CLEANING

A. Do not leave materials exposed to weather longer than recommended by manufacturer.

B. Protect installed barrier until installation of covering.

C. Repair or replace damaged membrane before installing covering.

D. Remove all masking materials after work is completed.

END OF SECTION

SECTION 07 42 13.16
METAL PLATE WALL PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Metal plate panels for walls and soffits, with related flashings and accessory components.

1.02 RELATED REQUIREMENTS

A. Section 05 40 00 - Cold-Formed Metal Framing: Wall panel substrate sheathing.

B. Section 06 10 00 - Rough Carpentry: Wall panel substrate sheathing.

C. Section 07 21 00 - BOARD AND BATT INSULATION.

D. Section 07 92 00 - Joint Sealants: Sealing joints between metal wall panel system and adjacent construction.

E. Section 09 21 16 - Gypsum Board Assemblies: Wall panel substrate sheathing.

1.03 PREINSTALLATION MEETINGS

A. Preinstallation Meeting: Convene one week before starting work related to installation of wall panel substrate.
   1. Require attendance of parties directly effecting work of this section, as follows:
      a. Hoffman.
      b. Contractor.
   2. Review procedures for coordinated installation of wall assembly components by multiple installers and to maintain proper air-water barrier (AWB) and panel substrate performance requirements.

1.04 SUBMITTALS

A. Shop Drawings: Indicate dimensions, layout, joints, construction details, and methods of anchorage.

B. Samples: Submit two samples of wall panel and soffit panel, 12 inch by 12 inch in size illustrating finish color, sheen, and texture.

C. Manufacturer's Qualification Statement.

D. Installer's Qualification Statement.

E. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with not less than three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified with minimum three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect panels from accelerated weathering by removing or venting sheet plastic shipping wrap.

B. Store prefinished material off ground and protected from weather; prevent twisting, bending, or abrasion, and provide ventilation to stored materials; slope metal sheets to ensure drainage.

C. Prevent contact with materials that may cause discoloration or staining of products.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design: Steel Plate Panels.
   1. Highline S1 manufactured by PAC-CLAD.
   2. PAC 750/850 Soffit Panels manufactured by PAC-CLAD

B. Other Acceptable Manufacturers - Steel Plate Wall Panels:
   1. Substitutions: See Section 01 60 00 - PRODUCT REQUIREMENTS.

2.02 DESIGN CRITERIA

A. Metal Plate Wall Panels System: Factory fabricated prefinished metal panel system, site assembled.
   1. Type of Wall Panel System: Pressure Equalized Rain Screen (PERS) in compliance with AAMA 508.
   2. Provide exterior wall panels, soffit panels, and subgirt framing assembly.
   3. Design and size components to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of wall.
   4. Wind Load Testing: In compliance with ASTM E330/E330M to obtain the following results:
      a. Maximum Allowable Deflection of Non-Exposed Panels: L/60 for length(L) of span; no permanent deformation of panel system is allowed.
      b. Maximum Allowable Deflection of Highly Visible Panels: L/175 for length(L) of span or 3/4 inch whichever is less, normal to plane of wall between supports of secured perimeter framing members.
   5. Intermediate Panel Stiffeners: Provide as required by design loads applied to panels, and secured to rear face of panel with silicone based adhesive and of size and strength to maintain panel flatness; stiffener material is compatible with silicone.
   6. Movement: Accommodate movement within system without damage to components or deterioration of seals, movement between system and perimeter components when subject to 100 degrees F seasonal temperature cycling; dynamic loading and release of loads; and deflection of structural support framing.
   7. Fabrication: Formed true to shape, accurate in size, square, and free from distortion or defects; pieces of longest practical lengths.
   8. Corners: Factory-fabricated in one continuous piece with minimum 2 inch returns.

2.03 MANUFACTURED METAL PANELS

A. Metal Plate Wall Panels:
   1. Orientation: Horizontal; style as indicated.
   2. Joint Layout: As indicated on Drawings.

B. Metal Plate Soffit Panels:
   1. Joint Layout: Match Roof Panel.
   2. Material: Aluminum,.032 inch minimum thickness.
   3. Profile: Helf Vent

C. Subgirts: Z-Shaped; to attach wall panel system to face of building structural wall.

D. Trim and Flashings: Match panel thickness and finish as metal panels; brake formed to required profiles.

E. Fasteners: Provide of manufacturer recommended material.

2.04 MATERIALS

A. Substrate Wall Sheathing: Refer to Section 06 10 00 for additional information.

B. Substrate Wall Insulation: Refer to Section 07 21 00 for additional information.

2.05 FINISHES

A. Superior Performing Organic Top Coating: Complying with AAMA 2605 for testing, performance, and application procedures, and consisting of two-coat, thermally cured polyvinylidene fluoride (PVDF) system.
   1. Chemically etch metal panels using appropriate cleaner in accordance with manufacturer's written instructions.
   2. Primer: Apply acid resistant primer to cleaned aluminum metal plate; thickness range of 0.20 mils, 0.0002 inch to 0.30 mils, 0.0003 inch.

3. PVDF Resin Color Coating: At least 70 percent polyvinylidene fluoride (PVDF) based; thickness range of 0.80 mils, 0.0008 inch to 1.20 mils, 0.0012 inch and applied by metal finisher certified by coating manufacturer.
4. Color: As selected by Architect from manufacturer's standard line.

2.06 ACCESSORIES

A. Sealants: Comply with ASTM C920, and refer to Section 07 92 00 for additional requirements.
1. Exposed Sealant: Elastomeric; silicone, polyurethane, or silyl-terminated polyether/polyurethane.
2. Concealed Sealant: Non-curing butyl sealant or tape sealant.
3. Seam Sealant: Factory-applied, non-skinning, non-drying type.

B. Fasteners: Manufacturer's standard type to suit application; _____.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate framing members are ready to receive panels.

3.02 PREPARATION

A. Install subgirts perpendicular to panel length, securely fastened to substrates, shimmed and leveled to uniform plane, and spaced at intervals indicated.

3.03 INSTALLATION

A. Install panels on walls and soffits in accordance with manufacturer's instructions and approved shop drawings.

B. Protect surfaces in contact with cementitious materials and dissimilar metals with bituminous paint; allow time to properly dry prior to wall panel installation.

C. Fasten panels to substrate structural supports; aligned, level, and plumb.

D. Locate joints over supports, and lap panel ends minimum 2 inches.

E. Provide expansion and control joints where indicated.

F. Use concealed fasteners unless otherwise indicated and approved by Hoffman.

G. Seal and place gaskets to prevent weather penetration; maintain neat appearance.

3.04 TOLERANCES

A. Maximum Offset From True Alignment Between Adjacent Members Butting or In Line: 1/16 inch.

B. Maximum Variation from Plane or Location Indicated on Drawings: 1/4 inch.

3.05 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Do not cover installed air/water barriers until required inspections have been completed.

3.06 CLEANING

A. Remove site cuttings from finish surfaces.

B. Remove protective material from wall panel surfaces.

C. See Section 01 74 19 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL, for additional requirements.

3.07 PROTECTION

A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION

SECTION 07 51 00

BUILT-UP BITUMINOUS ROOFING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Built-up roofing membrane, conventional and protected membrane application.

B. Insulation, flat and tapered.

C. Vapor retarders.

D. Base flashings.

E. Roofing cant strips, accessories, and walkways.

1.02 RELATED REQUIREMENTS

A. Section 05 31 00 - Steel Decking: Roofing substrate.

B. Section 06 10 00 - Rough Carpentry: Wood nailers and curbs.

C. Section 07 01 50.19 - Preparation for Re-Roofing.

D. Section 07 62 00 - Sheet Metal Flashing and Trim: Counterflashings, reglets and _____.

E. Section 22 10 06 - Plumbing Piping Specialties: Roof drains.

1.03 REFERENCE STANDARDS

A. ASTM C728 - Standard Specification for Perlite Thermal Insulation Board.

B. ASTM D41/D41M - Standard Specification for Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing.

C. ASTM D226/D226M - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.

D. ASTM D312/D312M - Standard Specification for Asphalt Used in Roofing.

E. ASTM D1863/D1863M - Standard Specification for Mineral Aggregate Used on Built-Up Roofs.

F. ASTM D2178/D2178M - Standard Specification for Asphalt Glass Felt Used in Roofing and Waterproofing.

G. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement, Asbestos-Free.

H. FM (AG) - FM Approval Guide.

I. FM DS 1-28 - Wind Design.

J. NRCA (RM) - The NRCA Roofing Manual.

K. UL (FRD) - Fire Resistance Directory.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate with installation of associated counterflashings installed by other sections as the work of this section proceeds.

B. Preinstallation Meeting: Convene one week before starting work of this section.
   1. Attendees:
      a. Architect.
      b. Owner (optional).
      c. Field Project Manager.
      d. Roofing Manufacturer's representative.
      e. Roofing Contractor's Foreman and Project Manager.
      f. Independent Testing Agency (ITA).
   2. Review the following:
      a. Roofing schedule including where project will start and how the installation will proceed.
      b. Submittal requirements and status.

c. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
d. Review loading limitations of decking during and after roofing.
e. Review flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing.
f. Review governing regulations and requirements for safety, fall protection, and covering of roof openings.
g. Review temporary protection requirements for roofing system during and after installation. Also review roof observation and repair procedures after roofing installation.
h. Review roof observation and repair procedures after roofing installation.
i. Document discussions in writing, including actions required, and distribute copy of report to each meeting participant.
j. Review debris removal and cleanup procedures.

3. Review preparation and installation procedures and coordinating and scheduling required with related work.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data indicating membrane and bitumen materials, base flashing materials, insulation, and surfacing.

C. Shop Drawings: Indicate joint or termination detail conditions, conditions of interface with other materials, setting plan for tapered insulation, and mechanical fastener layout.

D. Samples of Aggregate: Submit one (1) one lb containers of roofing aggregate.

E. Manufacturer's Installation Instructions: Indicate special procedures.

F. Manufacturer's Field Reports: Indicate procedures followed.

G. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

B. Installer:
1. Qualifications: Company specializing in performing the work of this section which has completed at least ten (10) previous installations of roofing materials similar to the type included in this section.
2. Certification: Furnish to the Architect, before roofing contract award, written documentation that installer is manufacturer certified to install roofing systems of the type included in this section.
3. Ability to furnish warranty specified in this section.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer's original containers, dry and undamaged, with seals and labels intact.

B. Ensure storage and staging of materials does not exceed static and dynamic load-bearing capacities of roof decking.

C. Handle and store roofing materials and equipment in a manner to avoid permanent deflection or damage of decking.

D. Keep all combustible materials away from all ignition sources.

1.08 FIELD CONDITIONS

A. Do not apply roofing membrane during unsuitable weather.

B. Do not apply roofing membrane when ambient temperature is below 40 degrees F or above 95 degrees F.

C. Do not apply roofing membrane to damp or frozen deck surface or when precipitation is expected or occurring.

D. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed the same day.

E. Schedule applications so that no partially completed sections of roof are left exposed at end of workday.

F. Do not remove existing roofing membrane when weather conditions threaten the integrity of the building contents or intended continued occupancy.

G. Maintain continuous temporary protection prior to and during installation of new roofing system.

1.09 WARRANTY

A. See Section 01 78 00 - CLOSEOUT SUBMITTALS, for additional warranty requirements.

B. Project Installation Guarantee: Submit written agreement signed by the Installer, guaranteeing to correct failures in product and workmanship for a 2-year period from date of Substantial Completion, without reducing or otherwise limiting other rights to correction which the Owner may have under the contract documents. Guarantee shall cover work of this section including:
   1. Roof membrane, base sheet and base flashings.
   2. Insulation.
   3. Roofing Accessories.
   4. Metal flashings and counter-flashings.

C. Warranty for Full Replacement Value (No Dollar Limit or NDL) of completed installation signed by manufacturer warranting against water infiltration and defects of materials and workmanship for a period of 15 years. Warranty shall be complete for labor, materials, repair of defects, and other items necessary to obtain watertight roofing system for full specified time period.

D. Manufacturer's Warranty is not intended to cover products specified under Section 07620.

E. The warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Sheet and Bitumen Materials:
   1. GAF; ____: www.gaf.com/#sle.
   2. Firestone Building Products Company.
   3. Johns Manville; _____: www.jm.com/#sle.
   4. Substitutions: See Section 01 60 00 - PRODUCT REQUIREMENTS.

2.02 ROOFING - CONVENTIONAL APPLICATION

A. Built-up Bituminous Roofing: Asphalt felt membrane, four ply plus base sheet, with vapor retarder and insulation.

B. Roofing Assembly Requirements:
   1. Classifications and Code Requirements:
      a. Roofing system used on metal decks shall meet the requirements of FM Approved Standard for Class I Insulated Steel Deck Roofs.
      b. Non-ballasted roofs shall be designed for a wind uplift pressures required by current codes and as calculated by ASCE-7.
   2. Roof Covering External Fire Resistance Classification: UL (FRD) Class A.
   3. Factory Mutual Classification: Class 1 and windstorm resistance of 1-60, in accordance with FM DS 1-28.

C. Acceptable Insulation Types - Constant Thickness Application: Any of the types specified.

1. Bottom Layer of Insulation: 2.0 inches isocyanurate board insulation.
2. Middle Layer of Insulation: 2.0 inches isocyanurate board insulation.
3. Top Layer of Insulation: 0.75 inches perlite insulation.

D. Acceptable Insulation Types - Tapered Application: Any of the types specified.
1. Bottom Layer of Insulation: 2.0 inches isocyanurate board insulation.
2. Middle Layer of Insulation: Tapered isocyanurate board insulation, minimum 0.5 inch thickness.
3. Top Layer of Insulation: 1.0 inches perlite insulation.

E. Surfacing: Aggregate.

2.03 SHEET MATERIALS

A. Vapor Retarder Felt: Asphalt-saturated organic, ASTM D226/D226M, Type I ("No.15") felt, unperforated.

B. Flexible Coping Flashing Material: EPDM sheet; conforming to the following:
1. Thickness: 60 mil.
2. Color: Black.

C. Roofing Felt: ASTM D2178/D2178M; Asphalt-saturated glass fiber felt, type IV; heavy duty.
1. Acceptable products include:
a. GlasPly Premier as manufactured by Johns Manville.
b. Ply VI as manufactured by Firestone.

D. Base Flashing Material: Modified bitumen, reinforced, granule surface.
1. Product: DynaLastic 250 manufactured by Johns Manville.
2. Product: SBS Premium FR as manufactured by Firestone.

2.04 BITUMINOUS MATERIALS

A. Bitumen: ASTM D312/D312M Type IV, asphalt.

B. Bitumen: ASTM D 312, asphalt.
1. Vapor Barrier Ply Sheets: Type IV.
2. Insulation Embedment: Type III or IV.
3. Interply Embedment: Type IV.
4. Flashing Embedment: Type IV.
5. Flood Coat and Gravel Embedment: Type II.

C. Primer: ASTM D 41, asphalt type equal to Concrete Primer as manufactured by Manville.

D. Roof Cement: ASTM D4586/D4586M, Type II, asbestos free.

2.05 INSULATION

A. Perlite Board Insulation: Expanded perlite mineral aggregate, and complies with ASTM C728.
1. Board Size: 24 by 48 inch.
2. Board Thickness: 3/4 inch.
3. Board Edges: Square.
4. Thermal Resistance at 1/2 inch Thickness: R-value of 1.4.

B. Crickets, Saddles and Tapered Areas: Provide pre-formed units of type and shape indicated. Taper to provide indicated slope to drain. Fabricate from rigid polyisocyanurate foam.

2.06 SURFACING MATERIALS - CONVENTIONAL APPLICATION

A. Aggregate: ASTM D1863/D1863M; sound, hard washed river gravel; 1/4 inch minimum to 1/2 inch maximum size.

B. Walkway Pads: Suitable for maintenance traffic, contrasting color or otherwise visually distinctive from roof membrane.
1. Composition: Asphaltic with mineral granule surface.
2. Surface Color: White or yellow.

2.07 ACCESSORIES

A. Cant and Edge Strips: Bitumen-impregnated wood fiberboard, compatible with roofing materials; cants formed to 45 degree angle, tapered edge strips, and other configurations as detailed.

B. Lead Flashing: Soft lead sheet, 3 lbs/sq. ft., sizes as detailed.

C. Insulation Joint Tape: Glass fiber reinforced type as recommended by insulation manufacturer, compatible with roofing materials; 6 inches wide; self adhering.

D. Insulation Fasteners: Appropriate for purpose intended and approved by roofing manufacturer.
   1. Length as required for thickness of insulation material and penetration of deck substrate, with metal washers.

E. Roofing Nails: Galvanized, hot dipped type, size and configuration as required to suit application.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces and site conditions are ready to receive work.

B. Verify deck is supported and secure.

C. Verify deck is clean and smooth, flat, free of depressions, waves, or projections, properly sloped and suitable for installation of roof system.

D. Verify deck surfaces are dry and free of snow or ice.

E. Verify that roof openings, curbs, and penetrations through roof are solidly set, and cant strips are in place.

F. Start of work in this section denotes acceptability by the roofing contractor of that substrate. Any corrective action required by having installed new roofing over an unsatisfactory surface shall be the Contractor's responsibility.

3.02 PREPARATION - GENERAL

A. Protect adjacent areas such as walls, glass and glazing, gravel and pavement and landscaped areas. Contractor shall be responsible for replacement and/or repair of any damaged adjacent area to the satisfaction of the Owner.

B. Waste materials shall not be thrown from the roof at any time.

3.03 CONCRETE DECK PREPARATION

A. Verify adjacent precast concrete roof members do not vary more than 1/4 inch in height. Verify grout keys are filled flush.

B. Fill surface honeycomb and variations with latex filler.

C. Confirm dry deck by moisture meter with 12 percent moisture maximum.

D. Conventional Application: Apply mopped two-ply vapor retarder.

3.04 METAL DECK PREPARATION

A. Install preformed acoustical glass fiber insulation strips as specified in Section 05 31 00 within acoustic deck flutes. Install in accordance with manufacturer's instructions.

3.05 VAPOR RETARDER INSTALLATION - CONVENTIONAL APPLICATION

A. Mopped Two-Ply Vapor Retarder:
   1. Apply primer at a rate of 1.0 gal/square (100 sq ft) and allow to dry.
   2. Mop surface with hot bitumen and embed two plies of vapor retarder felt; lap plies 19 inches, full mop each ply.
   3. Apply bitumen at 20 lbs/square (100 sq ft).
   4. Glaze top surface of the vapor retarder with bitumen if insulation is not placed immediately.

B. Extend vapor retarder under cant strips and blocking.

3.06 INSTALLATION - GENERAL

A. Install roofing system in accordance with manufacturer's instructions unless more restrictive requirements are indicated by contract documents, or are necessary to accommodate project circumstances.

B. Schedule inspections and field tests required for roofing system with independent testing agencies, and cooperate with the testing agency personnel during the field visits.

C. Prevent roofing materials from damaging or spilling on adjacent construction. Replace adjoining materials damaged by roofing system installation.

D. End of each days Roofing Work:
   1. Install insulation roofing plies, asphalt, and other roofing materials in a way to prevent insulation and roofing plies from being left exposed during precipitation or overnight.
   2. At conclusion of daily work, close off exposed edges of roofing felts and insulation with two No. 15 roofing plies set in plastic cement. Remove seal layer before commencing next day's work.
   3. Apply glaze-coat to exposed roofing plies at conclusion of work day if finish surface material has not been installed.

E. Obtain approval from Hoffman Field Project Manager and Owner prior for location of heating kettle. Locate away from existing air intakes or HVAC equipment.

3.07 INSULATION INSTALLATION - CONVENTIONAL APPLICATION

A. General:
   1. Ensure vapor retarder is clean and dry, continuous, and ready for application of roofing system.
   2. Attachment of Insulation:
      a. Precast Decking: Embed each layer of insulation in floor coat mopping of hot bitumen in accordance with insulation manufacturer's instructions.
      b. Metal Decking:
         1) Mechanically fasten first layer of insulation to deck in accordance with roofing manufacturer's instructions and FM (AG) Factory Mutual approved requirements.
         2) Embed second layer of insulation into flood coat mopping of hot bitumen in accordance with roofing and insulation manufacturers' instructions.
   3. Lay subsequent layers of insulation with joints staggered minimum 6 inch from joints of preceding layer.
   4. Place tapered insulation to the required slope pattern in accordance with manufacturer's instructions.
   5. On metal deck, place boards parallel to flutes with insulation board edges bearing on deck flutes.
   6. Lay boards with edges in moderate contact without forcing. Cut insulation to fit neatly to perimeter blocking and around penetrations through roof.
   7. Tape joints of insulation in accordance with roofing and insulation manufacturers' instructions.
   8. At roof drains, use factory-tapered boards to slope down to roof drains over a distance of 18 inches.
   9. Do not apply more insulation than can be covered with membrane in same day.

B. Tapered Insulation:
   1. Install tapered insulation system in accordance with reviewed layout drawings.
   2. Embed second layer in a continuous application of insulation adhesive or steep asphalt applied at a rate of 30-pounds per square.
   3. Stagger end and side joints from joints of layer below.
   4. Provide tapered water diverter at upstream face of roof penetrations greater than 24 inches in width.

C. Overlay Board, Crickets and Saddles:

1. Embed overlay board in a continuous application of insulation adhesive or steep asphalt applied at a rate of 30-pounds per square.
2. Stagger end and side joints from joints of layer below.
3. Install preformed crickets and saddles using a solid mopping of steep asphalt.
4. Trim insulation as required to provide surface of insulation flush with roof drains.
5. Install cants where roof meets vertical surfaces, unless otherwise noted.

3.08 MEMBRANE APPLICATION

A. Install built-up bituminous roofing system in accordance with manufacturers recommendations and NRCA (RM) applicable requirements.

B. Equiviscous Temperature (EVT) at Point of Application: Comply with NRCA (RM) recommendations.
1. Establish softening point (SP), flash point (FP), finished blowing temperature (FBT) and equiviscous temperature (EVT) for bitumen, either by manufacturer's product data or by tests of actual materials.
2. Do not heat bitumen above a temperature 25 degrees below the flash point (FP).
3. Do not heat bitumen above a temperature necessary to attain EVT at point of application more than 1 hour prior to time of application.
4. Do not use bitumen which has been heated to and maintained at a temperature above the finished blowing temperature (FBT) for longer than 3 hours. Remove unacceptable bitumen from the project site.
5. Open heating kettle lid only to add bitumen.

C. At field of roof apply four (4) membrane plies, weather lap edges and ends, and mop with 25 lb/square (+/- 10 pounds per square) of bitumen per ply.
1. Begin membrane installation from low point of roof.
2. Lap each ply 27-1/2 inches over preceding ply, leaving 8-1/2 inches exposed.
3. Provide 6 inch end lap of each ply.

D. Broom felts to apply smooth, free from air pockets, wrinkles, fish-mouths, or tears.

E. Coordinate installation of roof drains and sumps and related flashings.

3.09 BASE FLASHINGS

A. Prime concrete or masonry surfaces to receive flashings with asphalt primer.

B. At intersections with vertical surfaces:
1. Extend membrane over cant strips and up a minimum of 4 inches onto vertical surfaces.
2. Mop on base flashing of two additional plies of felt and one ply of modified bitumen base flashing material.
3. Extend all plies of flashings to heights indicated on drawings, but not less than 8 inches above surface of membrane.
4. Secure base flashing to nailing strips at 4 inches on center.
5. Seal top edge of flashing at terminations and curbs with fiberglass mesh tape embedded and top-coated wit roofing cement.

C. At gravel stops, extend membrane under gravel stop and to the outside face of the wall.

D. Penetrations and Stripping In:
1. Do not strip in metal components heavier than 24 gauge sheet metal, 16-ounce copper, or 0.040 inch aluminum.
2. Do not strip in metal components greater than 10 feet in length.
3. Set metal flanges in full bed of roofing cement. Prime metal surface to receive stripping.
4. Install stripping plies in accordance with roofing membrane manufacturer.
5. Around roof penetrations, mop in and seal flanges and flashings with two additional plies of felt.

E. Roof Drains:
1. Coat clamping ring base with generous application of roofing cement.

2. Set minimum 36 inch square lead flashing in bed of roofing cement on roof membrane. Prime surfaces of lead flashing as required.
3. Apply stripping over lead flashing. Extend first ply a minimum of 4 inches beyond edge of lead flashing.

F. Install other accessories in accordance with manufacturer's instructions and NRCA Construction Details as applicable.

G. Install walkway pads in hot bitumen at 20 lb/square. Set joints 6 inches apart.

3.10 AGGREGATE SURFACING - CONVENTIONAL APPLICATION

A. Apply uniform flood coat of bitumen at rate of 60 lbs/square (100 sq ft).

B. While flood coat is hot, embed aggregate at rate of 400 lbs/square (100 sq ft).

C. Evenly distribute aggregate and ensure bond with flood coat. Extend aggregate to bottom edge of cant strips.

3.11 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for general requirements for field quality control and inspection.

B. Inspection, including test cuts and evaluation procedures, will be performed in accordance with ASTM D 3617 and Chapter V, "Quality Control," of the NRCA Low-Slope Roofing Manual

C. Field testing may be performed to:
1. Ascertain bitumen quantities placed.
2. Take and evaluate test cuts of installed membrane.

D. Require site attendance of roofing and insulation material manufacturers daily during installation of the Work.

3.12 CLEANING

A. Remove bituminous markings from finished surfaces.

B. In areas where finished surfaces are soiled by bitumen or other source of soiling caused by work of this section, consult manufacturer of surfaces for cleaning advice and comply with their documented instructions.

C. Repair or replace defaced or damaged finishes caused by work of this section.

3.13 PROTECTION

A. Protect installed roofing and flashings from construction operations.

B. Where traffic must continue over finished roof membrane, protect surfaces using durable materials.

C. When remaining construction work will in no way affect or endanger roofing, installer shall make a final inspection of roofing and prepare a written report to the Architect, describing the nature and extent of deterioration or damage or non-conformance with specified requirements affecting the work or warranty.

D. Installer shall repair or replace (as required) deterioration or defective work found at time of final inspection.

END OF SECTION

SECTION 07 53 00
ELASTOMERIC MEMBRANE ROOFING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Elastomeric roofing membrane, ballasted conventional and adhered conventional application.

B. Insulation, flat and tapered.

C. Flashings.

D. Roofing stack boots, roofing expansion joints, and walkway pads.

E. Roof pavers systems.

F. Related accessories.

1.02 RELATED REQUIREMENTS

A. Section 07 62 00 - Sheet Metal Flashing and Trim: Counterflashings, reglets.

B. Section 22 10 06 - Plumbing Piping Specialties: Roof drains.

1.03 REFERENCE STANDARDS

A. ASCE 7 - Minimum Design Loads for Buildings and Other Structures.

B. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.

C. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension.

D. ASTM D448 - Standard Classification for Sizes of Aggregate for Road and Bridge Construction.

E. ASTM D624 - Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers.

F. ASTM D4637/D4637M - Standard Specification for EPDM Sheet Used in Single-Ply Roof Membrane.

G. FM DS 1-28 - Wind Design.

H. SPRI RP-4 - Wind Design Standard for Ballasted Single-Ply Roofing Systems.

I. UL (DIR) - Online Certifications Directory.

J. UL (FRD) - Fire Resistance Directory.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate with installation of associated counterflashings installed under other sections.

B. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section.

C. Attendees:
   1. Owner.
   2. Hoffman Field Project Manager.
   3. Roofing Manufacturer's representative.
   4. Roofing Contractor's Foreman and Project Manager.

D. Review the following:
   1. Roofing schedule including where project will start and how the installation will proceed.
   2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
   3. Review loading limitations of decking during and after roofing.
   4. Review flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing.
   5. Review governing regulations and requirements for safety, fall protection, and covering of roof openings.

6. Review temporary protection requirements for roofing system during and after installation.
7. Review roof observation and repair procedures after roofing installation.
8. Review debris removal and cleanup procedures.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data indicating membrane materials, flashing materials, insulation, and surfacing.
   1. Maintenance Data: Submit a set of instructions detailing preventative maintenance and noting a list of harmful substances which may damage the roofing membrane.

C. Shop Drawings: Indicate joint or termination detail conditions, conditions of interface with other materials, setting plan for tapered insulation, mechanical fastener layout, and paver layout.
   1. Manufacturer's Installation Instructions: Indicate membrane seaming precautions, special procedures, and perimeter conditions requiring special attention.

D. Manufacturer's Installation Instructions: Indicate membrane seaming precautions, special procedures, and perimeter conditions requiring special attention.

1.06 QUALITY ASSURANCE

A. Qualifications:
   1. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.
   2. Installer Qualifications: Company specializing in performing the work of this section with minimum five years documented experience, and approved by manufacturer.
   3. Roofing components shall be provided from a single manufacturer source or approved by the manufacturer to assure compatibility and conformance to manufacturer's warranty conditions.
   4. Review methods and procedures related to roofing installation, including manufacturer's written instructions.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer's original containers, dry and undamaged, with seals and labels intact.

B. Store materials in weather protected environment, clear of ground and moisture.

C. Ensure storage and staging of materials does not exceed static and dynamic load-bearing capacities of roof decking.

D. Protect foam insulation from direct exposure to sunlight.

E. Handle and store roofing materials and equipment in a manner to avoid permanent deflection or damage of decking.

F. Flammable materials shall be stored in a cool, dry area away from sparks and open flames. Follow all precautions as outlined in manufacturer's Material Safety Data Sheets.

G. Materials having been determined by the Architect to be damaged shall be immediately removed from the construction site and replaced at no cost to Hoffman or the Owner.

1.08 FIELD CONDITIONS

A. Do not apply roofing membrane during unsuitable weather.

B. Do not apply roofing membrane when ambient temperature is below 32 degrees F or above 90 degrees F.

C. Do not apply roofing membrane to damp or frozen deck surface or when precipitation is expected or occurring.

D. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed the same day.

E. Schedule applications so that no partially completed sections of roof are left exposed at end of workday.

F. Maintain continuous temporary protection to interior of building prior to and during installation of new roofing system.

1.09 WARRANTY

A. See Section 01 78 00 - CLOSEOUT SUBMITTALS, for additional warranty requirements.

B. Correct defective Work within a two year period after Date of Substantial Completion.

C. Warranty for Full Replacement Value (No Dollar Limit or NDL) Systems Warranty signed by manufacturer warranting against water infiltration and defects of materials and workmanship for a period of 15 years. Warranty shall be complete for labor, materials, repair of defects, and other items necessary to obtain watertight roofing system for full specified time period.
   1. Exceptions NOT Permitted:
      a. Damage due to roof traffic.
      b. Damage due to wind of speed greater than 56 mph but less than 90 mph.

D. Warranty is not intended to cover products specified under Section 07 62 00.

E. The warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

F. Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. EPDM Membrane Manufacturer and Systems:
   1. Carlisle Roofing Systems, Inc; Sure-Seal EPDM: www.carlisle-syntec.com/#sle.
   2. Product: Rubberguard FR EPDM as manufactured by Firestone Building Products Co: www.firestonebpco.com.
   3. Johns Manville; JM EPDM FR : www.jm.com/#sle.
   4. Substitutions: See Section 01 60 00 - PRODUCT REQUIREMENTS.

2.02 ROOFING - UNBALLASTED APPLICATIONS

A. Elastomeric Membrane Roofing: One ply membrane, fully adhered, over insulation.

B. Roofing Assembly Requirements:
   1. Roof Covering External Fire Resistance Classification: UL (DIR) certified Class A.
   2. Factory Mutual Classification: Class 1 and windstorm resistance of 1-90, in accordance with FM DS 1-28.

C. Acceptable Insulation Types - Constant Thickness Application: Any of the types specified.
   1. Bottom Layer of Insulation: 2.0 inches isocyanurate board insulation.
   2. Top Layer of Insulation: 2.0 inches isocyanurate board insulation.

D. Acceptable Insulation Types - Tapered Application: Any of the types specified.
   1. Bottom Layer of Insulation: 1.5 inches isocyanurate board insulation.
   2. Middle Layer of Insulation: Tapered isocyanurate board insulation, minimum 1/2 inch thickness, tapered at 1/4:12.
   3. Top Layer of Insulation: 1.5 inches isocyanurate board insulation.

E. Water Diverters and Crickets:
   1. Use tapered isocyanurate at minimum 1/2 inch per foot taper.

2.03 ROOFING - BALLASTED APPLICATIONS

A. Elastomeric Membrane Roofing: One ply membrane loose-laid over insulation with ballast.

B. Roofing Assembly Requirements:
   1. Roof Covering External Fire Resistance Classification: UL (DIR) certified Class A.

C. Acceptable Insulation Types- Under Membrane - Constant Thickness Application: Any of the types specified.
   1. Bottom Layer of Insulation: 2.0 inches isocyanurate board insulation.
   2. Top Layer of Insulation: 2.0 inches isocyanurate board insulation.

D. Acceptable Insulation Types- Under Membrane - Tapered Application: Any of the types specified.
   1. Bottom Layer of Insulation: 1.5 inches isocyanurate board insulation.
   2. Middle Layer of Insulation: Tapered isocyanurate, minimum 1/2 inch, tapered at 1/4:12.
   3. Top Layer of Insulation: 1.5 inches isocyanurate board insulation.

E. Ballast: Comply with SPRI RP-4 for Category 3, Exposure B, using aggregate where noted on drawings.

2.04 MEMBRANE AND ASSOCIATED MATERIALS

A. Membrane: Ethylene-propylene-diene-terpolymer (EPDM); non-reinforced; complying with minimum properties of ASTM D4637.
   1. Thickness: 0.060 inch (60 mil).
   2. Sheet Width: 76 inch, minimum; factory-fabricate into largest sheets possible.
   3. Color: Black.
   4. Tensile Strength: 1305 psi, measured in accordance with ASTM D412.
   5. Ultimate Elongation: 300 percent, measured in accordance with ASTM D412.
   6. Tear Strength: 150 lbf/inch, measured in accordance with ASTM D624.

B. Seaming Materials: Three inch wide self-adhesive tape compatible with membrane.

C. Flexible Flashing Material: Same material as membrane.
   1. Thickness: 60 mil.
   2. Maximum Perm Rate: 2.0.
   3. Tensile Strength: 1,200 psi.
   4. Elasticity: 50 percent with full recovery without set.
   5. Color: Black.

D. Cushion Sheet: _____.

2.05 INSULATION

A. Polyisocyanurate (ISO) Board Insulation: Rigid cellular foam, complying with ASTM C1289.
   1. Classifications:
      a. Type II:
         1) Class 2 - Faced with coated polymer-bonded glass fiber mat facers on both major surfaces of core foam.
         2) Compressive Strength: Classes 1-2-3, Grade 2 - 20 psi (138 kPa), minimum.
         3) Thermal Resistance, R-value:9 At 1-1/2 inch thick; Class 2 - 8.0 (1.41) at 75 degrees F.
   2. Board Size: 48 by 96 inch.
   3. Board Thickness: 1.5 inch.
   4. Board Edges: Square.

B. Infill Insulation: Use unfaced fiberglass insulation around penetrations and edges.

2.06 BALLAST MATERIALS

A. No.4 Aggregate: Sound, hard, washed stone, ASTM D 448 Size Classification 4.

B. No.2 Aggregate: Sound, hard, washed stone, ASTM D 448 Size Classification 2.

2.07 ROOF PAVERS SYSTEMS

A. Precast Concrete Roof Pavers: Precast concrete tiles, with texture and color as indicated; supported by adjustable pedestal system.
   1. Comply with local wind load resistance requirements of ASCE 7.
   2. Texture: As selected by Architect from manufacturer's standard line.

3. Length and Width: 23-7/8 inch by 23-7/8 inch, nominal.
4. Thickness: 2 inch, nominal.

2.08 ACCESSORIES

A. Stack Boots: Prefabricated flexible boot and collar for pipe stacks through membrane; same material as membrane.

B. Insulation Fasteners: Appropriate for purpose intended and approved by roofing manufacturer, with manufacturer's enhanced corrosion resistant coating.
1. Length as required for thickness of insulation material and penetration of deck substrate, with metal washers.

C. Termination Bar: 0.100" thick, 3003-H14, aluminum, pre-punched at 4" o.c. with slotted holes.

D. Termination Bar Anchors: Use stainless steel Zamac Nailin manufactured by the Rawlplug Co. for anchoring SPM holding bars to concrete or masonry.

E. Membrane Adhesive: A VOC compliant, solvent based contact bonding adhesive as recommended by membrane manufacturer.

F. Thinners and Cleaners: As recommended by adhesive manufacturer, compatible with membrane.

G. Insulation Adhesive: As recommended by insulation manufacturer.

H. Roofing Nails: Galvanized, hot dipped type, size and configuration as required to suit application.

I. Night Seal: Compatible with materials with which it is used, furnished by membrane manufacturer.

J. Strip Reglet Devices: Galvanized steel, maximum possible lengths per location, with attachment flanges.

K. Sealants: As recommended by membrane manufacturer.

L. Walkway Pads: Suitable for maintenance traffic.
1. Composition: Roofing membrane manufacturer's standard.
2. Size: Manufacturer's standard size(s).

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces and site conditions are ready to receive work.

B. Verify deck is supported and secure.

C. Verify deck is clean and smooth, flat, free of depressions, waves, or projections, properly sloped and suitable for installation of roof system.

D. Verify deck surfaces are dry and free of snow or ice.

E. Verify that roof openings, curbs, and penetrations through roof are solidly set, and cant strips are in place.

3.02 PREPARATION

3.03 INSULATION INSTALLATION

A. Attachment of Insulation:
1. Mechanically fasten insulation to deck in accordance with insulation manufacturer's instructions and Factory Mutual requirements.

B. Lay subsequent layers of insulation with joints staggered minimum 6 inch from joints of preceding layer.

C. Place tapered insulation to the required slope pattern in accordance with manufacturer's instructions and approved shop drawings.

D. On metal deck, place boards parallel to flutes with insulation board edges bearing on deck flutes.

E. Lay boards with edges in moderate contact without forcing. Cut insulation to fit neatly to perimeter blocking and around penetrations through roof.

F. Damaged or wet insulation shall not be used and shall be removed from the site.

G. Solidly fill with batt insulation all gaps at perimeter or penetrations.

H. Install tapered insulation water diverters at upslope face of all roof penetrations more than 30 inches in width.

I. At roof drains, use factory-tapered boards to slope down to roof drains over a distance of 18 inches.

J. Do not apply more insulation than can be covered with membrane in same day.

3.04 MEMBRANE INSTALLATION

A. Cut sheets to maximum size possible to minimize seams.

B. Roll out membrane, free from wrinkles or tears. Place sheet into place without stretching and allow to relax.

C. Shingle joints on sloped substrate in direction of drainage.

D. Install membrane as required to minimize wrinkles and bubbles.

E. Fully Adhered Application: Apply adhesive to substrate at rate required by manufacturer . Fully embed membrane in adhesive except in areas directly over or within 3 inches of expansion joints. Fully adhere one roll before proceeding to adjacent rolls.

F. Overlap edges and ends and seal seams by contact adhesive, minimum 3 inches. Seal permanently waterproof. Apply uniform bead of sealant to joint edge.

G. Continue membrane up vertical surfaces minimum 8 inches above top of cant or edge strip unless otherwise noted. Fasten top of membrane with devices and at locations and frequency as recommended by manufacturer.

3.05 FLASHING INSTALLATION

A. Install flashings as indicated and recommended by manufacturer. Use longest pieces practical.

B. At intersections with vertical surfaces:
   1. Extend membrane up a minimum of 8 inches onto vertical surfaces.
   2. Fully adhere flexible flashing over membrane and up to nailing strips.
   3. Secure flashing to nailing strips at 8 inches on center.
   4. Insert flashing into reglets and secure.

C. At gravel stops, extend membrane under gravel stop and to the outside face of the wall.

D. Around roof penetrations, seal flanges and flashings with factory prefabricated pipe seals or field fabricated pipe seals.

E. Coordinate installation of roof drains and related flashings.

F. Coordinate installation of associated counterflashings installed under other sections.

3.06 PAVERS AND EDGE TREATMENT INSTALLATION

A. Install pavers on pedestals in accordance with manufacturer's instructions.
   1. Fully support edges; shim and adjust pavers to provide level surface.
   2. Provide approximately 1/8 inch space between pavers to permit surface water drainage.

3.07 BALLAST INSTALLATION

A. Place cushion sheet over membrane prior to placing concrete pavers.

B. Install ballast immediately after membrane has been installed. Evenly distribute aggregate ballast.

C. Place pavers carefully to avoid damage to insulation and membrane.

3.08 SEALANT INSTALLATION

A. Apply authorized sealant(s) at locations as required by manufacturer and per project requirements. Sealant(s) are to shed water.

B. Use primer when recommended by manufacturer.

3.09 TEMPORARY SEALS

A. At the end of each working day or at the sign of rain, install temporary, 100% watertight seals where the completed new roofing adjoins the uncovered deck or existing roof surface.

B. If water is allowed to enter beneath the newly completed roofing, the affected areas shall be removed and replaced at no additional expense.

C. Prior to the commencement of work, cut out and remove all contaminated membrane, insulation, roof cement or sealant and properly dispose off site.

3.10 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for general requirements for field quality control and inspection.

B. Manufacturer's Field Services:
   1. Notify manufacturer in timely manner to arrange for manufacturer's technical representative's site visits to ensure proper installation, verify work is in accordance with manufacturer's requirements, and warranty requirements have been met.
   2. Manufacturer's Qualified Technical Representative: Monitor activities and advise applicator of proper installation procedures and precautions.
   3. Minimum Site Visits:
      a. Pre-Installation meeting.
      b. First week of roofing work on site including acceptance of substrate conditions.
      c. Monthly during roofing installation.
      d. Inspection and acceptance of completed roofing.
   4. Submit reports; include site observations, instructions, and monitoring activities.

3.11 CLEANING

A. See Section 01 74 19 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL, for additional requirements.

B. Remove bituminous markings from finished surfaces.

C. In areas where finished surfaces are soiled by work of this section, consult manufacturer of surfaces for cleaning advice and comply with their documented instructions.

D. Repair or replace defaced or damaged finishes caused by work of this section.

E. Remove all debris from roof and legally dispose of.

3.12 PROTECTION

A. Protect installed roofing and flashings from construction operations.

B. Where traffic must continue over finished roof membrane, protect surfaces using durable materials.

END OF SECTION

SECTION 07 61 00
SHEET METAL ROOFING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sheet metal roofing, associated flashings, and underlayment.

B. Counterflashings.

C. Wood sheathing.

D. Snow guards.

E. Sealants for joints within sheet metal fabrications.

1.02 RELATED REQUIREMENTS

A. Section 05 12 00 - Structural Steel Framing: Steel framing.

B. Section 05 31 00 - Steel Decking: Steel deck substrate.

C. Section 06 10 00 - Rough Carpentry: Wood nailers.

D. Section 07 62 00 - Sheet Metal Flashing and Trim.

E. Section 07 92 00 - Joint Sealants: Sealants and Caulking.

1.03 REFERENCE STANDARDS

A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum.

B. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix).

C. ASTM A792/A792M - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.

D. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

E. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric).

F. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.

G. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.

H. ICC-ES AC188 - Acceptance Criteria for Roof Underlayments.

I. SMACNA (ASMM) - Architectural Sheet Metal Manual.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week before starting work of this section.

B. Convene at project site to review requirements of this section.

C. Require attendance by representatives of installer and other entities directly affecting, or affected by, construction activities of this section.

1.05 SYSTEM DESCRIPTION

A. Finish Performance Requirements:

1. Color change and fade resistance: No cracking, peeling, blistering, or loss of adhesion when tested in accordance with ASTM G 90; color change, after removal of surface deposits such as dirt or chalk, maximum 5 NBS units.
2. Humidity resistance: No blistering, peeling, or loss of adhesion, after 1,000 hours testing in accordance with ASTM D 2247.

1.06 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on metal types, finishes, characteristics.

C. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.
   1. Indicate products/materials required for construction activities of this section not supplied by manufacturer of products of this section.
   2. Plans: Dimensioned drawings indicating the following:
      a. Indicate layout of panels and panel sizes, including custom-fabricated panels if required.
      b. Fastener types and locations.
      c. Locations and spacings for snow hooks, including installation recommendations and details.
      d. Locations of gutters, downspouts, and connections to roof drainage piping; indicate slopes for correct drainage.
      e. Locations of trim and other sheet metal items.
   3. Details: Dimensioned drawings indicating the following:
      a. Profile of each type trim and other sheet metal item.
      b. Interface of roof panel system with adjacent construction.

D. Quality Assurance Submittals:
   1. Design Data: Structural design calculations, bearing seal and signature of professional structural engineer licensed to practice in Wisconsin.
   2. Test Reports: Certified reports documenting testing and compliance of roof panel system to specified wind uplift requirements.
   3. Manufacturer's Instructions: Printed installation instructions for each roof panel system component, including product storage requirements.

E. Color Samples: Submit two samples 6 x 6 inch in size illustrating metal finish and color.

F. Closeout Submittals: Warranty documents specified in WARRANTY Article of PART 1 of this section.

1.07 QUALITY ASSURANCE

A. Perform work in accordance with SMACNA (ASMM) requirements and standard details, except as otherwise noted.

B. Underwriters Laboratories (UL) wind uplift resistance classification: Roof assembly shall be classified as class UL 90 as defined by UL 580 Specifications.

C. Field measurements will be taken prior to fabrication to assure symmetry.

D. Installer Qualifications: Company specializing in performing sheet metal roof installations with minimum five years of experience.

1.08 MOCK-UP

A. Construct mock-up of sheet metal roofing, ____ feet long by ____ feet wide, illustrating associated attachments, flashings, joints and junctions, and terminating items.

B. Locate where directed.

C. Mock-up may remain as part of the Work.

1.09 DELIVERY, STORAGE, AND HANDLING

A. Stack material to prevent twisting, bending, or abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

B. Prevent contact with materials that could cause discoloration or staining.

1.10 WARRANTY

A. See Section 01 78 00 - CLOSEOUT SUBMITTALS, for additional warranty requirements.

B. Special Warranty:

1. Contractor shall warrant roof panel system, as installed, to be in accord with the Contract Documents and free from leaks, faults, and defects in materials and installation for a period of three years.
2. Have warranty countersigned by representative of roofing system manufacturer and installer of work of this section.

C. Manufacturer's Warranty: Manufacturer's warranties against defects in products as follows:
1. Failure of roof panel due to rupture, structural failure, or perforation: 20 years.
2. Fluorocarbon paint finish: 25 years against blistering, peeling, cracking, flaking, checking, or chipping; 20 years against color change in excess of 5 NBS units when tested in accordance with ASTM D 2244, or chalking rating less than 8 when tested in accordance with ASTM D 4214.
3. Water leakage: 10 year installed system warranty against water leakage.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Sheet Metal Roofing Manufacturers:
1. Petersen Aluminum Corporation: www.pac-clad.com/#sle.

2.02 MANUFACTURERS

A. Metal Roofing:
1. Petersen Aluminum Corporation. PAC-CLAD Tite-Loc or similar able to slope 1/2" per 12"
2. Substitutions: See Section 01600 - Product Requirements.

2.03 MATERIALS

A. Sheet Metal Roofing:
1. Aluminum-Zinc Alloy Coated Steel Sheet (Galvalume): ASTM A792/A792M; AZ55 coating designation; 24 gage, 0.0239 inch thick.

B. Aluminum Sheet: ASTM B209 (ASTM B209M), ___ alloy, ___ temper; 20 gage, 0.032 inch minimum base metal thickness; clear anodized finish.

2.04 COMPONENTS

A. Sheet Metal Roofing: Field formed panels fabricated on site using portable roll former.
1. Profile: Standing seams at 16 inches on center with two minor stiffening beads, with installed sealant or gasket at seam, similar to Tite-Loc Panels manufactured by Pac-Clad.
2. Seam Height: 1-1/2 inches
3. Panel Seams: Mechanical double-locked in field with mechanical seamer.
4. Panel Length: As indicated on drawings, fabricated in one continuous length.
5. Texture: Smooth, dull matte specular gloss 25 to 35 percent at 60 degrees F.
6. Color: To be selected by Architect from manufacturer's standard colors.
7. Protective Film: Strippable vinyl film applied during panel fabrication and finishing.

B. Installation Clips: Manufacturer's standard clips for concealed securement of panels.

2.05 FABRICATION

A. Form sections true to shape, accurate in size, square, and free from distortion or defects.

B. Fabricate cleats of same material as sheet, thickness to match roofing sheet, and at least ___ inch wide, interlockable with sheet.

C. Fabricate starter strips, interlockable with sheet.

D. Form pieces in longest practical lengths.

E. Hem exposed edges on underside 1/2 inch; miter and seam corners.

F. Fabricate corners from one piece with minimum 18 inch long legs; seam for rigidity, seal with sealant.

G. Fabricate vertical faces with bottom edge formed outward 1/4 inch and hemmed to form drip.

H. Fabricate flashings to allow toe to extend 2 inches over roofing gravel. Return and brake edges.

2.06 FINISHES

A. Clear Anodized Finish: AAMA 611 AA-M12C22A41 Class I clear anodic coating not less than 0.7 mils thick.

B. PVDF (Polyvinylidene Fluoride) Coating: Superior Performance Organic Finish, AAMA 2605; multiple coat, thermally cured fluoropolymer finish system.

C. Color: As selected by Hoffman from manufacturer's standard colors.

D. Primer Coat: On coated sheets, finish concealed side of sheet with primer compatible with finish system as recommended by finish system manufacturer.

2.07 ACCESSORIES

A. Fasteners: Galvanized steel, with soft neoprene washers.

B. Underlayment: Synthetic non-asphaltic sheet, intended by manufacturer for mechanically fastened roofing underlayment without sealed seams.
   1. Minimum Requirements: Comply with requirements of ICC-ES AC188 for non-self-adhesive sheet.
   2. Self Sealability: Passing nail sealability test specified in ASTM D1970/D1970M.
   3. Ultraviolet Resistance and Weatherability: Approved in writing by manufacturer for exposure to weather for minimum of 12 months.
   4. Low Temperature Flexibility: Passing test specified in ASTM D1970/D1970M.
   5. Fasteners: As specified by manufacturer and building code qualification report or approval, if any.
   6. Products:
      a. GCP - Grace Ice & Water Shield.

C. Concealed Sealants: Non-curing butyl sealant.

D. Exposed Sealants: ASTM C920 elastomeric sealant, with minimum movement capability as recommended by manufacturer for sealed substrates; color to match adjacent material.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine surfaces to receive sheet metal roofing. Notify the Architect in writing of any deficiencies encountered.

B. Inspect roof deck to verify deck is clean and smooth, free of depressions, waves, or projections, properly sloped to drains.

C. Verify deck is dry and free of snow or ice. Verify joints in wood deck are solidly supported and fastened.

D. Verify correct placement of wood nailers and insulation positioning between nailers.

E. Verify roof openings, curbs, pipes, sleeves, ducts, or vents through roof are solidly set, reglets are in place, and nailing strips located.

F. Verify roofing termination and base flashings are in place, sealed, and secure.

G. Correct defective conditions before beginning work. Starting work shall constitute acceptance of such conditions.

3.02 PREPARATION

A. Obtain field measurements prior to completion of fabrication and roll forming.

B. Install starter and edge strips, and cleats before starting installation.

C. Back paint concealed metal surfaces and surfaces in contact with dissimilar metals with protective backing paint to a minimum dry film thickness of 15 mil.

3.03 INSULATION INSTALLATION

A. Attachment of Insulation and Sheathing:

1. Mechanically fasten insulation and sheathing to deck in accordance with insulation manufacturer's instructions and Factory Mutual requirements.

B. Lay subsequent layers of insulation with joints staggered minimum 6 inch from joints of preceding layer.

C. On metal deck, place boards parallel to flutes with insulation board edges bearing on deck flutes.

D. Lay boards with edges in moderate contact without forcing. Cut insulation to fit neatly to perimeter blocking and around penetrations through roof.

E. Space wood sheathing along edges and ends as required by manufacturer.

F. Damaged or wet insulation shall not be used and shall be removed from the site.

G. Solidly fill with batt insulation all gaps at perimeter or penetrations.

H. Do not apply more insulation than can be covered with sheathing and membrane in same day.

3.04 INSTALLATION - STANDING SEAM ROOFING

A. Lay sheets with long dimension perpendicular to eaves. Apply pans beginning at eaves.

B. Lock cleats into seams and flatten.

C. At eaves and gable ends, terminate roofing by hooking over edge strip.

D. Finish standing seams 1 inch high on flat surfaces

E. Finish standing seams 1-1/2 inch high on curved surfaces.

F. Bend up one side edge 1-1/2 inches and other edge 1-3/4 inches.

G. Make first fold 1/4 inch wide single fold and second fold 1/2 inch wide, providing locked portion of standing seam, 5 plies in thickness.

H. Fold lower ends of seams at eaves over at 45 degree angle.

I. Terminate standing seams at ridge and hips by turning down with tapered fold.

3.05 INSTALLATION - BUILT-IN GUTTERS AND DOWNSPOUTS

A. Secure gutter lining to substrate with cleats spaced per manufacturers recommended ____ inches on center along edges of gutters.

B. Longitudinal joints not acceptable.

C. At roof edges, extend gutter lining under metal roofing 6 inches minimum and terminate in 3/4 inch folded edge secured by cleats; hook lower end of roofing into lock strip to form 3/4 inch wide loose-lock seam.

D. Seal gutters watertight, and seal joint of gutter to drain.

3.06 INSTALLATION - FLASHINGS

A. Insert flashings into reglets to form tight fit.
   1. Secure in place with plastic wedges at manufacturers recommended ____ inches on center.
   2. Seal flashings into reglets with sealant.

B. Secure flashings in place using concealed fasteners, and use exposed fasteners only where permitted.

C. Cleat and seam all joints.

D. Apply plastic cement compound between metal flashings and felt flashings.

E. Fit flashings tight in place, and make corners square, surfaces true and straight in planes, and lines accurate to profiles.

F. Seal metal joints watertight.

3.07 INSTALLATION-ICE AND SNOW HOOKS

A. Contractor to install ice and snow hooks in pattern shown on approved shop drawings from manufacturer of snow hook. Minimum design should include two rows of hooks centered on each panel at ends.

B. Install hooks at middle of each roof panel per manufacturer's specifications using adhesive or tape.

C. Color to match roof panels.

3.08 CLEANING

A. Remove strippable coating from panels and trim, when provided, and perform dry wipe-down cleaning of panels as installed.

B. Remove site cuttings from finish surfaces.

C. Clean and wash prefinished surfaces with mild soap and water; rinse with clean water.

D. Remove all debris from roof and legally dispose of.

3.09 PROTECTION

A. Do not permit traffic over unprotected roof surface.

B. Replace products having damage other than minor finish scratches.

C. Repair minor finish scratches in accordance with panel manufacturer's recommendations; replace panels that cannot be repaired so that no damage is visible from a distance of 5 feet.

D. Hoffman shall be sole judge of acceptability of repair to damaged finishes; replace products having rejected repairs.

3.10 TOLERANCES

A. Panel Width: 12 inches +/- 1/8 inch, 16 inches +/- 1/8 inch.

B. Seam Height: 1-1/2 inches +/- 1/8 inch.

C. Panel Camber (sweep): 3/16 inches in 10', maximum 1/2".

D. Panel Shearing Length: 1/4 inch +/- maximum.

END OF SECTION

SECTION 07 62 00
SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fabricated sheet metal items, including flashings and counterflashings.

B. Sealants for joints within sheet metal fabrications.

1.02 RELATED REQUIREMENTS

A. Section 07 53 00 - Elastomeric Membrane Roofing: Roofing system.

B. Section 07 71 00 - Roof Specialties: Manufactured copings, flashings, and expansion joint covers.

1.03 REFERENCE STANDARDS

A. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix).

B. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix).

C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

D. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

E. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric).

F. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.

G. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement, Asbestos-Free.

H. CDA A4050 - Copper in Architecture - Handbook.

I. SMACNA (ASMM) - Architectural Sheet Metal Manual.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week before starting work of this section.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Include the following:
   1. Material profiles and jointing patterns.
   2. Jointing details, fastening methods and terminations.
   3. All installation details.
   4. Material gauges.

C. Samples: Submit two samples 6 x 6 inch in size illustrating metal finish color and sheet metal gauge.

1.06 QUALITY ASSURANCE

A. Perform work in accordance with SMACNA (ASMM) and CDA A4050 requirements and standard details, except as otherwise indicated.

B. Fabricate and install perimeter flashings and components in accordance with the most current edition of FM 1-49 Loss Prevention Data Sheet.

C. Fabricator and Installer Qualifications: Company specializing in sheet metal work with five years of documented experience.

D. Field measurement shall be taken by the installer prior to fabrication.

E. Do not begin fabrication of sheet metal components until shop drawings have been submitted and approved by Architect.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

B. Prevent contact with materials that could cause discoloration or staining.

C. Protect all materials and installations from damage by other trades.

D. Coping, fascia or gravel stop with strippable film shall not be exposed to direct sunlight or extreme heat. All strippable film should be removed immediately after installation is complete.

1.08 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a two year period after Date of Substantial Completion.

C. Contractor shall warrant installed system to be free of leaks and free from defects in materials and workmanship for two years.

D. Factory Finish: 20-year Warranty stating finish will be:
   1. Free of fading or color change in excess of 5 Delta E units; ASTM D 2244.
   2. Will not chalk in excess of numeral rating of 8 for colors and 6 for whites; ASTM D 4214.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Sheet Metal Flashing and Trim Manufacturers:
   1. Petersen Aluminum Corporation: www.pac-clad.com/#sle.
   2. Substitutions: See Section 01 60 00 - PRODUCT REQUIREMENTS.

2.02 SHEET MATERIALS

A. Pre-Finished Galvanized Steel: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 24 gage, (0.0239) inch thick base metal, shop pre-coated with PVDF coating.
   1. PVDF (Polyvinylidene Fluoride) Coating: Superior Performance Organic Finish, AAMA 2605; multiple coat, thermally cured fluoropolymer finish system.
   2. Color: As selected by Hoffman from manufacturer's standard colors.
   3. Thickness: As scheduled, but not lighter than 24 gauge.
   4. Texture: Smooth finish.

B. Pre-Finished Aluminum: ASTM B209 (ASTM B209M); 20 gage, (0.032 inch) thick; plain finish shop pre-coated with modified silicone coating.
   1. Fluoropolymer Coating: High Performance Organic Finish, AAMA 2604; multiple coat, thermally cured fluoropolymer finish system.
   2. Color: As selected by Hoffman from manufacturer's standard colors.

2.03 FABRICATION

A. Shop fabricate components to maximum extent possible to minimize site fabrication.

B. Fabricate to allow for adjustments in field for proper anchoring and joining.

C. Form sections true to shape, accurate in size, square, and free from distortion or defects.

D. Fabricate cleats and starter strips interlockable with coping and counterflashing in accordance with SMACNA or NRCA recommendations.

E. Form pieces in longest possible lengths.

F. Hem exposed edges on underside 1/2 inch; miter and seam corners.

G. Form material with flat lock seams, except where otherwise indicated; at moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.

H. Fabricate corners from one piece with minimum 18 inch long legs; seam for rigidity, seal with sealant.

I. Fabricate vertical faces with bottom edge formed outward 3/4 inch and hemmed to form drip.

J. Fabricate flashings to allow toe to extend 2 inches over roofing gravel. Return and brake edges.

2.04 ACCESSORIES

A. Fasteners: Galvanized steel, with soft neoprene washers.

B. Primer: Zinc chromate type.

C. Concealed Sealants: Non-curing butyl sealant.

D. Exposed Sealants: ASTM C920; elastomeric sealant, with minimum movement capability as recommended by manufacturer for substrates to be sealed; color to match adjacent material.

E. Plastic Cement: ASTM D4586/D4586M, Type I.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.

B. Verify roofing termination and base flashings are in place, sealed, and secure.

3.02 PREPARATION

A. Install starter and edge strips, and cleats before starting installation.

B. Install surface mounted reglets true to lines and levels, and seal top of reglets with sealant.

C. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil.

3.03 INSTALLATION

A. Insert flashings into reglets to form tight fit; secure in place with lead wedges; pack remaining spaces with lead wool; seal flashings into reglets with sealant.

B. Conform to standards set forth in the SMACNA Architectural Sheet Metal Manuals.

C. Coordinate installation of components of this section with installation of roofing membrane and base flashing.

D. Fabricate and install continuous cleats at all flashings, copings, and fascias.

E. Secure flashings in place using concealed fasteners, and use exposed fasteners only where permitted..

F. Apply plastic cement compound between metal flashings and felt flashings.

G. Fit flashings tight in place; make corners square, surfaces true and straight in planes, and lines accurate to profiles.

H. Seal metal joints watertight.

I. Sheet metal joint covers shall be a minimum of 6 inches in width and set in two continuous beads of sealant.

3.04 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for field inspection requirements.

B. Inspection will involve surveillance of work during installation to ascertain compliance with specified requirements.

3.05 SCHEDULE

A. Through-Wall Flashing in Masonry:
   1. Material: Prefinished galvanized steel.
   2. Thickness: 24 ga.

3.06 FASCIA AND CORNICES:

A. Material: Prefinished galvanized steel.

B. Thickness: 24 ga. for fascias up to 8 inches and 20 ga. for fascias 8 inches and over.

C. Scuppers:
   1. Material: Prefinished galvanized steel
   2. Thickness: 22 ga.

D. Coping, Cap, Parapet, Sill and Ledge Flashings:
   1. Material: Prefinished galvanized steel.
   2. Thickness: 24 ga. minimum.

E. Counterflashings at Roofing Terminations (over roofing base flashings):
   1. Material: Prefinished galvanized steel.
   2. Thickness: 24 ga.

F. Counterflashings at Curb-Mounted Roof Items, including skylights and roof hatches:
   1. Material: Prefinished galvanized steel.
   2. Thickness: 24 ga.

G. Roofing Penetration Flashings, for Pipes, Structural Steel, and Equipment Supports:
   1. Material: Prefinished galvanized steel.
   2. Thickness: 24 ga.

H. Continuous Cleats:
   1. Material: Galvanized steel.
   2. Thickness: 22 ga.

I. Snow Guards: Match Color of panels

J. Decorative Fascia: Interior Fascia Trim
   1. Material: Aluminum Sheet
   2. Thickness: .032
   3. Color: As selected by Hoffman
   4. Reveal: Schluter DesignLine or Similar

END OF SECTION

SECTION 07 71 23

MANUFACTURED GUTTERS AND DOWNSPOUTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pre-finished aluminum gutters and downspouts.

1.02 RELATED REQUIREMENTS

A. Section 07 62 00 - Sheet Metal Flashing and Trim.

B. Section 33 41 11 - Site Storm Utility Drainage Piping: Connection of downspouts to storm sewer.

1.03 REFERENCE STANDARDS

A. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix).

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

C. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

D. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric).

E. SMACNA (ASMM) - Architectural Sheet Metal Manual.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Conform to SMACNA (ASMM) for sizing components for rainfall intensity determined by a storm occurrence of 1 in 10 years.

B. Comply with applicable code for size and method of rain water discharge.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on prefabricated components.

C. Samples: Submit two samples, 12 inch long illustrating component design, finish, color, and configuration.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Stack material to prevent twisting, bending, or abrasion, and to provide ventilation. Slope to drain.

B. Prevent contact with materials that could cause discoloration, staining, or damage.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Gutters and Downspouts:
   1. ATAS International, Inc; Water Control System: www.atas.com/#sle.
   2. Drexel Metals Inc; 7 Inch Box Gutter: www.drexmet.com/#sle.

B. Substitutions: See Section 01 60 00 - PRODUCT REQUIREMENTS.

C. Scupper and Collectors:
   1. ATAS International, Inc; Scuppers and Collector Boxes: www.atas.com/#sle.
   2. Substitutions: See Section 01 60 00 - PRODUCT REQUIREMENTS.

2.02 MATERIALS

A. Pre-Finished Galvanized Steel Sheet: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 0.02 inch thick base metal.
   1. Finish: Shop pre-coated with modified silicone coating.

2. Color: As indicated.

B. Pre-Finished Aluminum Sheet: ASTM B209 (ASTM B209M); 0.032 inch thick.
   1. Finish: Plain, shop pre-coated with modified silicone coating.
   2. Color: As indicated.

C. Protective Backing Paint: Zinc molybdate alkyd.

2.03 COMPONENTS

A. Gutters: SMACNA semi-circular style profile, Style K.

B. Downspouts: SMACNA Rectangular profile.

C. Anchors and Supports: Profiled to suit gutters and downspouts.
   1. Anchoring Devices: In accordance with CDA requirements.
   2. Gutter Supports: Brackets.
   3. Downspout Supports: Brackets.

D. Fasteners: Aluminum, with soft neoprene washers.

2.04 ACCESSORIES

2.05 FABRICATION

A. Form gutters and downspouts of profiles and size indicated.

B. Fabricate with required connection pieces.

C. Form sections square, true, and accurate in size, in maximum possible lengths, free of distortion or defects detrimental to appearance or performance. Allow for expansion at joints.

D. Hem exposed edges of metal.

E. Fabricate gutter and downspout accessories; seal watertight.

2.06 FINISHES

A. Fluoropolymer Coating: High Performance Organic Finish, AAMA 2604; multiple coat, thermally cured fluoropolymer finish system; color as indicated.

B. Primer Coat: Finish concealed side of metal sheets with primer compatible with finish system, as recommended by finish system manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that surfaces are ready to receive work.

3.02 PREPARATION

A. Paint concealed metal surfaces and surfaces in contact with dissimilar metals with protective backing paint to a minimum dry film thickness of 15 mil.

3.03 INSTALLATION

A. Install gutters, downspouts, and accessories in accordance with manufacturer's instructions.

B. Sheet Metal: Join lengths with formed seams sealed watertight. Flash and seal gutters to downspouts and accessories.

C. Slope gutters 1/8 inch per foot .

D. Connect downspouts to storm sewer system. Seal connection watertight.

E. Set splash pads, specified in section 33 41 11 under downspouts.

END OF SECTION

SECTION 07 72 00
ROOF ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Roof hatches.

B. Rooftop Fall Protection

1.02 RELATED REQUIREMENTS

A. Section 07 53 00 - Elastomeric Membrane Roofing: Flashing for roof units.

B. Section 07 62 00 - Sheet Metal Flashing and Trim: Roof accessory items fabricated from sheet metal.

1.03 REFERENCE STANDARDS

A. 29 CFR 1910.23 - Guarding floor and wall openings and holes.

B. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

C. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric).

D. UL (DIR) - Online Certifications Directory.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used.
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.
   4. Maintenance requirements.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store products under cover and elevated above grade.

1.06 WARRANTY

A. See Section 01 78 00 - CLOSEOUT SUBMITTALS, for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

C. Submit manufacturer's warranty. Ensure that forms have been completed in Owner's name and registered with manufacturer.

PART 2 PRODUCTS

2.01 ROOF HATCHES AND VENTS

A. Roof Hatch Manufacturers:
   1. Acudor Products Inc: www.acudor.com/#sle.
   2. Bilco Company: www.bilco.com/#sle.
   3. Dur-Red Products: www.dur-red.com.
   4. Milcor, Inc: www.milcorinc.com.
   5. Substitutions: See Section 01 60 00 - PRODUCT REQUIREMENTS.

B. Roof Hatches and Smoke Vents: Factory-assembled galvanized steel frame and cover, complete with operating and release hardware.
   1. Style: Provide flat metal covers unless otherwise indicated.
   2. Mounting: Provide frames and curbs suitable for mounting conditions as indicated on drawings.
   3. Size: Match existing; single-leaf style.

C. Frames and Curbs: One-piece curb and frame with integral cap flashing to receive roof flashings; extended bottom flange to suit mounting.
   1. Material: Galvanized steel, 14 gage, 0.0747 inch thick.
   2. Finish: Factory prime paint.
   3. Insulation: Manufacturer's standard; 1 inch rigid glass fiber, located on outside face of curb.
   4. Curb Height: 12 inches from finished surface of roof, minimum.

D. Metal Covers: Flush, insulated, hollow metal construction.
   1. Capable of supporting 40 psf live load.
   2. Material: Galvanized steel; outer cover 14 gage, 0.0747 inch thick, liner 22 gage, 0.03 inch thick.
   3. Finish: Factory prime paint.
   4. Insulation: Manufacturer's standard 1 inch rigid glass fiber.
   5. Gasket: Neoprene, continuous around cover perimeter.

E. Safety Railing System: Manufacturer's standard accessory safety rail system mounted directly to curb.
   1. Comply with 29 CFR 1910.23, with a safety factor of two.
   2. Posts and Rails: Aluminum tube.
   3. Gate: Same material as railing; automatic closing with latch.
   4. Finish: Manufacturer's standard, factory applied finish.
   5. Gate Hinges and Post Guides: ASTM B221 (ASTM B221M), 6063 alloy, T5 temper aluminum.
   6. Mounting Brackets: Hot dipped galvanized steel, 1/4 inch thick, minimum.
   7. Fasteners: Stainless steel, Type 316.

F. Hardware: Steel, zinc coated and chromate sealed, unless otherwise indicated or required by manufacturer.
   1. Lifting Mechanisms: Compression or torsion spring operator with shock absorbers that automatically opens upon release of latch; capable of lifting covers despite 10 psf load.
   2. Hinges: Heavy duty pintle type.
   3. Hold open arm with vinyl-coated handle for manual release.
   4. Latch: Upon closing, engage latch automatically and reset manual release.
   5. Manual Release: Pull handle on interior.
   6. Locking: Padlock hasp on interior.

2.02 ROOFTOP FALL PROTECTION AND ACCESSORIES

A. Provide manufactured products as referenced in the Drawings.
   1. Manufacturer: PSG Pure Safety Group; Guardian Fall Protection
   2. Anchor points and associated mounting hardware.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Hoffman of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using methods recommended by manufacturer for achieving acceptable results for applicable substrate under project conditions.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions, in manner that maintains roofing system weather-tight integrity.

3.04 CLEANING

A. Clean installed work to like-new condition.

B. Coordinate with installation of roofing system and related flashings for weathertight installation.

C. Adjust hinges for smooth operation.

3.05 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 07 84 00
FIRESTOPPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Firestopping systems.

B. Firestopping of all joints and penetrations in fire-resistance rated, whether indicated on drawings or not.

C. Sealing of all joints and penetrations in smoke-resistant assemblies whether indicated on drawings or not.

D. Perimeter Fire Barrier System between a rated floor and an exterior wall assembly.

1.02 RELATED REQUIREMENTS

A. Section 01 45 33 - Code-Required Special Inspections.

B. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.

C. Section 01 70 00 - EXECUTION AND CLOSEOUT REQUIREMENTS: Cutting and patching.

D. Section 07 05 53 - Fire and Smoke Assembly Identification.

E. Section 03 30 00 - Cast-In-Place Concrete.

F. Section 04 20 00 - Unit Masonry.

G. Section 07 81 23 - Intumescent Mastic Fireproofing.

H. Section 09 21 16 - Gypsum Board Assemblies: Gypsum wallboard fireproofing.

I. Section 21 00 00 - Fire Suppression.

J. Section 22 00 00 - Plumbing.

K. Section 23 00 00 - Heating, Ventilating, and Air-Conditioning (HVAC).

L. Section 26 00 00 - Electrical.

M. Section 27 00 00 - Communications.

1.03 DEFINITIONS

A. Firestopping: Material or combination of materials used to retain integrity of fire-rated construction by maintaining an effective barrier against the spread of flame, smoke, and hot gases through penetrations in, or construction joints between, fire rated wall and floor assemblies.

1.04 REFERENCE STANDARDS

A. ASTM E814 - Standard Test Method for Fire Tests of Through-Penetration Fire Stops.

B. ASTM E1966 - Standard Test Method for Fire Resistive Joint Systems.

C. ASTM E2307 - Standard Test Method for Determining Fire Resistance of Perimeter Fire Barriers Using Intermediate-Scale, Multi-story Test Apparatus.

D. ASTM E2837 - Standard Test Method for Determining the Fire Resistance of Continuity Head-of-Wall Joint Systems Installed Between Rated Wall Assemblies and Nonrated Horizontal Assemblies.

E. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.

F. ITS (DIR) - Directory of Listed Products.

G. FM 4991 - Approval Standard for Firestop Contractors.

H. FM (AG) - FM Approval Guide.

I. SCAQMD 1168 - South Coast Air Quality Management District Rule No.1168.

J. UL 2079 - Standard for Tests for Fire Resistance of Building Joint Systems.

K. UL (DIR) - Online Certifications Directory.

L. UL (FRD) - Fire Resistance Directory.

M. NFPA 101 - Life Safety Code.

N. NFPA 70 - National Electrical Code.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate the installation of firestopping with other trades and construction.

B. Preinstallation Meeting: Conduct a preinstallation meeting at least one week prior to the start of the work of this section; require attendance by all affected trades.
   1. Review preparation and installation procedures and coordinating and scheduling required with related work.
   2. Review requirements for any code-required special inspections.

1.06 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Schedule of Firestopping: List each type of penetration, fire rating of the penetrated assembly, and firestopping test or design number.
   1. Product Data: Provide data on product characteristics, performance ratings, and limitations.
      a. Manufacturer's installation instructions indicating preparation and installation instructions.
      b. Manufacturer's certification that products meet or exceed specified requirements.

1.07 QUALITY ASSURANCE

A. Fire Testing: Provide firestopping assemblies of designs that provide the scheduled fire ratings when tested in accordance with methods indicated.
   1. Listing in UL (FRD), FM (AG), or ITS (DIR) will be considered as constituting an acceptable test report.
   2. Valid evaluation report published by ICC Evaluation Service, Inc. (ICC-ES) at www.icc-es.org will be considered as constituting an acceptable test report.
   3. Submission of actual test reports is required for assemblies for which none of the above substantiation exists.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years documented experience.

C. For this project, firestopping shall be installed by a single subcontractor specializing in firestopping regardless of craft responsible for penetration.

D. Firestop Systems do not reestablish the structural integrity of load bearing partitions/assemblies, or support live loads and traffic. Installer shall consult the structural engineer prior to penetrating any load bearing assembly.

E. Installer Qualifications: Company specializing in performing the work of this section who is certified, licensed, or otherwise qualified by the firestopping manufacturer as having been provided the necessary training to install manufacturer's products per specified requirements and meeting at least one of the following qualifications:
   1. Approved by Factory Mutual Research Corporation under FM 4991, or meeting any two of the following requirements:
   2. UL Approved Contractor.
   3. Manufacturer Accredited Fire Stop Specialty Contractor.
   4. Verification of minimum three years documented experience installing work of this type.
   5. Verification of at least five satisfactorily completed projects of comparable size and type.
   6. Licensed by local authorities having jurisdiction (AHJ).

F. Single-Source Responsibility: Provide firestop systems for all conditions from a single manufacturer.

G. Proposed firestop materials and methods shall conform to applicable governing codes having local jurisdiction.

H. For those firestop applications that exist for which no qualified tested system is available through a manufacturer, an Engineering Judgement (EJ) derived from similar qualified tested system designs or other tests will be submitted to local authorities having jurisdiction for their review and approval prior to installation. Engineering judgement documents must follow requirements set forth by the International Firestop Council.
   1. Submit Manufacturer's engineering judgement identification number and drawing details when no qualified tested system is available for an application. Engineering judgement must include both project name and contractor's name who will install firestop system as described in document.

1.08 MOCK-UP

A. Install one firestopping assembly representative of each fire rating design required on project.
   1. Where one design may be used for different penetrating items or in different wall or floor constructions, install one assembly for each different combination.
   2. Where firestopping is intended to fill a linear opening, install minimum of 1 linear ft.

B. Obtain approval of authority having jurisdiction or Architect before proceeding.

C. If accepted, mock-up will represent minimum standard for the Work.

D. If accepted, mock-up may remain as part of the Work. Remove and replace mock-ups not accepted.

1.09 FIELD CONDITIONS

A. Comply with firestopping manufacturer's recommendations for temperature and conditions during and after installation; maintain minimum temperature before, during, and for three days after installation of materials.

B. Provide firestopping products containing no detectable asbestos, as determined by the method specified in 40 CFR Par 763, Subpart F, Appendix A, Section 1, "Polarized Light Microscopy."

C. Firestopping shall be free of PCB's, ethylene glycol and lead.

D. Do not use any products containing solvents or that require hazardous waste disposal.

E. During installation, provide masking and drop cloths to prevent firestopping materials from contaminating any adjacent surfaces.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Deliver material in the manufacturer's original, unopened containers or packages with manufacturers name, product identification, lot numbers, UL-Labels, and mixing and installation instructions, as applicable.

B. Store materials in the original, unopened containers or packages, and under conditions recommended by manufacturers.

C. Do not use damaged materials.

D. All Firestop materials shall be installed prior to expiration of shelf life.

E. Coordinate delivery of materials with scheduled installation date to allow minimum storage time at job site.

1.11 COORDINATION

A. Coordinate construction of openings and penetrating items to ensure that through-penetration firestop systems are installed according to specified requirements.

B. Verify existing conditions and substrates before starting work. Correct unsatisfactory conditions before proceeding.

C. Coordinate sizing of sleeves, openings, core-drilled holes or cut openings to accommodate through-penetration firestop systems.

D. Schedule installation of firestopping after completion of penetrating item installation but prior to covering or concealing of openings.

E. Do not cover up firestopping installations until Architect or Authorities Having Jurisdiction have examined each installation.

F. Do not use damaged or expired materials.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Firestopping Manufacturers:
   1. 3M Fire Protection Products: www.3m.com/firestop.
   2. Hilti, Inc; _____: www.us.hilti.com/#sle.
   3. Specified Technologies Inc: www.stifirestop.com/#sle.
   4. Substitutions: See Section 01 60 00 - PRODUCT REQUIREMENTS.

2.02 MATERIALS

A. Firestopping Materials: Any materials meeting requirements.

B. Volatile Organic Compound (VOC) Content: Provide products having VOC content lower than that required by SCAQMD 1168.

C. Mold and Mildew Resistance: Provide firestoppping materials with mold and mildew resistance rating of zero(0) in accordance with ASTM G21.

D. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Provide type of materials as required for tested firestopping assembly.

E. Provide firestopping composed of components that are compatible with each other, the substrates forming openings, and the items, if any, penetrating the firestopping under conditions of service and application, as demonstrated by the firestopping manufacturer based on testing and field experience.

F. Provide components for each firestopping system that are needed to install fill material. Use only components specified by the firestopping manufacturer and approved by the qualified testing agency for the designated fire-resistance-rated systems.

G. Firestopping Materials are either "cast-in-place" or "post installed". Provide cast-in-place firestop devices prior to concrete placement.

H. Provide a round fire-rated cable management device whenever cables penetrate fire rated walls, where frequent cable changes and additions may occur.
   1. The fire-rated cable management device shall consist of a corrugated steel tube with zinc coating, contain and inner plastic housing, intumescent material rings, and inner fabric smoke seal membrane.
   2. The length of the sleeve shall be 12.4 inches.
   3. The fire-rated cable management device shall contain integrated intumescent firestop wrap strip materials sufficient to maintain the hourly rating of the barrier being penetrated. The fire-rated cable management device shall contain a smoke seal fabric membrane or intumescent firestop plugs sufficient to achieve the L-Rating requirements of the barrier type.
   4. Install device per the manufacturer’s published installation instructions.

2.03 FIRESTOPPING ASSEMBLY REQUIREMENTS

A. Perimeter Fire Containment Firestopping: Use system that has been tested according to ASTM E2307 to have fire resistance F Rating equal to required fire rating of floor assembly.
   1. Movement: Provide systems that have been tested to show movement capability as indicated.
   2. Temperature Rise: In addition, provide systems that have been tested to show T Rating as indicated.
   3. Where floor assembly is not required to have a fire rating, provide systems that have been tested to show L Rating as indicated.

B. Head-of-Wall Joint System Firestopping at Joints Between Fire-Rated Wall Assemblies and Non-Rated Horizontal Assemblies: Use system that has been tested according to ASTM E2837 to have fire resistance F Rating equal to required fire rating of floor or wall, whichever is greater.
   1. Movement: Provide systems that have been tested to show movement capability as indicated.

C. Floor-to-Floor, Wall-to-Wall, and Wall-to-Floor Joints, Except Perimeter, Where Both Are Fire-Rated: Use system that has been tested according to ASTM E1966 or UL 2079 to have fire resistance F Rating equal to required fire rating of the assembly in which the joint occurs.
   1. Movement: Provide systems that have been tested to show movement capability as indicated.
   2. Air Leakage: Provide systems that have been tested to show L Rating as indicated.
   3. Watertightness: Provide systems that have been tested to show W Rating as indicated.
   4. Listing by FM (AG), ITS (DIR), UL (DIR), or UL (FRD) in their certification directories will be considered evidence of successful testing.

D. Through Penetration Firestopping: Use system that has been tested according to ASTM E814 to have fire resistance F Rating equal to required fire rating of penetrated assembly.
   1. Temperature Rise: Provide systems that have been tested to show T Rating as indicated.
   2. Air Leakage: Provide systems that have been tested to show L Rating as indicated.
   3. Watertightness: Provide systems that have been tested to show W Rating as indicated.
   4. Listing by FM (AG), ITS (DIR), UL (DIR), or UL (FRD) in their certification directories will be considered evidence of successful testing.

2.04 FIRESTOPPING FOR PERIMETER CONTAINMENT

2.05 FIRESTOPPING FOR FLOOR-TO-FLOOR, WALL-TO-FLOOR, AND WALL-TO-WALL JOINTS

A. Concrete and Concrete Masonry Walls and Floors:
   1. Floor to Floor Joints:

2.06 FIRESTOPPING SYSTEMS

A. Firestopping: Any material meeting requirements.

B. Fire Ratings: Use any system listed by UL or FM or that has F Rating equal to fire rating of penetrated assembly and minimum T Rating Equal to F Rating and that meets all other specified requirements.

2.07 MATERIALS

A. Intumescent Sealants: Single component, intumescent latex formulation, conforming to the following:
   1. Formulation: No-sag, non-halogen formula; fast drying, paintable.

B. Endothermic Sealant: Single component intumescent latex formulation, conforming to the following:
   1. Formulation: High flow rate, no-sag formula, low shrinkage, paintable.

C. Elastomeric Sealants: Single component latex formulations that upon cure do not re-emulsify during exposure to moisture and accommodate a minimum +/- 25 percent movement.

D. Silicone Firestop Sealant: One part, neutral curing silicone sealant, meeting the requirements of ASTM C920.

E. Firestop Devices: Factory-assembled steel collars lined with intumescent material capable of expanding a minimum 30 times sized to fit specific outside diameter of penetrating item.

F. Wall Opening Protective Materials: Intumescent, non-curing pads or inserts for protection of electrical switch and receptacle boxes.

G. Firestop Putty: One-part, 100% solids intumescent firestop compound which expands on exposure to surface heat gain; conforming to the following:
   1. Potential Expansion: Minimum 1000 percent.
   2. Formulation: Non-halogen, nontoxic synthetic elastomer formula.
   3. Durability and Longevity: Flexible, re-enterable.

H. Wrap Strip: Single component intumescent elastomeric sheet with foil one side, re-enterable, capable of expanding a minimum of 30 times.

I. Mortar: Portland cement based dry-mix product formulated for mixing with water at site to form a non-shrinking, water-resistant, homogenous mortar.

J. Silicone Foam: Multicomponent, silicone-based liquid elastomers, that when mixed, expand and cure in place to produce a flexible, non-shrinking foam.

K. Firestopping Spray: Water based, capable of drying to a tough elastomeric coating, paintable.
   1. Compression/Extension Recovery: +/- 25% of original joint width.

L. Fiber Packing Material: Mineral wool fiber packing insulation; conforming to the following:
   1. Density: 4.0 lb/cu ft.
   2. Asbestos Content: None.
   3. Service Temperatures: Continuous to 1200F.

M. Firestop Devices - Wrap Type: Mechanical device with incombustible filler and one-piece metal collar, with locking latch and bendable tabs to secure, intended to be installed after penetrating item has been installed; conforming to the following:

N. Firestop Devices - Cast-In Type: Sleeve and sealing material, intended to be cast in concrete floor forms or in concrete on metal deck, not requiring any additional materials to achieve penetration seal for use with non-combustible and combustible plastic pipe.

O. Reusable Firestopping: Self contained, highly intumescent, removable compressible shapes, pillows, or blocks specifically tested in removable configuration.

P. Perimeter Fire Barrier System: UL tested assembly of mineral wool and firestopping spray between a rated floor/roof and an exterior wall assembly; conforming to the following:
   1. Mineral Wool:
      a. Density: 4.0 lb/cu. ft.
      b. Asbestos Content: None.
      c. Moisture Absorption: <1%; inorganic.
      d. Service Temperature: Continuous t 1200 degrees F.
      e. Manufacturers:
         1) Thermafiber, Inc.; www.thermafiber.com
         2) Substitutions: See Section 01 60 00 - Product Requirements.
   2. Firestopping Spray: Water based, capable of drying to a tough elastomeric coating, paintable, meeting the following:
      a. Compression/Extension Recovery: +/- 25% of original joint width.
      b. Manufacturers:
         1) Hilti, Inc.; www.us.hilti.com
         2) Tremco; www.tremcosealants.com
         3) Substitutions: See Section 01 60 00 - Product Requirements.
   3. Impaling Clips: Provide impaling clips as required for fastening and holding mineral wool fiber packing material/fire proof insulation in place.

Q. Smoke and Acoustical Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant meeting the following:
   1. Manufacturers:
      a. Hilti, Inc.; Hilti CP 506 Smoke and Acoustic Sealant: www.us.hilti.com
      b. Substitutions: See Section 01 60 00 - Product Requirements.

R. Smoke and Acoustical Spray: Manufacturer's standard sprayable latex material complying with ASTM C919 and the following:
   1. Manufacturers:
      a. Hilti, Inc.; Hilti CP 572 Smoke and Acoustic Spray.
      b. Substitutions: See Section 01 60 00 - Product Requirements.

S. Labels: Red and white self-adhesive label.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify openings are ready to receive the work of this section.

B. Verification of Conditions: Examine areas and conditions under which work is to be performed and identify conditions detrimental to proper or timely completion.
   1. Verify penetrations are properly sized and in suitable condition for application of materials.
   2. Surfaces to which firestop materials will be applied shall be free of dirt, grease, oil, rust, laitance, release agents, water repellents, and any other substances that may affect proper adhesion.
   3. Provide masking and temporary covering to prevent soiling of adjacent surfaces by firestopping materials.
   4. Comply with manufacturer's recommendations for temperature and humidity conditions before, during and after installation of firestopping.
   5. Do not proceed until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other materials that could adversely affect bond of firestopping material.

B. Remove incompatible materials that could adversely affect bond.

3.03 COORDINATION

A. Coordinate location and proper selection of cast-in-place Firestop Devices with trade responsible for the work. Ensure device is installed before placement of concrete.

B. Responsible trades to provide adequate spacing of field run pipes to allow for installation of cast-in-place firestop devices without interferences.

C. Coordinate with plumbing, mechanical, electrical and other trades to assure that all pipe, conduit, cable and other items that penetrate fire rated construction have been permanently installed prior to installation of Firestops.

D. Schedule and sequence the work to assure that partitions and other construction is not erected prior to the installation of Firestops.

3.04 INSTALLATION

A. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings.

B. Consult with mechanical engineer, project manager, and damper manufacturer prior to installation of UL firestop systems that might hamper the performance of fire dampers as it pertains to duct work.

C. Do not cover installed firestopping until inspected by authorities having jurisdiction.

D. Install labeling required by code.

E. At locations where firestop sealant will be exposed to exterior conditions or weather, use a silicone based firestop sealant that is water and UV resistant.

3.05 FIELD QUALITY CONTROL

A. Independent Testing Agency: Inspection agency employed and paid by Owner, may be retained to examine penetration firestopping in accordance with ASTM E2174, “Standard Practice for On-Site Inspection of Installed Fire Stops and ASTM E2393, “Standard Practice for On-Site Inspection of Installed Fire Stop Joint Systems.

B. Repair or replace penetration firestopping and joints at locations where inspection results indicate firestopping or joints do not meet specified requirements.

C. Examine sealed penetration areas to ensure proper installation before concealing or enclosing areas.

D. Keep areas of work accessible until inspection by applicable code authorities.

E. Perform under this section patching and repairing of firestopping caused by cutting or penetrating of existing firestop systems already installed by other trades or Owner.

F. Manufacturer's Field Services: During Installation, provide periodic destructive testing inspections to assure proper installation/application. After installation is complete, submit findings in writing indicating whether or not the installation of the tested system identified was installed correctly.

3.06 THROUGH PENETRATION MARKING AND IDENTIFICATION

A. Through-Penetration Systems: Identify through-penetration firestop systems with pressure-sensitive, self-adhesive, preprinted vinyl labels. Attach labels permanently to surfaces of penetrated construction on both sides of each firestop system installation where labels will be visible to anyone seeking to remove penetrating items or firestop systems. Include as a minimum the following information on labels:
   1. The Words: "Warning - Through Penetration Firestop System - Do Not Disturb. Notify Building Management of Any Damage.
   2. Contractor's name, address, and phone number.
   3. Through-Penetration firestop system designation of applicable testing and inspecting agency.
   4. Date of installation.
   5. Through-Penetration firestop system manufacturer's name.
   6. Installer's Name.

3.07 FIRE AND SMOKE ASSEMBLY IDENTIFICATION

A. See Section 07 05 33 - Fire and Smoke Assembly Identification

3.08 CLEANING

A. Clean adjacent surfaces of firestopping materials.

B. Remove equipment, materials and debris, leaving area in undamaged, clean condition.

3.09 PROTECTION

A. Protect adjacent surfaces from damage by material installation.

B. Protect firestopping during and after curing period from contact with contaminating substances or from damage resulting from construction operations.

C. Repair or replace any deteriorated or damaged firestopping as required to produce firestopping complying with specified requirements and codes.

END OF SECTION

SECTION 07 92 00
JOINT SEALANTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Nonsag gunnable joint sealants.

B. Joint backings and accessories.

1.02 REFERENCE STANDARDS

A. ASTM C661 - Standard Test Method for Indentation Hardness of Elastomeric-Type Sealants by Means of a Durometer.

B. ASTM C1193 - Standard Guide for Use of Joint Sealants.

C. ASTM C1311 - Standard Specification for Solvent Release Sealants.

D. ASTM C1330 - Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants.

E. SCAQMD 1168 - South Coast Air Quality Management District Rule No.1168.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the work with other sections referencing this section.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data for Sealants and Accessory Products: Submit manufacturer's technical data sheets for each product to be used, that includes the following.
   1. Physical characteristics, including movement capability, VOC content, hardness, cure time, and color availability.
   2. List of backing materials approved for use with the specific product.
   3. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
   4. Substrates the product should not be used on.
   5. Substrates for which use of primer is required.
   6. Installation instructions, including precautions, limitations, and recommended backing materials and tools.
   7. Sample product warranty.

C. Color Cards for Selection: Where sealant color is not specified, submit manufacturer's color cards showing standard colors available for selection.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

B. Installer Qualifications: Company specializing in performing the work of this section and with at least three years of documented experience and approved by manufacturer.

1.06 MOCK-UP

A. Provide mock-up of sealant joints in conjunction with wall under provisions of Section 01 40 00.

B. Construct mock-up with specified sealant types and with other components noted.

C. Locate where directed by Architect.

D. Mock-up may not remain as a part of the Work.

1.07 FIELD CONDITIONS

A. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

1.08 WARRANTY

A. See Section 01 78 00 - CLOSEOUT SUBMITTALS, for additional warranty requirements.

B. Correct defective work within a five year period after Date of Substantial Completion.

C. Warranty: Include coverage for installed sealants and accessories that fail to achieve watertight seal , exhibit loss of adhesion or cohesion, or do not cure.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Non-Sag Sealants: Permits application in joints on vertical surfaces without sagging or slumping.
   1. Bostik Inc: www.bostik-us.com.
   2. Dow Corning Corporation: www.dowcorning.com/construction.
   3. Hilti, Inc: www.us.hilti.com.
   4. Momentive Performance Materials, Inc (formerly GE Silicones): www.momentive.com/#sle.
   5. Pecora Corporation: www.pecora.com.
   6. Tremco Commercial Sealants & Waterproofing: www.tremcosealants.com.
   7. Substitutions: See Section 01 60 00 - PRODUCT REQUIREMENTS.

2.02 JOINT SEALANT APPLICATIONS

A. Scope:
   1. Exterior Joints: Seal open joints, whether or not the joint is indicated on drawings, unless specifically indicated not to be sealed. Exterior joints to be sealed include, but are not limited to, the following items.
      a. Wall expansion and control joints.
      b. Joints between door, window, and other frames and adjacent construction.
      c. Joints between different exposed materials.
      d. Openings below ledge angles in masonry.
      e. Other joints indicated below.
   2. Do not seal the following types of joints.
      a. Intentional weepholes in masonry.
      b. Joints indicated to be treated with manufactured expansion joint cover or some other type of sealing device.
      c. Joints where sealant is specified to be provided by manufacturer of product to be sealed.
      d. Joints where installation of sealant is specified in another section.

2.03 JOINT SEALANTS - GENERAL

A. Sealants and Primers: Provide products having lower volatile organic compound (VOC) content than indicated in SCAQMD 1168.

2.04 NONSAG JOINT SEALANTS

A. Polyurethane Sealant: 1, Grade NS, Uses M and A; single or multi-component; not expected to withstand continuous water immersion or traffic.
   1. Movement Capability: Plus and minus 25 percent, minimum.
   2. Hardness Range: 20 to 35, Shore A, when tested in accordance with ASTM C661.
   3. Color: To be selected by Hoffman from manufacturer's standard range.
   4. Service Temperature Range: Minus 40 to 180 degrees F.

2.05 ACCESSORIES

A. Backer Rod: Cylindrical cellular foam rod with surface that sealant will not adhere to, compatible with specific sealant used, and recommended by backing and sealant manufacturers for specific application.
   1. Type for Joints Not Subject to Pedestrian or Vehicular Traffic: ASTM C1330; Type O - Open Cell Polyurethane.

2. Closed Cell and Bi-Cellular: 25 to 33 percent larger in diameter than joint width.

B. Backing Tape: Self-adhesive polyethylene tape with surface that sealant will not adhere to and recommended by tape and sealant manufacturers for specific application.

C. Masking Tape: Self-adhesive, nonabsorbent, non-staining, removable without adhesive residue, and compatible with surfaces adjacent to joints and sealants.

D. Joint Cleaner: Non-corrosive and non-staining type, type recommended by sealant manufacturer; compatible with joint forming materials.

E. Primers: Type recommended by sealant manufacturer to suit application; non-staining.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that joints are ready to receive work.

B. Verify that backing materials are compatible with sealants.

C. Verify that backer rods are of the correct size.

3.02 PREPARATION

A. Remove loose materials and foreign matter that could impair adhesion of sealant.

B. Clean joints, and prime as necessary, in accordance with manufacturer's instructions.

C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.

D. Mask elements and surfaces adjacent to joints from damage and disfigurement due to sealant work; be aware that sealant drips and smears may not be completely removable.

E. Concrete Floor Joints That Will Be Exposed in Completed Work: Test joint filler in inconspicuous area to verify that it does not stain or discolor slab.

3.03 INSTALLATION

A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.

B. Perform installation in accordance with ASTM C1193.

C. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer.

D. Install bond breaker backing tape where backer rod cannot be used.

E. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.

F. Do not install sealant when ambient temperature is outside manufacturer's recommended temperature range, or will be outside that range during the entire curing period, unless manufacturer's approval is obtained and instructions are followed.

G. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.

H. Concrete Floor Joint Filler: After full cure, shave joint filler flush with top of concrete slab.

3.04 FIELD QUALITY CONTROL

A. Remove and replace failed portions of sealants using same materials and procedures as indicated for original installation.

3.05 CLEANING

A. Clean adjacent soiled surfaces.

3.06 PROTECTION

A. Protect sealants until cured.

3.07 POST-OCCUPANCY

A. Post-Occupancy Inspection: Perform visual inspection of entire length of project sealant joints at a time that joints have opened to their greatest width; i.e. at low temperature in thermal cycle. Report failures immediately and repair.

END OF SECTION

SECTION 08 11 13
HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Non-fire-rated hollow metal doors and frames.

B. Hollow metal frames for wood doors.

C. Fire-rated hollow metal doors and frames.

D. Thermally insulated hollow metal doors with frames.

E. Hollow metal borrowed lites glazing frames.

F. Accessories, including glazing.

1.02 RELATED REQUIREMENTS

A. Section 04 05 11 - Masonry Mortaring and Grouting: Masonry grout fill for hollow metal frames.

B. Section 04 20 00 - Unit Masonry: Installation of frames in masonry.

C. Section 06 10 00 - Rough Carpentry.

D. Section 08 14 16 - Flush Wood Doors.

E. Section 08 71 00 - Door Hardware DO NOT USE.

F. Section 08 80 00 - Glazing: Glass for doors and borrowed lites.

G. Section 09 21 16 - Gypsum Board Assemblies.

H. Section 09 91 13 - Exterior Painting: Field painting.

I. Section 09 91 23 - Interior Painting: Field painting.

1.03 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design.

B. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors.

C. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100).

D. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

E. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable.

F. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.

G. BHMA A156.115 - American National Standard for Hardware Preparation in Steel Doors and Steel Frames.

H. ICC A117.1 - Accessible and Usable Buildings and Facilities.

I. ITS (DIR) - Directory of Listed Products.

J. NAAMM HMMA 830 - Hardware Selection for Hollow Metal Doors and Frames.

K. NAAMM HMMA 831 - Hardware Locations for Hollow Metal Doors and Frames.

L. NAAMM HMMA 840 - Guide Specifications for Installation and Storage of Hollow Metal Doors and Frames.

M. NAAMM HMMA 861 - Guide Specifications for Commercial Hollow Metal Doors and Frames.

N. NFPA 80 - Standard for Fire Doors and Other Opening Protectives.

O. SDI 117 - Manufacturing Tolerances for Standard Steel Doors and Frames.

P. UL (DIR) - Online Certifications Directory.

Q. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data / Shop Drawings: .
   1. Product Data Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes; and one copy of referenced standards/guidelines.
   2. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and any indicated finish requirements.

C. Installation Instructions: Manufacturer's published instructions, including any special installation instructions relating to this project.

D. Manufacturer's Qualification Statement.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years documented experience.

B. Hardware Coordination: Coordinate with hardware supplier for the proper placement and preparation for door hardware with door and frame fabrication. Secure necessary hardware templates and hardware information from hardware supplier.

C. Maintain at project site copies of reference standards relating to installation of products specified.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Marking: Mark each item with appropriate heading and door number in accordance with drawings and approved shop drawings.

B. Inspection: Accept doors and frames on site in manufacturer's packaging. Inspect for damage. Minor damages may be repaired provided that the refinished items are equal in all respects to new work and acceptable to Architect, otherwise, remove and replace damaged items.

C. Comply with NAAMM HMMA 840 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
   1. Store doors at building site under cover on minimum 4-inch high wood blocking.
   2. Avoid use of non-vented plastic or canvas shelters which would create a humidity chamber.
   3. If cardboard wrapper on door becomes wet, remove carton immediately. Provide minimum 1/4" spaces between stacked doors to promote air circulation.

D. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion and adverse effects on factory applied painted finish.
   1. Protect against damage in shipping.
   2. If wrapped in plastic, break plastic seals on site to permit ventilation.

1.07 WARRANTY

A. See Section 01 78 00 - CLOSEOUT SUBMITTALS, for additional warranty requirements.

B. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to, and not a limitation of, other rights Owner may have under the Contract Documents.
   1. Correct defective Work within a one year period after Date of Substantial Completion.

C. Warranty shall include reinstallation labor which may be required due to repair or replacement of defective doors or frames where defect was not apparent prior to installation. Warranty shall also include finishing that may be required due to repair or replacement of defective doors.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Hollow Metal Doors and Frames:
   1. Ceco Door, an Assa Abloy Group company: www.assaabloydss.com.
   2. Pioneer Industries, Inc.
   3. Steelcraft, an Allegion brand: www.allegion.com/us.
   4. Curries, an Assa Abloy Group company: www.assaabloydss.com.
   5. Substitutions: See Section 01 60 00 - PRODUCT REQUIREMENTS.

2.02 PERFORMANCE REQUIREMENTS

A. Requirements for Hollow Metal Doors and Frames:
   1. Steel Sheet: Comply with one or more of the following requirements; galvannealed steel complying with ASTM A653/A653M, cold-rolled steel complying with ASTM A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel complying with ASTM A1011/A1011M, commercial steel (CS) Type B, for each.
   2. Accessibility: Comply with ICC A117.1 and ADA Standards.
   3. Exterior Door Top Closures: Flush end closure channel, with top and door faces aligned.
   4. Door Edge Profile: Manufacturers standard for application indicated.
   5. Typical Door Face Sheets: Flush.
   6. Glazed Lights: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings. Style: Manufacturers standard.
   7. Hardware Preparations, Selections and Locations: Comply with NAAMM HMMA 830 and NAAMM HMMA 831 or BHMA A156.115 and ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
   8. Zinc Coating for Typical Interior and/or Exterior Locations: Provide metal components zinc-coated (galvanized) and/or zinc-iron alloy-coated (galvannealed) by the hot-dip process in accordance with ASTM A653/A653M, with manufacturer's standard coating thickness, unless noted otherwise for specific hollow metal doors and frames.
      a. Based on SDI Standards: Provide at least A40/ZF120 (galvannealed) when necessary, coating not required for typical interior door applications, and at least A60/ZF180 (galvannealed) for corrosive locations.

B. Hollow Metal Panels: Same construction, performance, and finish as doors.

C. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.

2.03 HOLLOW METAL DOORS

A. Door Finish: Factory primed and field finished.

B. Exterior Doors: Thermally insulated.
   1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
      a. Level 1 - Standard-duty.
      b. Physical Performance Level C, 250,000 cycles; in accordance with ANSI/SDI A250.4.
      c. Model 1 - Full Flush.
      d. Door Face Metal Thickness: 20 gage, 0.032 inch, minimum.
      e. Zinc Coating: A60/ZF180 galvannealed coating; ASTM A653/A653M.
   2. Door Core Material: Manufacturers standard core material/construction and in compliance with requirements.
   3. Door Thermal Resistance: R-Value of 9.9, minimum, for installed thickness of polyisocyanurate.
   4. Door Thickness: 1-3/4 inch, nominal.
   5. Weatherstripping: Refer to Section 08 71 00.

C. Interior Doors, Non-Fire Rated:
   1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
      a. Level 1 - Standard-duty.
      b. Physical Performance Level C, 250,000 cycles; in accordance with ANSI/SDI A250.4.
      c. Model 1 - Full Flush.
      d. Door Face Metal Thickness: 20 gage, 0.032 inch, minimum.
      e. Zinc Coating: Not required; ASTM A653/A653M.
   2. Door Core Material: Manufacturers standard core material/construction and in compliance with requirements.
   3. Door Thickness: 1-3/4 inch, nominal.

D. Fire-Rated Doors:
   1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
      a. Level 1 - Standard-duty.
      b. Physical Performance Level C, 250,000 cycles; in accordance with ANSI/SDI A250.4.
      c. Model 1 - Full Flush.
      d. Door Face Metal Thickness: 20 gage, 0.032 inch, minimum.
      e. Zinc Coating: A60/ZF180 galvannealed coating; ASTM A653/A653M.
   2. Fire Rating: As indicated on Door and Frame Schedule, tested in accordance with UL 10C ("positive pressure") with temperature rise ratings as required by code, tested in accordance with NFPA 252.
      a. Temperature-Rise Rating (TRR) Across Door Thickness: In accordance with local building code and authorities having jurisdiction.
      b. Provide units listed and labeled by UL (DIR) or ITS (DIR).
      c. Attach fire rating label to each fire rated unit.
   3. Door Core Material: Manufacturers standard core material/construction in compliance with requirements.
   4. Door Thickness: 1-3/4 inch, nominal.

2.04 HOLLOW METAL FRAMES

A. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.

B. Frame Finish: Factory primed and field finished.

C. Exterior Door Frames: Fully welded.
   1. Galvanizing: Components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A653/A653M, with A40/ZF120 coating.
   2. Weatherstripping: Separate, see Section 08 71 00.

D. Interior Door Frames, Non-Fire Rated: Full profile/continuously welded type.
   1. Frame Metal Thickness: 18 gage, 0.042 inch, minimum.
   2. Double back-bend type at drywall partitions. Allow throat depth 1/8" wider than wall thickness.

E. Door Frames, Fire-Rated: Full profile/continuously welded type.
   1. Fire Rating: Same as door, labeled.
   2. Frame Metal Thickness: 18 gage, 0.042 inch, minimum.
   3. Double back-bend type at drywall partitions. Allow throat depth 1/8" wider than wall thickness.

F. Mullions for Pairs of Doors: Fixed, with profile similar to jambs.

G. Transom Bars: Fixed, of profile same as jamb and head.

H. Provide mortar guard boxes for hardware cut-outs in frames to be installed in masonry or to be grouted.

I. Frames in Masonry Walls: Size to suit masonry coursing with head member 4 inch high to fill opening without cutting masonry units.

2.05 ACCESSORIES

A. Glazing: As specified in Section 08 80 00, factory installed.

B. Removable Stops: Formed sheet steel, shape as indicated on drawings, mitered or butted corners; prepared for countersink style tamper proof screws.

C. Astragals for Double Doors: Specified in Section 08 71 00.

D. Mechanical Fasteners for Concealed Metal-to-Metal Connections: Self-drilling, self-tapping, steel with electroplated zinc finish.

E. Silencers: Resilient rubber, fitted into drilled hole; provide three on strike side of single door, three on center mullion of pairs, and two on head of pairs without center mullions.

F. Temporary Frame Spreaders: Provide for factory- or shop-assembled frames.

G. Frame Anchors: Minimum of six wall anchors and two base anchors. Provide with an additional anchor for every 30 inches over 90 inches.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

C. Verify that finished walls are in plane to ensure proper door alignment.

D. Notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Coat inside of frames to be installed in masonry or to be grouted, with bituminous coating, prior to installation.

3.03 INSTALLATION

A. Install doors and frames in accordance with manufacturer's instructions and related requirements of specified door and frame standards or custom guidelines indicated.

B. Install fire rated units in accordance with NFPA 80 and local code authority.

C. Coordinate frame anchor placement with wall construction.

D. Grout frames in masonry construction, using hand trowel methods; brace frames so that pressure of grout before setting will not deform frames.

E. Install door hardware as specified in Section 08 71 00.

F. Comply with glazing installation requirements of Section 08 80 00.

G. Coordinate installation of electrical connections to electrical hardware items.

H. Touch up damaged factory finishes.

3.04 TOLERANCES

A. Clearances Between Door and Frame: Comply with related requirements of specified frame standards or custom guidelines indicated in accordance with SDI 117 or NAAMM HMMA 861.

B. Maximum Diagonal Distortion: 1/16 inch measured with straight edge, corner to corner.

3.05 ADJUSTING

A. Adjust for smooth and balanced door movement.

3.06 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before date of Substantial Completion.

3.07 SCHEDULE

A. Refer to Door and Frame Schedule on the drawings.

END OF SECTION

SECTION 08 14 16
FLUSH WOOD DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Flush wood doors; flush and flush glazed configuration; fire rated, non-rated, and acoustical.

1.02 RELATED REQUIREMENTS

A. Section 06 20 00 - Finish Carpentry: Wood door frames.

B. Section 08 11 13 - HOLLOW METAL DOORS AND FRAMES.

C. Section 08 71 00 - Door Hardware DO NOT USE.

D. Section 08 80 00 - Glazing.

E. Section 09 93 00 - Staining and Transparent Finishing: Field finishing of doors.

1.03 REFERENCE STANDARDS

A. ANSI A135.4 - American National Standard for Basic Hardboard.

B. ASTM E413 - Classification for Rating Sound Insulation.

C. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards.

D. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 3.0.

E. ICC (IBC) - International Building Code.

F. ICC (IBC) - International Building Code.

G. NFPA 80 - Standard for Fire Doors and Other Opening Protectives.

H. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies.

I. UL 10B - Standard for Fire Tests of Door Assemblies.

J. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies.

K. WDMA I.S. 1A - Interior Architectural Wood Flush Doors.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data / Shop Drawings:
   1. Product Data: Indicate door core materials and construction; veneer species, type and characteristics, styles and edge banding.
      a. Manufacturer's Installation Instructions: Indicate special installation instructions.
   2. Shop Drawings: Show doors and frames, elevations, sizes, types, swings, undercuts, beveling, blocking for hardware, factory machining, factory finishing, cutouts for glazing and other details.
      a. Provide information as required by AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS).

C. Samples: Submit two samples of door veneer, 6 by 6 inch in size illustrating wood grain, stain color, and sheen.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section, with not less than three years of documented experience.

B. Obtain doors from a single manufacturer.

1.06 REGULATORY REQUIREMENTS

A. Fire Door and Panel Construction: Conform to NFPA 252.
   1. Listed and classified by UL as suitable for the purpose specified and indicated.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Package, deliver and store doors in accordance with specified quality standard.

B. Protect doors during transit, storage and handling to prevent damage, soiling and deterioration. Comply with recommendations of WDMA - NWWDA pamphlet "How to Store, Handle, Finish, Install, and Maintain Wood Doors", as well as manufacturer's instructions.

C. Accept doors on site in manufacturer's packaging. Inspect for damage.

D. Protect doors with resilient packaging sealed with heat shrunk plastic. Do not store in damp or wet areas; or in areas where sunlight might bleach veneer. Seal top and bottom edges with tinted sealer if stored more than one week. Break seal on site to permit ventilation.

E. Identify each door with individual opening numbers which correlate with designation system used on shop drawings for doors, frames, and hardware, using temporary, removable markings.

F. Do not deliver or install doors until conditions for temperature and relative humidity have been stabilized and will be maintained in storage and installation areas during remainder of construction period to comply with AWI quality standard including Section 100-S-3 "Moisture Content".

1.08 WARRANTY

A. See Section 01 78 00 - CLOSEOUT SUBMITTALS, for additional warranty requirements.

B. Warranty, executed in Owner's name for all doors provided by manufacturer for referenced project.

C. Interior Doors: Provide manufacturer's warranty for the life of the installation.

D. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction.

E. Warranty shall include reinstallation labor which may be required due to repair or replacement of defective doors where defect was not apparent prior to hanging.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Wood Veneer Faced Doors:
   1. Eggers Industries: www.eggersindustries.com/#sle.
   2. Oshkosh Door Company: www.oshkoshdoor.com.
   3. VT Industries.
   4. Marshfield DoorSystems, Inc: www.marshfielddoors.com.
   5. Substitutions: See Section 01 60 00 - PRODUCT REQUIREMENTS.

2.02 DOORS

A. Doors: Refer to drawings for locations and additional requirements.
   1. Quality Standard: Custom Grade, Heavy Duty performance, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.
   2. Wood Veneer Faced Doors: 5-ply unless otherwise indicated.

B. Interior Doors: 1-3/4 inches thick unless otherwise indicated; flush construction.
   1. Provide solid core doors at each location.
   2. Fire Rated Doors: Tested to ratings indicated on drawings in accordance with UL 10C - Positive Pressure; Underwriters Laboratories Inc (UL) or Intertek/Warnock Hersey (WHI) labeled without any visible seals when door is open.
   3. Wood veneer facing for field transparent finish as indicated on drawings.

2.03 DOOR AND PANEL CORES

A. Non-Rated Solid Core and 20 Minute Rated Doors: Type particleboard core (PC), plies and faces as indicated.

B. Fire-Rated Doors: Mineral core type, with fire resistant composite core (FD), plies and faces as indicated above; with core blocking as required to provide adequate anchorage of hardware without through-bolting.

2.04 DOOR FACINGS

A. Veneer Facing for Transparent Finish: Red oak, veneer grade in accordance with quality standard indicated, plain sliced (flat cut), with book match between leaves of veneer, running match of spliced veneer leaves assembled on door or panel face.
   1. Vertical Edges: Same species as face veneer.
   2. Pairs: Pair match each pair; set match single and pairs within 10 feet of each other when doors are closed.

B. Facing Adhesive: Type I - waterproof.

2.05 DOOR CONSTRUCTION

A. Fabricate doors in accordance with door quality standard specified.

B. Cores Constructed with stiles and rails.

C. Fabricate fire rated doors in accordance with UL requirements. Attach fire rating label to door.

D. Provide solid blocks at lock edge and top of door for closer for hardware reinforcement.
   1. Provide solid blocking for other throughbolted hardware.

E. Vertical Exposed Edge of Stiles - Veneer Faces: Of same species as veneer facing. Minimum 5/16" thick

F. Fit door edge trim to edge of stiles after applying veneer facing.

G. Bond edge banding to cores.

H. Factory machine doors for hardware other than surface-mounted hardware, in accordance with hardware requirements and dimensions.

I. Factory fit doors for frame opening dimensions identified on shop drawings, with edge clearances in accordance with specified quality standard.

J. Provide edge clearances in accordance with the quality standard specified.

2.06 FACTORY FINISHING - WOOD VENEER DOORS

A. Finish work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified and as follows:
   1. Transparent:
      a. System - 5, Varnish, Conversion.
      b. Stain: As selected by Hoffman.
      c. Sheen: Satin.

B. Factory finish doors in accordance with approved sample.

C. Seal door top edge with color sealer to match door facing.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

C. Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.

3.02 INSTALLATION

A. Install doors in accordance with manufacturer's instructions and specified quality standard.

B. Install fire-rated doors in accordance with NFPA 80 requirements.

C. Factory-Finished Doors: Do not field cut or trim; if fit or clearance is not correct, replace door.

D. Adjust width of non-rated doors by cutting equally on both jamb edges.

1. Trim fire-rated doors in strict compliance with fire rating limitations.

E. Trim door height by cutting bottom edges to a maximum of 3/4 inch (19 mm).

F. Trim fire door height at bottom edge only, in accordance with fire rating requirements.

G. Use machine tools to cut or drill for hardware.

H. Coordinate installation of doors with installation of frames and hardware.

3.03 TOLERANCES

A. Comply with specified quality standard for fit and clearance tolerances.

B. Comply with specified quality standard for telegraphing, warp, and squareness.

C. Maximum Diagonal Distortion (Warp): 1/8 inch measured with straight edge or taut string, corner to corner, over an imaginary 36 by 84 inches surface area.

D. Maximum Vertical Distortion (Bow): 1/8 inch measured with straight edge or taut string, top to bottom, over an imaginary 36 by 84 inches surface area.

E. Maximum Width Distortion (Cup): 1/8 inch measured with straight edge or taut string, edge to edge, over an imaginary 36 by 84 inches surface area.

3.04 ADJUSTING

A. Adjust doors for smooth and balanced door movement.

B. Adjust closers for full closure.

3.05 SCHEDULE

A. Refer to Door and Frame Schedule appended to this section.

END OF SECTION

SECTION 08 31 00
ACCESS DOORS AND PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wall and ceiling access door and frame units.

B. Floor access door and frame units, interior and exterior.

C. Access door and frame units, fire-rated and non-fire-rated, in wall and ceiling locations.

1.02 RELATED REQUIREMENTS

A. Section 09 91 23 - Interior Painting: Field paint finish.

1.03 REFERENCE STANDARDS

A. UL (FRD) - Fire Resistance Directory.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide sizes, types, finishes, hardware, scheduled locations, and details of adjoining work.
   1. Manufacturer's Installation Instructions: Indicate installation requirements.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

PART 2 PRODUCTS

2.01 ACCESS DOORS AND PANELS ASSEMBLIES

A. Wall-Mounted Units:
   1. Material: Steel.
   2. Size: 12 inch by 12 inch.
   3. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.
   4. Wall Mounting Criteria: Provide surface-mounted face frame and door surface flush with frame surface.

B. Wall-Mounted Units in Wet Areas:
   1. Material: Steel, hot-dipped zinc, or zinc-aluminum-alloy coated.
   2. Size: 12 inch by 12 inch.
   3. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.
   4. Wall Mounting Criteria: Provide surface-mounted face frame and door surface flush with frame surface.

C. Fire-Rated Wall-Mounted Units:
   1. Wall Fire-Rating: As indicated on drawings.
   2. Material: Steel.
   3. Size: 12 inch by 12 inch.

D. Ceiling-Mounted Units:
   1. Size - Lay-In Grid Ceilings: To match module of ceiling grid.
   2. Size - Other Ceilings: 12 inch by 12 inch.
   3. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.

E. Fire-Rated Ceiling-Mounted Units:
   1. Ceiling Fire-Rating: As indicated on drawings.
   2. Material: Steel.
   3. Size: 12 inch by 12 inch.
   4. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.

2.02 WALL AND CEILING MOUNTED UNITS

A. Manufacturers:
   1. ACUDOR Products Inc: www.acudor.com/#sle.
   2. Karp Associates, Inc: www.karpinc.com.
   3. Milcor, Inc: www.milcorinc.com.
   4. Substitutions: See Section 01 60 00 - PRODUCT REQUIREMENTS.

2.03 FLOOR ACCESS UNITS

A. Floor Access Units: Factory fabricated, fully assembled units with corner joints welded, filled, and ground flush; square and without rack or warp; coordinate requirements with type of installation assembly being used for each unit.
   1. Size: As indicated on the drawings.
   2. Hardware: Steel, hot-dipped galvanized.
      a. Hinges: Removable pin.

B. Interior Floor Access Units: Steel, minimum 1/4 inch thick.
   1. Design Load: Design to support live load of 150 lb/sq ft with deflection not to exceed 1/180 of span.
   2. Operation: Manual opening, and manual closing.
   3. Finish: Rust inhibiting primer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that rough openings are correctly sized and located.

3.02 INSTALLATION

A. Install units in accordance with manufacturer's instructions.

B. Install frames plumb and level in openings, and secure units rigidly in place.

C. Position units to provide convenient access to concealed equipment when necessary.

END OF SECTION

SECTION 08 32 23

SLIDING/FOLDING GLAZED DOORS/WALLS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Factory fabricated sliding/folding glazed door/wall with frames and operating hardware.
   1. Aluminum panel frame system.

1.02 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Rough opening framing.

B. Section 07 92 00 - Joint Sealants: Sealing joints between door frames and adjacent construction.

C. Section 08 71 00 - Door Hardware DO NOT USE: Cylinder locks.

D. Section 08 80 00 - Glazing: Glass and glazing accessories.

1.03 REFERENCE STANDARDS

A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum.

B. ASTM D1187/D1187M - Standard Specification for Asphalt-Base Emulsions for Use as Protective Coatings for Metal.

C. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.

D. ASTM E413 - Classification for Rating Sound Insulation.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide information on dimensions, frame and sill construction, glazing, and hardware.

C. Shop Drawings: Indicate opening dimensions, elevations of different types, and framed opening tolerances.

D. Manufacturer's Installation Instructions: Include complete preparation, installation, and cleaning requirements.

E. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in, and with not fewer than three years of experience, manufacturing products of the type specified.

B. Installer Qualifications: Company specializing in installation of products of the type specified, with not fewer than three years of experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to project site and store in manufacturer's protective cartons until openings are ready for installation.

B. Protect finished surfaces with wrapping paper or strippable coating during installation. Do not use adhesive papers or sprayed coatings that bond to substrate when exposed to sunlight or weather.

1.07 WARRANTY

A. See Section 01 78 00 - CLOSEOUT SUBMITTALS, for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

C. Provide five year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units.

PART 2 PRODUCTS

2.01 BASIS OF DESIGN - ALUMINUM PANEL FRAME

A. Floor Mounted; Non-thermally Broken, with Insulating Glazing:
   1. Basis of Design: Kawneer 1010 Series: www.kawneer.com.

B. Other Manufacturers: Provide either the product identified as "Basis of Design" or an equivalent product of one of the manufacturers listed below.
   1. C.R. Laurence Company, Inc; U.S. Aluminum: www.crl-arch.com/sle.
   2. DORMA USA, Inc: www.dorma.com.
   3. Modernfold, a DORMA Group Company: www.modernfold.com.
   4. NanaWall Systems, Inc: www.nanawall.com.

C. Substitutions: See Section 01 60 00 - PRODUCT REQUIREMENTS.
   1. For any product not identified as "Basis of Design", submit information as specified for substitutions.

2.02 PERFORMANCE REQUIREMENTS

A. Acoustical Performance: Provide glass partitions and door assemblies tested by qualified testing agency, calculated in accordance with ASTM E413, tested in accordance with ASTM E90, and rated for not less than Sound Transmission Class (STC) indicated.
   1. Partition STC Rating: 45, minimum, for framed partition.

2.03 SLIDING/FOLDING GLAZED DOORS/WALLS

A. Aluminum Sliding/Folding Glazed Doors/Walls: Extruded aluminum sliding/folding and operable panel frames, factory fabricated; complete with, flashings, support and anchorage devices, and glazing.
   1. Configuration: As shown on drawings.
   2. Support System: Top hung.
   3. Standard Sill: Raised type, with sealant, shims and fasteners at necessary locations.
      a. Finish: To match the panel frame.
   4. Panel Rail Depth: 4 inch.
   5. Aluminum Frames: Factory finished; manufacturer's standard corner construction; thermally broken.
   6. Glass Stops: Same material and color as frame.
   7. Aluminum Frame Finish: Anodized coating in accordance with AAMA 611.
      a. Sheen: Matte.
      b. Interior Color: Clear anodized

2.04 FACTORY ASSEMBLY

A. Factory assemble sliding/folding operable panel frames as single unit, including head, jambs, and bottom sections; provide concealed fasteners.
   1. Sizes: Allow for tolerances of rough framed openings, clearances, and shims at perimeter of assemblies.
   2. Joints and Corners: Flush, hairline and waterproof, accurately fitted and secured; prepared to receive anchors; fasteners and attachments concealed from view; reinforced as required for imposed loads.
   3. Glazing: Factory installed.

2.05 ACCESSORIES

A. Glazing: As specified in Section 08 80 00.

B. Sliding/Folding Hardware: Provide manufacturer's standard hardware including carriages with sealed ball bearing rollers, and top or bottom tracks.

C. Door Hardware: As specified in Section 08 71 00.

D. Exposed Hardware Finish: Brushed satin.

E. Locking Mechanisms: Minimum 2-point deadbolt locking of each panel; manufacturer's standard type.

F. Cylinder Locks: As specified in 08 71 00.

G. Anchors: Hot-dipped galvanized or stainless steel in accordance with project and manufacturer's installation requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that openings are ready to receive work and opening dimensions and clearances are as indicated on approved shop drawings.

3.02 PREPARATION

A. Prepare opening to permit correct installation of door unit in coordination with air and vapor seal.

3.03 INSTALLATION

A. Install door/wall unit assembly in accordance with manufacturer's instructions.

B. Attach frame and shims to perimeter opening to accommodate construction tolerances and other irregularities.

C. Use anchorage devices to securely fasten assembly to adjacent construction without distortion or imposed stresses.

D. Install perimeter trim and interior closures.

3.04 TOLERANCES

A. Maintain dimensional tolerances and alignment with adjacent work.

B. Maximum Variation from Plumb: 1/16 inch.

C. Maximum Variation from Level: 1/16 inch.

D. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch from 10 foot straight edge.

3.05 ADJUSTING

A. Adjust hardware for smooth operation.

3.06 CLEANING

A. Remove protective material from factory finished surfaces.

B. Remove labels and visible markings.

C. Wash surfaces by method recommended and acceptable to sealant and window manufacturer; rinse and wipe surfaces clean.

3.07 PROTECTION

A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION

SECTION 08 33 23
OVERHEAD COILING DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Overhead coiling doors, operating hardware, fire-rated, non-fire-rated, exterior, and interior, manual and electric operation.

B. Wiring from electric circuit disconnect to operator to control station.

1.02 RELATED REQUIREMENTS

A. Section 07 92 00 - Joint Sealants: Sealing joints between frames and adjacent construction.

B. Section 26 05 83 - Wiring Connections: Power to disconnect.

C. Section 28 46 00 - FIRE ALARM SYSTEM: Fire alarm interconnection.

1.03 REFERENCE STANDARDS

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

C. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

D. ITS (DIR) - Directory of Listed Products.

E. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

F. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts.

G. NEMA MG 1 - Motors and Generators.

H. NFPA 80 - Standard for Fire Doors and Other Opening Protectives.

I. UL (DIR) - Online Certifications Directory.

J. UL 325 - Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide general construction, electrical equipment, and component connections and details.
   1. Manufacturer's Installation Instructions: Indicate installation sequence and procedures, adjustment and alignment procedures.
   2. Maintenance Data: Indicate lubrication requirements and frequency and periodic adjustments required.
   3. Shop Drawings:
      a. Shop drawings for the fabrication and installation of curtains and frames.
      b. Include elevations, conditions at openings, and details of construction.
      c. Locations, installation requirements of finish hardware and reinforcements, and details of joints and connections.
      d. Advise the Architect in writing should any doors be ineligible for standard fire resistance labels due to door size, hardware, vision openings, or other features required by the Contract Documents.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of type specified and with at least three years documented experience.

C. Furnish each overhead coiling door as a complete unit produced by one manufacturer, including hardware, accessories, mounting and installation components.

D. Provide exterior assemblies that withstand positive and negative wind loads of 20 psf, without undue deflection or damage to components.

E. Furnish inserts and anchoring devices that are to be installed in concrete or masonry for unit installation. Include setting drawings, templates, instructions, and directions for installing inserts.

1.06 REGULATORY REQUIREMENTS

A. Conform to applicable code for fire rated openings.

B. Provide products listed and labeled by UL as suitable for the purpose specified and indicated.

C. Provide certificate of compliance from authority having jurisdiction indicating approval of fire rated units and operating hardware assembly.

D. Products Requiring Electrical Connection: Listed and classified by ITS (DIR), UL (DIR), or testing firm acceptable to authorities having jurisdiction as suitable for purpose specified.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store products indoors and protect from moisture, construction traffic, and damage.

1.08 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Submit 2 year manufacturer's warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Overhead Coiling Doors:
   1. Clopay Building Products: www.clopaydoor.com/#sle.
   2. Cornell Iron Works, Inc: www.cornelliron.com.
   3. Wayne-Dalton, a Division of Overhead Door Corporation: www.wayne-dalton.com/#sle.
   4. Raynor Rolling Doors.
   5. Substitutions: See Section 01 60 00 - PRODUCT REQUIREMENTS.

B. Overhead Coiling Fire Doors:
   1. Clopay Building Products: www.clopaydoor.com/#sle.
   2. Cornell Iron Works, Inc: www.cornelliron.com/#sle.
   3. Wayne-Dalton, a Division of Overhead Door Corporation; ____: www.wayne-dalton.com/#sle.
   4. Raynor Rolling Doors.
   5. Substitutions: See Section 01 60 00 - PRODUCT REQUIREMENTS.

2.02 OVERHEAD COILING FIRE DOORS

A. Provide Model "F" Series Rolling Fire Doors.
   1. Ratings as indicated on the drawings and schedules.
   2. Operation: Motor operator.
   3. Mounting: Interior face mounted on prepared opening.

B. Curtain and Bottom Bar:
   1. Slat material: ASTM A 653/A 653M galvanized steel, cold roll formed in continuous lengths to form curtains; zinc coated.
   2. Slat finish: Powder coat colored finish on both sides of slat. Color: To be selected.
   3. Slat shape: Flat slat.
   4. Slat gage: Not less than 26 gage.
   5. Endlocks: Each end of alternate slats to be fitted with endlocks to act as a wearing surface in the guides and to maintain slat alignment.; stamped steel.

6. Bottom bar: Reinforce curtain bottom with angles, material to match curtain material. Lift handles on both sides of curtain.

C. Governor: Viscous speed governor.

D. Hood:
1. Material: 24 gage galvanized steel.
2. Shape: Square.
3. Finish: Same as for curtain.
4. Provide through-the-wall fuse link.

E. Locking:
1. Motor operated doors: Integral gearing of motor operator to provide locking for door.

F. Control/Release Devices:
1. "McCabe Fuse" links.
2. Ionization type smoke detectors in locations indicated.
3. Type "AR" magnetic holder: Release when current is applied on signal from detector or alarm system; adjustable time delay. 110 V AC.

2.03 COILING DOORS

A. Non-Fire-Rated Interior Coiling Doors: Steel slat curtain.
1. Single thickness slats.
2. Nominal Slat Size: 2 inches wide x required length.
3. Finish: Factory painted, color as selected.
4. Guides, Formed Sheet Metal: Galvanized steel.
5. Hood Enclosure: Manufacturer's standard; primed steel.
6. Manual hand chain lift operation.
7. Mounting: Surface mounted.

B. Fire-Rated Coiling Doors: Steel slat curtain; comply with NFPA 80.
1. 1-1/2 hour fire rating.
2. Provide products listed and labeled by ITS (DIR) or UL (DIR) as suitable for the purpose specified and indicated.
3. Oversized Openings: Provide certificate of compliance from authorities having jurisdiction indicating approval of fire rated units and operating hardware assembly.
4. Single thickness slats.
5. Nominal Slat Size: 2 inches wide by required length.
6. Finish: Factory painted, color as selected.
7. Guides, Formed Sheet Metal: Galvanized steel.
8. Hood Enclosure: Manufacturer's standard; primed steel.
9. Coiling Door Release Mechanism: Fire alarm system activated with automatically governed closing speed.
10. Manual hand chain lift operation.
11. Mounting: Surface mounted.

2.04 MATERIALS AND COMPONENTS

A. Curtain Construction: Interlocking slats.
1. Slat Ends: Each slat fitted with end locks to act as wearing surface in guides and to prevent lateral movement.
2. Curtain Bottom: Fitted with angles to provide reinforcement and positive contact in closed position.

B. Steel Slats: Minimum thickness, 26 gage, 0.022 inch; ASTM A653/A653M galvanized steel sheet.
1. Galvanizing: Minimum G90 coating.

C. Guide Construction: Continuous, of profile to retain door in place, mounting brackets of same metal.

D. Guides - Sheet Metal: Formed from sheet metal, ___ gage, ___ inch thick; ___ inch wide.

1. Hot-Dip Galvanizing: Minimum G90 coating, in compliance with ASTM A653/A653M.

E. Hood Enclosure and Trim: Internally reinforced to maintain rigidity and shape.
   1. Match finish for slats.

F. Lock Hardware:
   1. Latching Mechanism: Inside mounted, adjustable keeper, spring activated latch bar feature to keep in locked or retracted position.
   2. Latch Handle: Manufacturer's standard.
   3. Slide Bolt: Provide on single-jamb side, extending into slot in guides, with padlock on one side.
   4. Manual Chain Lift: Provide padlockable chain keeper on guide.

G. Roller Shaft Counterbalance: Steel pipe and helical steel spring system, capable of producing torque sufficient to ensure smooth operation of curtain from any position and capable of holding position at mid-travel; with adjustable spring tension; requiring 25 lb nominal force to operate.

2.05 COMPONENTS

A. Overhead Counterbalances:
   1. Counterbalance: Housed in a steel pipe of diameter and wall thickness to restrict maximum deflection to 0.03 inch per foot of width.
   2. Springs: Helical torsion springs designed to include an overload factor of 25 percent and for optimum ease of operation; grease packed and mounted on a cold rolled steel inner shaft.
   3. Spring tension: Adjustable from outside of end bracket plate, except on integral frame construction and smaller shutters.
   4. Ball bearings: Sealed to minimize wear of pipe shaft rotation around inner shaft.
   5. Motorized Doors: Very high cycle springs to satisfy in excess of 100,000 cycles.

B. Overhead Coiling Door Bracket Plates:
   1. Bracket plates carrying pipe counterbalancing shaft: Not less than 1/4 inch thickness, square in shape; house ends of door coil.
   2. Drive end bracket plate: Fitted with a sealed ball bearing.
   3. Material: Galvanized steel.

C. Stop Lock Bearings: Prevent door/grille from falling completely to floor in event of damage to spring counterbalance or pipe shaft.

D. Overhead Hoods:
   1. Laterally reinforced to prevent sag.
   2. Intermediate hood supports: Furnish where door width exceeds 16 feet.

E. Primer for Galvanized Surfaces: Baked epoxy modified polyester primer, gray or tan.

2.06 ELECTRIC OPERATION

A. Electric Operators:
   1. Mounting: Side mounted.
   2. Motor Enclosure:
      a. Interior Coiling Doors: NEMA MG 1, Type 1; open drip proof.
   3. Motor Rating: 1/3 hp; continuous duty.
   4. Motor Voltage: 120 volts, single phase, 60 Hz.
   5. Motor Controller: NEMA ICS 2, full voltage, reversing magnetic motor starter.
   6. Controller Enclosure: NEMA 250, Type 1.
   7. Opening Speed: 12 inches per second.
   8. Brake: Adjustable friction clutch type, activated by motor controller.
   9. Manual override in case of power failure.
   10. Refer to Section 26 05 83 for electrical connections.

B. Control Station: Provide standard three button (Open-Close-Stop) momentary-contact control device for each operator complying with UL 325.
   1. 24 volt circuit.

2. Surface mounted, at interior door jamb.
3. Entrapment Protection Devices: Provide sensing devices and safety mechanisms complying with UL 325.
    a. Primary Device: Provide electric sensing edge, wireless sensing, NEMA 1 photo eye sensors, or NEMA 4X photo eye sensors as required with momentary-contact control device.

C. Safety Edge: Located at bottom of coiling door, full width, electro-mechanical sensitized type, wired to stop and reverse door direction upon striking object, hollow neoprene covered.

D. Fail Safe Control: Upon loss of continuity in circuit, open door and prevent motor operation until circuit/edge is repaired.

E. Panic Release Device: Allow emergency egress for motor operated units; comply with ADA requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that opening sizes, tolerances and conditions are acceptable.

3.02 INSTALLATION

A. Install units in accordance with manufacturer's instructions.

B. Install fire-rated doors in accordance with NFPA 80.

C. Use anchorage devices to securely fasten assembly to wall construction and building framing without distortion or stress.

D. Securely and rigidly brace components suspended from structure. Secure guides to structural members only.

E. Fit and align assembly including hardware; level and plumb, to provide smooth operation.

F. Coordinate installation of electrical service with Section 26 05 83.

G. Complete wiring from disconnect to unit components.

H. Complete wiring from fire alarm system.

I. Coordinate installation of sealants and backing materials at frame perimeter as specified in Section 07 90 05.

J. Install enclosure and perimeter trim.

3.03 TOLERANCES

A. Maintain dimensional tolerances and alignment with adjacent work.

B. Maximum Variation From Plumb: 1/16 inch.

C. Maximum Variation From Level: 1/16 inch.

D. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch per 10 ft straight edge.

3.04 FIELD QUALITY CONTROL

A. Drop test rated units in the presence of the Architect after installation.

3.05 DEMONSTRATION

A. Instruct the Owner's personnel in proper operation and maintenance of units.

3.06 ADJUSTING

A. Adjust operating assemblies for smooth and noiseless operation.

3.07 CLEANING

A. Clean installed components.

B. Remove labels and visible markings.

END OF SECTION

SECTION 08 36 13
SECTIONAL DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Overhead sectional doors, manually and electrically operated.

B. Operating hardware and supports.

C. Electrical controls.

1.02 RELATED REQUIREMENTS

A. Section 05 50 00 - Metal Fabrications: Steel channel opening frame.

B. Section 06 10 00 - Rough Carpentry: Rough wood framing for door opening.

C. Section 07 92 00 - Joint Sealants: Sealing joints between frames and adjacent construction.

D. Section 08 71 00 - Door Hardware DO NOT USE: Lock cylinders.

E. Section 26 05 33.13 - Conduit for Electrical Systems: Empty conduit from control units to door operator.

F. Section 26 05 83 - Wiring Connections.

1.03 REFERENCE STANDARDS

A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

B. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.

C. DASMA 102 - American National Standard Specifications for Sectional Overhead Type Doors.

D. ITS (DIR) - Directory of Listed Products.

E. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts.

F. NEMA MG 1 - Motors and Generators.

G. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

H. NFPA 70 - National Electrical Code.

I. UL (DIR) - Online Certifications Directory.

J. UL 325 - Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems.

1.04 PERFORMANCE REQUIREMENTS

A. Design and size components to withstand dead loads and positive and negative wind loads of design pressure of 20 lb/sq ft as measured in accordance with ASTM E 330.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Indicate opening dimensions and required tolerances, connection details, anchorage spacing, hardware locations, and installation details.
   1. Provide component construction and hardware.

C. Manufacturer's Installation Instructions: Include any special procedures required by project conditions.

D. Operation Data: Include normal operation, troubleshooting, and adjusting.

E. Maintenance Data: Include data for motor and transmission, shaft and gearing, lubrication frequency, and spare part sources.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

B. Comply with applicable code for motor and motor control requirements.

C. Products Requiring Electrical Connection: Listed and classified by ITS (DIR), UL (DIR), or testing firm acceptable to authorities having jurisdiction, as suitable for purpose specified.

1.07 WARRANTY

A. See Section 01 78 00 - CLOSEOUT SUBMITTALS for warranty requirements.

B. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

C. Correct defective Work within a one year period after Date of Substantial Completion.

D. Warranty: Include coverage for electric motor and transmission.

E. Provide two year manufacturer warranty for electric operating equipment.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Sectional Doors:
   1. Clopay Building Products: www.clopaydoor.com/#sle.
   2. Wayne-Dalton, a Division of Overhead Door Corporation: www.wayne-dalton.com/#sle.
   3. Ceco/Windsor Door..
   4. Substitutions: See Section 01 60 00 - PRODUCT REQUIREMENTS.

2.02 STEEL DOORS

A. Steel Doors: Flush steel, insulated; standard lift operating style with track and hardware; complying with DASMA 102, Commercial application.
   1. Performance: Withstand positive and negative wind loads equal to 1.5 times design wind loads specified by local code without damage or permanent set, when tested in accordance with ASTM E330/E330M, using 10 second duration of maximum load.
   2. Door Nominal Thickness: 2 inches thick.
   3. Exterior Finish: Factory finished with acrylic baked enamel; color as selected by Architect.
   4. Interior Finish: Factory finished with acrylic baked enamel; color as selected from manufacturers standard line.
   5. Electric Operation: Electric control station.

B. Door Panels: Flush steel construction; outer steel sheet of 0.058 inch thick, flat profile; inner steel sheet of 0.058 inch thick, flat profile; core reinforcement sheet steel roll formed to channel shape, rabbeted weather joints at meeting rails; insulated.

2.03 COMPONENTS

A. Track: Rolled galvanized steel, 0.090 inch minimum thickness; 2 inch wide, continuous one piece per side; galvanized steel mounting brackets 1/4 inch thick.

B. Hinge and Roller Assemblies: Heavy duty hinges and adjustable roller holders of galvanized steel; floating hardened steel bearing rollers, located at top and bottom of each panel, each side.

C. Lift Mechanism: Torsion spring on cross head shaft, with braided galvanized steel lifting cables.

D. Sill Weatherstripping: Resilient hollow rubber strip, one piece; fitted to bottom of door panel, full length contact.

E. Jamb Weatherstripping: Roll formed steel section full height of jamb, fitted with resilient weatherstripping, placed in moderate contact with door panels.

F. Head Weatherstripping: EPDM rubber seal, one piece full length.

G. Panel Joint Weatherstripping: Neoprene foam seal, one piece full length.

H. Lock: Inside center mounted, adjustable keeper, spring activated latch bar with feature to retain in locked or retracted position; interior and exterior handle.

I. Lock Cylinders: See Section 08 71 00.

2.04 MATERIALS

A. Sheet Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M, with G60/Z180 coating, stucco embossed surface.

B. Insulation: Foamed-in-place polyurethane, bonded to facing.
   1. Same thickness as core framing members.

2.05 ELECTRIC OPERATION

A. Electric Operators:
   1. Mounting: Side mounted on cross head shaft.
   2. Motor Enclosure:
   3. Motor Rating: 1/3 hp; continuous duty.
   4. Motor Voltage: 120 volts, single phase, 60 Hz.
   5. Motor Controller: NEMA ICS 2, full voltage, reversing magnetic motor starter.
   6. Controller Enclosure: NEMA 250, Type 1.
   7. Opening Speed: 12 inches per second.
   8. Brake: Adjustable friction clutch type, activated by motor controller.
   9. Manual override in case of power failure.
   10. Refer to Section 26 05 83 for electrical connections.

B. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated; enclose terminal lugs in terminal box sized to comply with NFPA 70.

C. Control Station: Provide standard three button (Open-Close-Stop) momentary-contact control device for each operator complying with UL 325.
   1. 24 volt circuit.
   2. Surface mounted, at interior door jamb.
   3. Entrapment Protection Devices: Provide sensing devices and safety mechanisms complying with UL 325.
      a. Primary Device: Provide electric sensing edge, wireless sensing, NEMA 1 photo eye sensors, or NEMA 4X photo eye sensors as required with momentary-contact control device.

D. Safety Edge: Located at bottom of sectional door panel, full width; electro-mechanical sensitized type, wired to stop and reverse door direction upon striking object; hollow neoprene covered to provide weatherstrip seal.

E. Provide radio control antenna detector.

F. Hand Held Transmitter: Digital control, and resettable.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that wall openings are ready to receive work and opening dimensions and tolerances are within specified limits.

B. Verify that electric power is available and of the correct characteristics.

3.02 PREPARATION

A. Prepare opening to permit correct installation of door unit to perimeter air and vapor barrier seal.

B. Apply primer to wood frame.

3.03 INSTALLATION

A. Install door unit assembly in accordance with manufacturer's instructions.

B. Anchor assembly to wall construction and building framing without distortion or stress.

C. Securely brace door tracks suspended from structure. Secure tracks to structural members only.

D. Fit and align door assembly including hardware.

E. Coordinate installation of electrical service. Complete power and control wiring from disconnect to unit components.

F. Coordinate installation of sealants and backing materials at frame perimeter as specified in Section 07 92 00.

G. Install perimeter trim.

3.04 TOLERANCES

A. Maximum Variation from Plumb: 1/16 inch.

B. Maximum Variation from Level: 1/16 inch.

C. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch from 10 ft straight edge.

D. Maintain dimensional tolerances and alignment with adjacent work.

3.05 ADJUSTING

A. Adjust door assembly for smooth operation and full contact with weatherstripping.

B. Have manufacturer's field representative present to confirm proper operation and identify adjustments to door assembly for specified operation.

3.06 PROTECTION

A. Protect installed products from damage until Date of Substantial Completion.

B. Do not permit construction traffic through overhead door openings after adjustment and cleaning.

END OF SECTION

SECTION 08 42 29
AUTOMATIC ENTRANCES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Operators for doors provided in other sections.

B. Controllers, actuators and safety devices.

1.02 RELATED REQUIREMENTS

A. Section 08 43 13 - Aluminum-Framed Storefronts: Aluminum doors and frames.

B. Section 26 05 83 - Wiring Connections.

C. Section 28 10 00 - Access Control: Connection to access control system; access control devices used as actuators.

D. Section 28 46 00 - FIRE ALARM SYSTEM: Connection to fire alarm system.

1.03 REFERENCE STANDARDS

A. BHMA A156.10 - American National Standard for Power Operated Pedestrian Doors.

B. BHMA A156.19 - American National Standard for Power Assist and Low Energy Power Operated Doors.

C. ITS (DIR) - Directory of Listed Products.

D. NFPA 70 - National Electrical Code.

E. NFPA 101 - Life Safety Code.

F. UL (DIR) - Online Certifications Directory.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data / Shop Drawings:
   1. Shop Drawings: Indicate layout and dimensions; head, jamb, and sill conditions; elevations; components, anchorage, recesses, materials, and finishes, electrical characteristics and connection requirements.
      a. Identify installation tolerances required, assembly conditions, routing of service lines and conduit, and locations of operating components and boxes.
   2. Product Data: Provide data on system components, sizes, features, and finishes.
      a. Maintenance Data: Include manufacturer's parts list and maintenance instructions for each type of hardware and operating component.
      b. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention, and manufacturer's hardware and component templates.

C. Samples: Submit two samples of finish samples for color and finish.

D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - PRODUCT REQUIREMENTS, for additional provisions.
   2. Wrenches and other tools required for maintenance of equipment.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience, and a member of AAADM.

B. Source Limitations: Obtain automatic door operators through one source from a single manufacturer.

1.06 COORDINATION

A. Templates: Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing automatic door operators to comply with indicated requirements.

B. Electrical System Roughing-in: Coordinate layout and installation of automatic door operators with connections to, power supplies, remote activation devices, and electric door latching hardware.

C. System Integration: Integrate automatic door operators with other systems as required for a complete working installation. Where required for proper operation, provide a time delay relay to signal automatic door operator to activate only after electric lock system is released.

1.07 PROJECT CONDITIONS

A. Field Measurements: Contractor shall verify openings to receive automatic door operators by field measurements before fabrication and indicate measurements on Shop Drawings.

B. Mounting Surfaces: Contractor shall verify all surfaces to be plumb, straight and secure; substrates to be of proper dimension and material.

1.08 WARRANTY

A. See Section 01 78 00 - CLOSEOUT SUBMITTALS, for additional warranty requirements.

B. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

C. Correct defective Work within a five year period after Date of Substantial Completion.

D. Provide two year manufacturer warranty.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Door Operators for Swing Doors Specified in Other Sections:
   1. DORMA USA, Inc; ED100: www.dorma.com/#sle.
   2. record-usa; 6100 Series Low Energy Swing Door: www.record-usa.com.
   3. Stanley Access Technologies; Magic Access LE (Low Energy): www.stanleyaccess.com/#sle.
   4. Substitutions: See Section 01 60 00 - PRODUCT REQUIREMENTS.

2.02 POWER OPERATED DOORS

A. Power Operated Doors: Provide products that comply with NFPA 101 and requirements of authorities having jurisdiction; provide equipment selected for actual door weight and for light pedestrian traffic, unless otherwise indicated.
   1. Swinging Fire Door Operators: In addition to other requirements, provide equipment ITS (DIR) or UL (DIR) listed as a fire door operator with automatic closer.
   2. Swinging Door Operators: Fully adjustable for opening and closing speeds, checking speeds, and hold-open time; in the event of power failure, disengage operator allowing door to function as a door with a spring closer.
   3. Exterior Swinging Doors: Provide equipment capable of operating, closing, and holding doors closed under positive and negative differential pressure; if necessary, provide power closing.
   4. Exterior and Vestibule Doors: Provide equipment suitable for operating temperature range of minus 20 to plus 140 degrees F ambient.

B. Swinging Doors with Low-Energy Power Operators: Comply with BHMA A156.19; operator activated by pushing or pulling the door or by a manual actuator, not a sensor; safeties not required.

2.03 OPERATORS FOR SWINGING DOORS PROVIDED BY OTHERS

A. Door Operator: Electric, surface mounted overhead.
   1. Operation: Low-energy power open, spring close operation.
   2. Variable speed control for opening and closing cycles.
   3. "Push" Side Actuator: Push plate.
   4. "Pull" Side Actuator: Push plate.
   5. Pull-Side Safety: Door-mounted.

6. Hold Open: Toggle switch at inside head of doors.

B. Enclosure: Extruded aluminum header concealing all operating parts except arms and manual control switches.
   1. Provide bottom loading header for access to controls and removable components without removal of door or operator.
   2. No exposed fasteners.
   3. Finish of Exposed Headers: Anodized aluminum.
   4. Color: To match door.

C. Door Arms and Linkage Assembly: A combination of door arms and linkage shall provide positive control of door through entire swing; units shall permit use of butt hung, center pivot, and offset pivot-hung doors.

D. Signage: Provide signage in accordance with ANSI/BHMA A156.19.

2.04 CONTROLLERS, ACTUATORS, AND SAFETIES

A. Controller: Provide microprocessor operated controller for each door.

B. Comply with BHMA A156.10 for actuator and safety types and zones.

C. Push Plate Actuator: Standard wall mounted, surface mounted momentary contact type; satin stainless steel plate; 4 inches diameter; labeled PUSH.

D. Swinging Door Safety Device: Door-mounted proximity detector device arranged to prevent operation of door when persons or obstructions are in the swing zone.

2.05 ELECTRICAL CHARACTERISTICS AND COMPONENTS

A. Electrical Characteristics:
   1. 120 volts, single phase, 60 Hz.
   2. Refer to Section 26 05 83: Electrical connections.

B. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70.

C. Disconnect Switch: Factory mount disconnect switch in control panel.

2.06 ACCESSORIES

A. Steel Clips, Supports, and Steel Anchors: Galvanized to 1.25 oz/sq ft.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are ready to receive work and dimensions are as indicated on shop drawings.

B. Verify that electric power is available and is of the correct characteristics.

3.02 INSTALLATION

A. Install equipment in accordance with manufacturer's instructions.

B. Provide for thermal expansion and contraction of door and frame units and live and dead loads that may be transmitted to operating equipment.

C. Provide for dimensional distortion of components during operation.

D. Coordinate installation of components with related and adjacent work; level and plumb.

3.03 ADJUSTING

A. Adjust door equipment for correct function and smooth operation.

3.04 CLEANING

A. Remove temporary protection, clean exposed surfaces.

3.05 CLOSEOUT ACTIVITIES

A. Demonstrate operation, operating components, adjustment features, and lubrication requirements.

END OF SECTION

SECTION 08 43 13
ALUMINUM-FRAMED STOREFRONTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Aluminum-framed storefront, with vision glass.

B. Aluminum doors and frames.

C. Low-Energy Door Operators provided under this section.

1.02 RELATED REQUIREMENTS

A. Section 05 12 00 - Structural Steel Framing: Steel attachment members.

B. Section 07 84 00 - Firestopping: Firestop at system junction with structure.

C. Section 08 42 29 - Automatic Entrances.

D. Section 08 51 13 - Aluminum Windows: Operable sash within glazing system.

E. Section 08 71 00 - Door Hardware DO NOT USE: Hardware items other than specified in this section.

F. Section 08 80 00 - Glazing: Glass and glazing accessories.

G. Section 09 91 23 - Interior Painting: Field painting of interior surface of infill panels.

1.03 REFERENCE STANDARDS

A. AAMA CW-10 - Care and Handling of Architectural Aluminum From Shop to Site.

B. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum.

C. AAMA 1503 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections.

D. ASCE 7 - Minimum Design Loads for Buildings and Other Structures.

E. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.

F. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

G. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

H. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric).

I. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.

J. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.

K. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.

L. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic").

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate with installation of other components that comprise the exterior enclosure.

B. Preinstallation Meeting: Conduct a preinstallation meeting one week before starting work of this section; require attendance by all affected installers.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data / Shop Drawings: Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, internal drainage details.
   1. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related work, expansion and contraction joint location and details, and field welding required.
      a. Include Design Engineer's stamp or seal on shop drawings for attachments and anchors.
      b. Design Data: Provide framing member structural and physical characteristics, engineering calculations, and dimensional limitations.
      c. Hardware Schedule: Complete itemization of each item of hardware to be provided for each door, cross-referenced to door identification numbers in Contract Documents.

C. Samples: Submit two samples 12 inches in size illustrating finished aluminum surface, glass, glazing materials.

1.06 QUALITY ASSURANCE

A. Designer Qualifications: Design structural support framing components under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in Wisconsin.

B. Manufacturer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.

C. Installer: Company specializing in performing the work of this section with minimum three years of experience.

D. Source Limitations: Obtain each type of store front system from one source from a single manufacturer.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Handle products of this section in accordance with AAMA CW-10.

B. Protect finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond to aluminum when exposed to sunlight or weather.

C. Store aluminum components in a clean dry location away from uncured masonry or concrete. Cover components with waterproof paper, tarpaulin or polyethylene sheeting in a manner to permit circulation of air.

D. Stack framing components in a manner that will prevent bending and avoid significant or permanent damage.

1.08 FIELD CONDITIONS

A. Field Measurements: Check openings by accurate field measurement prior to fabrication. Show recorded measurements on shop drawings.

B. Schedule: Coordinate fabrication schedule with construction progress to avoid delay of the Work.

C. Do not install sealants when ambient temperature is less than 40 degrees F. Maintain this minimum temperature during and 48 hours after installation.

1.09 WARRANTY

A. See Section 01 78 00 - CLOSEOUT SUBMITTALS, for additional warranty requirements.

B. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

C. Correct defective Work within a two year period after Date of Substantial Completion.

D. Provide five year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design: See below under description of products.

B. Aluminum-Framed Storefront and Doors:
   1. Kawneer North America: www.kawneer.com/#sle.
   2. Curtainwall Systems.
   3. Special-Lite, Inc.
   4. Oldcastle BuildingEnvelope: www.oldcastlebe.com/#sle.
   5. Tubelite, Inc: www.tubeliteinc.com/#sle.

C. Substitutions: See Section 01 60 00 - PRODUCT REQUIREMENTS.

2.02 STOREFRONT

A. Aluminum-Framed Storefront: Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.
   1. Glazing Position: Front-set.
   2. Vertical Mullion Dimensions: 2 inches wide by 4-1/2 inches deep.
   3. Finish: Superior performing organic coatings.
      a. Factory finish all surfaces that will be exposed in completed assemblies.
      b. Touch-up surfaces cut during fabrication so that no natural aluminum is visible in completed assemblies, including joint edges.
   4. Finish Color: As selected by Architect from manufacturer's standard line.
   5. Fabrication: Joints and corners flush, hairline, and weatherproof, accurately fitted and secured; prepared to receive anchors and hardware; fasteners and attachments concealed from view; reinforced as required for imposed loads.
   6. Construction: Eliminate noises caused by wind and thermal movement, prevent vibration harmonics, and prevent "stack effect" in internal spaces.
   7. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.
   8. Expansion/Contraction: Provide for expansion and contraction within system components caused by cycling temperature range of 170 degrees F over a 12 hour period without causing detrimental effect to system components, anchorages, and other building elements.
   9. Movement: Allow for movement between storefront and adjacent construction, without damage to components or deterioration of seals.
   10. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.
   11. Air and Vapor Seal: Maintain continuous air barrier and vapor retarder throughout assembly, primarily in line with inside pane of glazing and inner sheet of infill panel and heel bead of glazing compound.

B. Performance Requirements:
   1. Wind Loads: Design and size components to withstand the specified load requirements without damage or permanent set, when tested in accordance with ASTM E330/E330M, using loads 1.5 times the design wind loads and 10 second duration of maximum load.
      a. Design Wind Loads: Comply with requirements of ASCE 7.
      b. Member Deflection: Limit member deflection to flexure limit of glass in any direction, with full recovery of glazing materials.
   2. Water Penetration Resistance on Manufactured Assembly: No uncontrolled water on interior face, when tested in accordance with ASTM E331 at pressure differential of 8 psf.
   3. Air Leakage Laboratory Test: Maximum of 0.06 cu ft/min sq ft of wall area, when tested in accordance with ASTM E283 at 6.27 psf pressure differential across assembly.
   4. Condensation Resistance Factor of Framing: 50, minimum, measured in accordance with AAMA 1503.

2.03 COMPONENTS

A. Aluminum Framing Members: Tubular aluminum sections, thermally broken with interior section insulated from exterior, drainage holes and internal weep drainage system.
   1. Framing members for interior applications need not be thermally broken.
   2. Glazing Stops: Flush.
   3. Structurally Reinforced Members: Extruded aluminum with internal reinforcement of structural steel member.

B. Glazing: As specified in Section 08 80 00.

C. Accessories
   1. Provide thermal head and jamb fillers.
   2. Provide compatible extension clips as recommended by supplier for installation in wide cavity walls.

2.04 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M).

B. Structural Steel Sections: ASTM A36/A36M; galvanized in accordance with requirements of ASTM A123/A123M.

C. Fasteners: Stainless steel or aluminum, non-magnetic, and warranted by the manufacturer to be noncorrosive and compatible with aluminum components, anchors and other components.

D. Exposed Flashings: Aluminum sheet, 20 gage, 0.032 inch minimum thickness; finish to match framing members.

E. Concealed Flashings: 0.018 inch thick stainless steel or 0.026 inch thick minimum extruded aluminum. Material shall be warranted by the manufacturer to be noncorrosive and compatible other components.

F. Glass: As specified in Section 08 80 00.

G. Concrete and Masonry Inserts: Cast iron, malleable iron, or hot-dip galvanized steel inserts complying with ASTM A 123.

H. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.

I. Glazing Accessories: As specified in Section 08 80 00.

J. Compression Weatherstripping: Standard replaceable compressible weatherstripping gaskets of molded neoprene complying with ASTM D 2000 or molded PVC complying with ASTM D 2287.

K. Sliding Weatherstripping: Standard replaceable weatherstripping of wool, polypropylene, or nylon woven pile, with nylon fabric or aluminum strip backing, complying with AAMA 701.2.

L. Shop and Touch-Up Primer for Steel Components: SSPC-Paint 25, zinc oxide, alkyd, linseed oil primer.

M. Touch-Up Primer for Galvanized Steel Surfaces: SSPC-Paint 20, zinc rich.

2.05 FINISHES

A. Class I Color Anodized Finish: AAMA 611 AA-M12C22A42 Integrally colored anodic coating not less than 0.7 mils thick.

B. Color: As selected by Hoffman from manufacturer's standard range.

C. Touch-Up Materials: As recommended by coating manufacturer for field application.

2.06 HARDWARE

A. Other Door Hardware: As specified in Section 08 71 00.

B. In general, finish on hardware shall match that of the aluminum storefront system regardless of the finish specified elsewhere in the project.

C. Automatic Door Operators and Actuators: As specified in Section 08 42 29.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify dimensions, tolerances, and method of attachment with other work.

B. Verify that wall openings and adjoining air and vapor seal materials are ready to receive work of this section.

3.02 INSTALLATION

A. Install wall system in accordance with manufacturer's instructions.

B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.

C. Provide alignment attachments and shims to permanently fasten system to building structure.

D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.

E. Provide thermal isolation where components penetrate or disrupt building insulation.

F. Install sill flashings. Turn up ends and edges; seal to adjacent work to form water tight dam.

G. Where fasteners penetrate sill flashings, make watertight by seating and sealing fastener heads to sill flashing.

H. Coordinate attachment and seal of perimeter air and vapor barrier materials.

I. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

J. Set thresholds in bed of sealant and secure.

K. Install hardware using templates provided. Installation includes wiring and terminating all electrical components.
   1. See Section 08 71 00 for hardware installation requirements.
   2. See Section 08 42 29 for operator and actuator installation requirements.

L. Install glass and infill panels in accordance with Section 08 80 00, using glazing method required to achieve performance criteria.

M. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

3.03 TOLERANCES

A. Maximum Variation from Plumb: 0.06 inch per 3 feet non-cumulative or 0.06 inch per 10 feet, whichever is less.

B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.

3.04 FIELD QUALITY CONTROL

3.05 ADJUSTING

A. Adjust operating hardware for smooth operation.

3.06 CLEANING

A. Remove protective material from pre-finished aluminum surfaces.

B. Remove excess sealant by method acceptable to sealant manufacturer.

3.07 PROTECTION

A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION

SECTION 08 51 13
ALUMINUM WINDOWS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Extruded aluminum windows with fixed sash, operating sash, and infill panels.

B. Factory glazing.

C. Insect screens.

1.02 RELATED REQUIREMENTS

A. Section 05 50 00 - Metal Fabrications: Steel lintels.

B. Section 06 10 00 - Rough Carpentry: Rough opening framing.

C. Section 07 25 00 - WEATHER BARRIERS: Sealing frame to weather barrier installed on adjacent construction.

D. Section 07 92 00 - Joint Sealants: Sealing joints between window frames and adjacent construction.

E. Section 08 80 00 - Glazing.

1.03 REFERENCE STANDARDS

A. AAMA/WDMA/CSA 101/I.S.2/A440 - North American Fenestration Standard/Specification for windows, doors, and skylights.

B. AAMA CW-10 - Care and Handling of Architectural Aluminum From Shop to Site.

C. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum.

D. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

E. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

F. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric).

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week before starting work of this section.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data / Shop Drawings: Provide component dimensions, information on glass and glazing, internal drainage details, and descriptions of hardware and accessories.
   1. Shop Drawings: Indicate opening dimensions, elevations of different types, framed opening tolerances, method for achieving air and vapor barrier seal to adjacent construction, anchorage locations, and installation requirements.
   2. Manufacturer's Installation Instructions: Include complete preparation, installation, and cleaning requirements.

C. Samples: Submit two samples, 1 x 4 inch in size illustrating finish colors for selection.

D. Grade Substantiation: Prior to submitting shop drawings or starting fabrication, submit one of the following showing compliance with specified grade:
   1. Evidence of AAMA Certification.
   2. Evidence of WDMA Certification.
   3. Evidence of CSA Certification.
   4. Test report(s) by independent testing agency itemizing compliance and acceptable to authorities having jurisdiction.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years of documented experience.

B. Provide aluminum window units from one source and produced by a single manufacturer.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of AAMA CW-10.

B. Protect finished surfaces with wrapping paper or strippable coating during installation. Do not use adhesive papers or sprayed coatings that bond to substrate when exposed to sunlight or weather.

1.08 FIELD CONDITIONS

A. Do not install sealants when ambient temperature is less than 40 degrees F.

B. Maintain this minimum temperature during and 24 hours after installation of sealants.

1.09 PROJECT CONDITIONS

A. Field Measurements: Check actual openings in field prior to fabrication. Coordinate fabrication tolerances to ensure a proper fit of window units.

1.10 WARRANTY

A. See Section 01 78 00 - CLOSEOUT SUBMITTALS, for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

C. Provide five year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units.

D. Provide five year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.

E. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Aluminum Windows:
   1. TRACO: www.traco.com/#sle.
   2. YKK AP America Inc: www.ykkap.com/#sle.
   3. Special-Lite; Product SL-450T.
   4. CRL US Aluminum; Product IT451.
   5. Oldcaste Building Envelope; Product HP-175
   6. Substitutions: See Section 01 60 00 - PRODUCT REQUIREMENTS.

2.02 WINDOWS

A. Aluminum Windows: Extruded aluminum frame and sash, factory fabricated, factory finished, with operating hardware, related flashings, and anchorage and attachment devices.
   1. Frame Depth: 4-1/2 inches.
   2. Operable Units: Double weatherstripped.
   3. Provide units factory glazed.
   4. Fabrication: Joints and corners flush, hairline, and weatherproof, accurately fitted and secured; prepared to receive anchors; fasteners and attachments concealed from view; reinforced as required for operating hardware and imposed loads.
   5. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.
   6. Movement: Accommodate movement between window and perimeter framing and deflection of lintel, without damage to components or deterioration of seals.

7. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.
8. Thermal Movement: Design to accommodate thermal movement caused by 180 degrees F surface temperature without buckling stress on glass, joint seal failure, damaging loads on structural elements, damaging loads on fasteners, reduction in performance or other detrimental effects.

B. Fixed, Non-Operable Type:
1. Construction: Thermally broken.
2. Glazing: Double; clear; low-e; tempered.
3. Exterior Finish: Class I natural anodized.
4. Interior Finish: Class I natural anodized.

2.03 PERFORMANCE REQUIREMENTS

A. Grade: AAMA/WDMA/CSA 101/I.S.2/A440 requirements for specific window type:
1. Performance Class (PC): R.

2.04 COMPONENTS

A. Frames: 2 inch wide x 4-1/2 inch deep profile; thermally broken with interior portion of frame insulated from exterior portion; flush glass stops of snap-on type.

B. Glazing: As specified in Section 08 80 00.

C. Reinforced Mullion: 2 inch profile of extruded aluminum with integral reinforcement of shaped steel structural section.

D. Insect Screens: Extruded aluminum frame with mitered and reinforced corners; screen mesh taut and secure to frame; secured to window with adjustable hardware allowing screen removal without use of tools.
1. Hardware: Spring loaded steel pins; four per screen unit.
2. Frame Finish: Same as frame and sash.

E. Fasteners: Galvanized steel.

F. Glazing Materials: As specified in Section 08 80 00.

G. Sealant for Setting Sills and Sill Flashing: Non-curing butyl type.
1. Refer to Section 07 92 00 for additional requirements.

2.05 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M), 6063 alloy, T6 temper.

B. Concealed Steel Items: Profiled to suit mullion sections; galvanized in accordance with ASTM A123/A123M.

2.06 FABRICATION

A. Accurately fit and secure joints and corners. Make joints flush, hairline, and weatherproof.

B. Prepare components to receive anchor devices.

C. Arrange fasteners and attachments to ensure concealment from view.

D. Prepare components with internal reinforcement for operating hardware.

E. Provide steel internal reinforcement in mullions as required to meet loading requirements.

2.07 FINISHES

A. Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41 Clear anodic coating not less than 0.7 mils thick.

B. Finish Color: As indicated on drawings.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that wall openings and adjoining air and vapor seal materials are ready to receive aluminum windows.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install windows in accordance with manufacturer's instructions.

B. Install window assembly in accordance with AAMA/WDMA/CSA 101/I.S.2/A440.

C. Attach window frame and shims to perimeter opening to accommodate construction tolerances and other irregularities.

D. Align window plumb and level, free of warp or twist. Maintain dimensional tolerances and alignment with adjacent work.

E. Install sill and sill end angles.

F. Provide thermal isolation where components penetrate or disrupt building insulation. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

G. Coordinate attachment and seal of perimeter air barrier and vapor retarder materials.

H. Install glass and infill panels in accordance with requirements specified in Section 08 80 00.

3.03 TOLERANCES

A. Maximum Variation from Level or Plumb: 1/16 inches every 3 ft non-cumulative or 1/8 inches per 10 ft, whichever is less.

3.04 ADJUSTING

A. Adjust hardware for smooth operation and secure weathertight closure.

3.05 CLEANING

A. Remove protective material from factory finished aluminum surfaces.

B. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.

C. Protect window surfaces from contact with contaminating substances resulting from construction operations. In addition, monitor window surfaces adjacent to and below exterior concrete and masonry surfaces during construction for presence of dirt, scum, alkaline deposits, stains, or other contaminants. If contaminating substances do contact window surfaces, remove contaminants immediately according to manufacturer's written recommendations.

END OF SECTION

SECTION 08 71 00

DOOR HARDWARE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Hardware for wood, aluminum, and hollow metal doors.

B. Hardware for fire-rated doors.

C. Electrically operated and controlled hardware.

D. Lock cylinders for doors that hardware is specified in other sections.

E. Thresholds.

F. Weatherstripping and gasketing.

1.02 RELATED REQUIREMENTS

A. Section 07 92 00 - Joint Sealants: Sealants for setting exterior door thresholds.

B. Section 08 06 71 - Door Hardware Schedule: Schedule of door hardware sets.

C. Section 08 11 13 - HOLLOW METAL DOORS AND FRAMES.

D. Section 08 14 16 - Flush Wood Doors.

E. Section 08 36 13 - Sectional Doors: Door hardware, except cylinders.

F. Section 08 43 13 - Aluminum-Framed Storefronts: Door hardware, except cylinders.

G. Section 28 10 00 - Access Control: Electronic access control devices.

H. Section 28 46 00 - FIRE ALARM SYSTEM: Electrical connection to release magnetic holders.

1.03 PRICE AND PAYMENT PROCEDURES

A. Allowances: See Section 01 21 00 - ALLOWANCES, for cash allowances affecting this section.

1.04 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design.

B. BHMA A156.1 - American National Standard for Butts and Hinges.

C. BHMA A156.2 - American National Standard for Bored and Preassembled Locks & Latches.

D. BHMA A156.3 - American National Standard for Exit Devices.

E. BHMA A156.4 - American National Standard for Door Controls - Closers.

F. BHMA A156.6 - American National Standard for Architectural Door Trim.

G. BHMA A156.7 - American National Standard for Template Hinge Dimensions.

H. BHMA A156.8 - American National Standard for Door Controls - Overhead Stops and Holders.

I. BHMA A156.14 - American National Standard for Sliding and Folding Door Hardware.

J. BHMA A156.15 - American National Standard for Release Devices - Closer Holder, Electromagnetic and Electromechanical.

K. BHMA A156.16 - American National Standard for Auxiliary Hardware.

L. BHMA A156.18 - American National Standard for Materials and Finishes.

M. BHMA A156.21 - American National Standard for Thresholds.

N. BHMA A156.22 - American National Standard for Door Gasketing and Edge Seal Systems, Builders Hardware Manufacturers Association.

O. BHMA A156.26 - American National Standard for Continuous Hinges.

P. BHMA A156.28 - American National Standard for Recommended Practices for Mechanical Keying Systems.

Q. BHMA A156.31 - American National Standard for Electric Strikes and Frame Mounted Actuators.

R. BHMA A156.36 - American National Standard for Auxiliary Locks.

S. BHMA A156.115 - American National Standard for Hardware Preparation in Steel Doors and Steel Frames.

T. BHMA A156.115W - Hardware Preparation in Wood Doors with Wood or Steel Frames.

U. ICC A117.1 - Accessible and Usable Buildings and Facilities.

V. ITS (DIR) - Directory of Listed Products.

W. NFPA 70 - National Electrical Code.

X. NFPA 80 - Standard for Fire Doors and Other Opening Protectives.

Y. NFPA 101 - Life Safety Code.

Z. NFPA 105 - Standard for Smoke Door Assemblies and Other Opening Protectives.

AA. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies.

AB. UL (DIR) - Online Certifications Directory.

AC. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the manufacture, fabrication, and installation of products that door hardware is installed on.

B. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.

C. Preinstallation Meeting: Convene a preinstallation meeting one week prior to commencing work of this section; attendance is required by affected installers and the following:
   1. Hoffman.
   2. Installer's Architectural Hardware Consultant (AHC).
   3. Hardware Installer.
   4. Owner's Security Consultant.

D. Furnish templates for door and frame preparation to manufacturers and fabricators of products requiring internal reinforcement for door hardware.

E. Keying Requirements Meeting:
   1. Attendance Required:
      a. Owner.
      b. Hoffman.
      c. Installer's Architectural Hardware Consultant (AHC).
      d. Hardware Installer.
      e. Owner's Security Consultant.
   2. Agenda:
      a. Establish keying requirements.
   3. Incorporate "Keying Requirements Meeting" decisions into keying submittal upon review of door hardware keying system including, but not limited to, the following:
   4. Record minutes and distribute copies within two days after meeting to participants, with two copies to Hoffman, Owner, participants, and those affected by decisions made.
   5. Deliver established keying requirements to manufacturers.

1.06 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data / Shop Drawings: Manufacturer's catalog literature for each type of hardware, marked to clearly show products to be furnished for this project, and includes construction details, material descriptions, finishes, and dimensions and profiles of individual components.
   1. Shop Drawings - Door Hardware Schedule: Submit detailed listing that includes each item of hardware to be installed on each door. Use door numbering scheme as included in Contract Documents.

a. Prepared by or under supervision of Architectural Hardware Consultant (AHC).
b. Provide complete description for each door listed.
c. Provide manufacturer's and product names, and catalog numbers; include functions, types, styles, sizes and finishes of each item.
d. Include account of abbreviations and symbols used in schedule.

2. Shop Drawings - Electrified Door Hardware: Submit diagrams for power, signal, and control wiring for electrified door hardware that include details of interface with building safety and security systems. Provide elevations and diagrams for each electrified door opening as follows:
   a. Prepared by or under supervision of Architectural Hardware Consultant (AHC) and Electrified Hardware Consultant (EHC).
   b. Elevations: Submit front and back elevations of each door opening showing electrified devices with connections installed and an operations narrative describing how opening operates from either side at any given time.
   c. Diagrams: Submit point-to-point wiring diagram that shows each device in door opening system with related colored wire connections to each device.
3. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

C. Maintenance Data: Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.
   1. Bitting List: List of combinations as furnished.

D. Keying Schedule:
   1. Submit three (3) copies of Keying Schedule in compliance with requirements established during Keying Requirements Meeting unless otherwise indicated.

E. Maintenance Materials and Tools: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - PRODUCT REQUIREMENTS, for additional provisions.
   2. Lock Cylinders: five for each master keyed group.
   3. Tools: One set of each special wrench or tool applicable for each different or special hardware component, whether supplied by hardware component manufacturer or not.

1.07 QUALITY ASSURANCE

A. Standards for Fire-Rated Doors: Maintain one copy of each referenced standard on site, for use by Hoffman and Contractor.

B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years of documented experience.

C. Installer Qualifications: Company specializing in performing work of the type specified for commercial door hardware with at least five years of documented experience and approved by manufacturer.

D. Supplier Qualifications: Company with certified Architectural Hardware Consultant (AHC) and Electrified Hardware Consultant (EHC) to assist in work of this section.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Package hardware items individually; label and identify each package with door opening code to match door hardware schedule.

1.09 WARRANTY

A. See Section 01 78 00 - CLOSEOUT SUBMITTALS, for additional warranty requirements.

B. Warranty: Submit manufacturer's warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

C. Warranty against defects in material and workmanship for period indicated, from Date of Substantial Completion.
   1. Closers: Five years, minimum.
   2. Exit Devices: Three years, minimum.

3. Locksets and Cylinders: Three years, minimum.
4. Other Hardware: Two years, minimum.

PART 2 PRODUCTS

2.01 DESIGN AND PERFORMANCE CRITERIA

A. Provide specified door hardware as required to make doors fully functional, compliant with applicable codes, and secure to extent indicated.

B. Provide individual items of single type, of same model, and by same manufacturer.

C. Provide door hardware products that comply with the following requirements:
1. Applicable provisions of federal, state, and local codes.
2. Accessibility: ADA Standards and ICC A117.1.
3. Applicable provisions of NFPA 101.
4. Fire-Rated Doors: NFPA 80, listed and labeled by qualified testing agency for fire protection ratings indicated, based on testing at positive pressure in accordance with NFPA 252 or UL 10C.
5. Hardware on Fire-Rated Doors: Listed and classified by UL (DIR), ITS (DIR), testing firm acceptable to authorities having jurisdiction, or _____ as suitable for application indicated.
6. Hardware Preparation for Steel Doors and Steel Frames: BHMA A156.115.
7. Hardware Preparation for Wood Doors with Wood or Steel Frames: BHMA A156.115W.
8. Products Requiring Electrical Connection: Listed and classified by UL (DIR) as suitable for the purpose specified.

D. Electrically Operated and/or Controlled Hardware: Provide necessary power supplies, power transfer hinges, relays, and interfaces as required for proper operation; provide wiring between hardware and control components and to building power connection in compliance with NFPA 70.
1. Refer to Section 28 10 00 for additional access control system requirements.

E. Lock Function: Provide lock and latch function numbers and descriptions of manufacturer's series. Refer to Door Hardware Schedule.

F. Fasteners:
1. Provide fasteners of proper type, size, quantity, and finish that comply with commercially recognized standards for proposed applications.
   a. Aluminum fasteners are not permitted.
   b. Provide phillips flat-head screws with heads finished to match door surface hardware unless otherwise indicated.
2. Provide spacers or sex bolts with sleeves for through bolting of hollow metal doors and frames.
3. Fire-Rated Applications: Comply with NFPA 80.
   a. Provide wood or machine screws for hinges mortised to doors or frames, strike plates to frames, and closers to doors and frames.
   b. Provide steel through bolts for attachment of surface mounted closers, hinges, or exit devices to door panels unless proper door blocking is provided.

2.02 HINGES

A. Manufacturers:
1. McKinney; an Assa Abloy Group company: www.assaabloydss.com.
2. Hager Companies: www.hagerco.com.
3. Stanley, dormakaba Group: www.stanleyhardwarefordoors.com.
4. Substitutions: See Section 01 60 00 - PRODUCT REQUIREMENTS.

B. Hinges: Comply with BHMA A156.1, Grade 1.
1. Butt Hinges: Comply with BHMA A156.1 and BHMA A156.7 for templated hinges.
   a. Provide hinge width required to clear surrounding trim.
2. Continuous Hinges: Comply with BHMA A156.26.
3. Provide hinges on every swinging door.

4. Provide ball-bearing hinges at each door with closer.
5. Provide non-removable pins on exterior outswinging doors.
6. Provide following quantity of butt hinges for each door:
    a. Doors up to 60 inches High: Two hinges.
    b. Doors From 60 inches High up to 90 inches High: Three hinges.
    c. Doors 90 inches High up to 120 inches High: Four hinges.

2.03 TRACK AND HANGERS

A. Manufacturers:
1. Johnson Hardware: www.johnsonhardware.com.
2. Substitutions: See Section 01 60 00 - PRODUCT REQUIREMENTS.

B. Pocket Doors: Provide pocket door kit, including header assembly, split studs, hangers, door hanger plates, bumper, guides, floor plate, and end bracket.

C. Sliding and Bifolding Door Hardware: Comply with BHMA A156.14.
1. Provide track, hanger fasteners, guides, and pulls; size track and hangers in accordance with manufacturer's recommendations for weight of doors.
2. Provide one pull for each pair of panels hinged together.

D. Door Weight: Medium; medium frequency of use with 150 to 200 lbs door weight.

2.04 FLUSH BOLTS

A. Manufacturers:
1. Adams Rite or McKinney, an Assa Abloy Group company: www.assaabloydss.com.
2. Ives, an Allegion brand: www.allegion.com/us.
3. Rockwood: www.rockwoodmfg.com.
4. Substitutions: See Section 01 60 00 - PRODUCT REQUIREMENTS.

B. Flush Bolts: Comply with BHMA A156.16, Grade 1.
1. Flush Bolt Throw: 3/4 inch, minimum.
2. Provides extension bolts in leading edge of door, one bolt into floor, one bolt into top of frame.
    a. Pairs of Swing Doors: At inactive leaves, provide flush bolts of type as required to comply with code.
3. Provide dustproof floor strike for bolt into floor, except at metal thresholds.
4. Manual Flush Bolts: Provide lever extensions for top bolt at over-sized doors.
5. Self-Latching Flush Bolts: Automatically latch upon closing of door; manually retracted; located on inactive leaf of pair of doors.
6. Automatic Flush Bolts: Automatically latch upon closing of door; automatic retraction of bolts when active leaf is opened; located on inactive leaf of pair of doors.

2.05 EXIT DEVICES

A. Manufacturers:
1. Basis of Design: VonDuprin.
2. Stanley, dormakaba Group: www.stanleyhardwarefordoors.com/#sle.
3. Von Duprin, an Allegion brand; 98/99 series: www.allegion.com/us.
4. Substitutions: See Section 01 60 00 - PRODUCT REQUIREMENTS.

B. Exit Devices: Comply with BHMA A156.3, Grade 1.
1. Lever design to match lockset trim.
2. Provide cylinder with cylinder dogging or locking trim.
3. Provide exit devices properly sized for door width and height.
4. Provide strike as recommended by manufacturer for application indicated.
5. Provide less bottom rod (LBR) at scheduled locations to eliminate use of floor mounted strikes.
6. Provide UL (DIR) listed exit device assemblies for fire-rated doors and panic device assemblies for non-fire-rated doors.
7. For electrical options, provide quick connect plug-in pre-wired connectors.

2.06 ELECTRIC STRIKES

A. Manufacturers:
   1. Adams Rite, HES, or Securitron; an Assa Abloy Group company: www.assaabloydss.com.
   2. Von Duprin: www.allegion.com/us.
   3. Substitutions: See Section 01 60 00 - PRODUCT REQUIREMENTS.

B. Electric Strikes: Comply with BHMA A156.31, Grade 1.
   1. Provide UL (DIR) listed burglary-resistant electric strike; style to suit locks.
   2. Provide non-handed 12/24VDC electric strike suitable for door frame material and scheduled lock configuration.
   3. Provide field selectable Fail Safe/Fail Secure modes.
   4. Connect electric strikes into fire alarm where non-rated doors are scheduled to release with fire or sprinkler alarm condition.

2.07 CYLINDRICAL LOCKS

A. Manufacturers:
   1. Basis of Design: Schlage.
   2. Best, dormakaba Group: www.bestaccess.com.
   3. Schlage, an Allegion brand; ND Series: www.allegion.com/us.
   4. Substitutions: See Section 01 60 00 - PRODUCT REQUIREMENTS.

B. Cylindrical Locks (Bored): Comply with BHMA A156.2, Grade 1, 4000 Series.
   1. Bored Hole: 2-1/8 inch diameter.
   2. Latchbolt Throw: 1/2 inch, minimum.
   3. Backset: 2-3/4 inch unless otherwise indicated.
   4. Strikes: Provide manufacturer's standard strike for each latchset or lockset with strike box and curved lip extending to protect frame in compliance with indicated requirements.
      a. Finish: To match lock or latch.

2.08 AUXILIARY LOCKS (DEADLOCKS)

A. Manufacturers:
   1. Basis of Design: Schlage.
   2. Best, dormakaba Group: www.bestaccess.com/#sle.
   3. Schlage, an Allegion brand; B Series: www.allegion.com/us.
   4. Substitutions: See Section 01 60 00 - PRODUCT REQUIREMENTS.

B. Auxiliary Locks (Deadlocks): Comply with BHMA A156.36, Grade 1.
   1. Type: Bored (cylindrical).
   2. Backset: 2-3/4 inch, unless otherwise indicated.
   3. Bolt Throw: 1/2 inch, with latch made of hardened steel.
   4. Provide strike that matches frame.

2.09 DOOR PULLS AND PUSH PLATES

A. Manufacturers:
   1. Rockwood; an Assa Abloy Group company: www.assaabloydss.com.
   2. Hager Companies: www.hagerco.com.
   3. Substitutions: See Section 01 60 00 - PRODUCT REQUIREMENTS.

B. Door Pulls and Push Plates: Comply with BHMA A156.6.
   1. Pull Type: Straight, unless otherwise indicated.
   2. Push Plate Type: Flat, with square corners, unless otherwise indicated.
      a. Edges: Beveled, unless otherwise indicated.
   3. Material: Stainless steel, unless otherwise indicated.
   4. On solid doors, provide matching door pull and push plate on opposite faces.
   5. On glazed storefront doors, provide matching door pulls/push plates on both faces unless otherwise indicated.

2.10 DOOR PULLS AND PUSH BARS

A. Manufacturers:
   1. Rockwood; an Assa Abloy Group company: www.assaabloydss.com.
   2. Hager Companies: www.hagerco.com/#sle.
   3. Substitutions: See Section 01 60 00 - PRODUCT REQUIREMENTS.

B. Door Pulls and Push Bars: Comply with BHMA A156.6.
   1. Bar Type: Bar set, unless otherwise indicated.
   2. Material: Aluminum, unless otherwise indicated.

2.11 COORDINATORS

A. Manufacturers:
   1. Rockwood; an Assa Abloy Group company: www.assaabloydss.com.
   2. Ives, an Allegion brand: www.allegion.com/us.

B. Coordinators: Provide on doors having closers and self-latching or automatic flush bolts to ensure that inactive door leaf closes before active door leaf.
   1. Type: Bar, unless otherwise indicated.
   2. Material: Aluminum, unless otherwise indicated.
   3. Ensure that coordination of other door hardware affected by placement of coordinators and carry bar is applied properly for completely operable installation.

2.12 CLOSERS

A. Manufacturers; Surface Mounted:
   1. Basis of Design: LCN.
   2. LCN, an Allegion brand; 4040 Series: www.allegion.com/us.
   3. Stanley, dormakaba Group: www.stanleyhardwarefordoors.com.

B. Closers: Comply with BHMA A156.4, Grade 1.
   1. Type: Surface mounted to door.
   2. Provide door closer on each exterior door.
   3. Provide door closer on each fire-rated and smoke-rated door.
      a. Spring hinges are not an acceptable self-closing device, unless otherwise indicated.
   4. Where an overlapping astragal is included on pairs of swinging doors, provide coordinator to ensure door leaves close in proper order.
   5. At corridor entry doors, mount closer on room side of door.
   6. At outswinging exterior doors, mount closer on interior side of door.

2.13 OVERHEAD STOPS AND HOLDERS

A. Manufacturers:
   1. Rixson or Sargent; an Assa Abloy Group company: www.assaabloydss.com.
   2. Glynn-Johnson, an Allegion brand: www.allegion.com/us.
   3. Substitutions: See Section 01 60 00 - PRODUCT REQUIREMENTS.

B. Overhead Stops and Holders (Door Checks): Comply with BHMA A156.8, Grade 1.
   1. Stop is not required if positive stop feature is specified for door closer; positive stop feature of door closer is not an acceptable substitute for a stop, unless otherwise indicated.

2.14 PROTECTION PLATES

A. Manufacturers:
   1. Rockwood; an Assa Abloy Group company: www.assaabloydss.com.
   2. Ives, an Allegion brand: www.allegion.com/us.
   3. Substitutions: See Section 01 60 00 - PRODUCT REQUIREMENTS.

B. Protection Plates: Comply with BHMA A156.6.

C. Metal Properties: Stainless steel.
   1. Metal, Heavy Duty: Thickness 0.062 inch, minimum.

D. Edges: Beveled, on four sides unless otherwise indicated.

E. Fasteners: Countersunk screw fasteners.

2.15 KICK PLATES

A. Manufacturers:
   1. Ives, an Allegion brand: www.allegion.com/us.
   2. Rockwood: www.rockwoodmfg.com.
   3. Substitutions: See Section 01 60 00 - PRODUCT REQUIREMENTS.

B. Kick Plates: Provide along bottom edge of push side of every door with closer, except aluminum storefront and glass entry doors, unless otherwise indicated.
   1. Size: 8 inch high by 2 inch less door width (LDW) on push side of door.

2.16 ELECTROMAGNETIC DOOR HOLDERS

A. Manufacturers:
   1. DORMA USA, Inc; EM Series: www.dorma.com.
   2. Substitutions: See Section 01 60 00 - PRODUCT REQUIREMENTS.

B. Electromagnetic Door Holders: Comply with BHMA A156.15.
   1. Type: Wall mounted, single unit, standard duty, with strike plate attached to door.
   2. Holding Force, Standard Duty: 40 lbs-force, minimum.
   3. Voltage: 12/24VDC, and provide power supplies by same manufacturer as holders.
   4. Provide interface with fire detectors and fire-alarm system for fire-rated door assemblies.

2.17 WALL STOPS

A. Manufacturers:
   1. Rockwood; an Assa Abloy Group company; _____: www.assaabloydss.com/#sle.
   2. Hager Companies: www.hagerco.com/#sle.
   3. Substitutions: See Section 01 60 00 - PRODUCT REQUIREMENTS.

B. Wall Stops: Comply with BHMA A156.16, Grade 1 and Resilient Material Retention Test as described in this standard.
   1. Provide wall stops to prevent damage to wall surface upon opening door.
   2. Type: Bumper, concave, wall stop.
   3. Material: Stainless steel housing with rubber insert.

2.18 THRESHOLDS

A. Manufacturers:
   1. Pemko; an Assa Abloy Group company: www.assaabloydss.com.
   2. National Guard Products, Inc: www.ngpinc.com/#sle.
   3. Substitutions: See Section 01 60 00 - PRODUCT REQUIREMENTS.

B. Thresholds: Comply with BHMA A156.21.
   1. Provide threshold at each exterior door, unless otherwise indicated.
   2. Type: Flat surface.
   3. Material: Aluminum.
   4. Threshold Surface: Thermally broken.
   5. Field cut threshold to profile of frame and width of door sill for tight fit.
   6. Provide non-corroding fasteners at exterior locations.

2.19 WEATHERSTRIPPING AND GASKETING

A. Manufacturers:
   1. Pemko; an Assa Abloy Group company: www.assaabloydss.com/#sle.
   2. National Guard Products, Inc: www.ngpinc.com/#sle.
   3. Substitutions: See Section 01 60 00 - PRODUCT REQUIREMENTS.

B. Weatherstripping and Gasketing: Comply with BHMA A156.22.
   1. Head and Jamb Type: Adjustable.
   2. Door Sweep Type: Encased in retainer.
   3. Material: Aluminum, with brush weatherstripping.

4. Provide gasketing for smoke and draft control doors that complies with local codes, requirements of assemblies tested in accordance with UL 1784.
5. Provide weatherstripping on each exterior door at head, jambs, and meeting stiles of door pairs, unless otherwise indicated; .
6. Provide door bottom sweep on each exterior door, unless otherwise indicated.
7. Provide sound-rated gasketing and automatic door bottom on doors indicated as "Sound-Rated", "Acoustical", or with "Sound Transmission Class (STC) rating"; fabricate as continuous gasketing, do not cut or notch gasketing material.

2.20 SILENCERS

A. Silencers: Provide at equal locations on door frame to mute sound of door's impact upon closing.
1. Single Door: Provide three on strike jamb of frame.
2. Pair of Doors: Provide two on head of frame, one for each door at latch side.
3. Material: Rubber, gray color.

2.21 KEY CABINET

A. Key Cabinet: Sheet steel construction, piano hinged door with key lock; BHMA A156.28.
1. Mounting: Wall-mounted.
2. Capacity: Actual quantity of keys, plus 25 percent additional capacity.
3. Size key hooks to hold 6 keys each.
4. Finish: Baked enamel, manufacturer's standard color.
5. Key cabinet lock to building keying system.

2.22 FIRE DEPARTMENT LOCK BOX

A. Manufacturers:
1. Knox Company; Knox-Box Rapid Entry System: www.knoxbox.com.
2. Substitutions: See Section 01 60 00 - PRODUCT REQUIREMENTS.

B. Fire Department Lock Box:
1. Coordinate type required with local authorities.
2. Heavy-duty, surface mounted, solid stainless-steel box with hinged door and interior gasket seal; single drill resistant lock with dust covers and tamper alarm.
3. Capacity: Holds 10 keys.
4. Finish: Manufacturer's standard dark bronze.

2.23 FINISHES

A. Finishes: Provide door hardware of same finish, unless otherwise indicated.
1. Primary Finish: 625; bright chromium plated over nickel, with brass or bronze base material (former US equivalent US26); BHMA A156.18.
2. Exceptions:
a. Where base material metal is specified to be different, provide finish that is an equivalent appearance in accordance with BHMA A156.18.
b. Hinges for Fire-Rated Doors: Steel base material with painted finish, in compliance with NFPA 80.
c. Aluminum Surface Trim and Gasket Housings: Anodized to match door panel finish, not other hardware, unless otherwise indicated.
d. Hardware for Aluminum Storefront Doors: Finished to match door panel finish, except at hand contact surfaces provide stainless steel with satin finish, unless otherwise indicated.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install hardware in accordance with manufacturer's instructions and applicable codes.

B. Install hardware on fire-rated doors and frames in accordance with applicable codes and NFPA 80.

C. Install hardware for smoke and draft control doors in accordance with NFPA 105.

D. Use templates provided by hardware item manufacturer.

E. Do not install surface mounted items until application of finishes to substrate are fully completed.

F. Door Hardware Mounting Heights: Distance from finished floor to center line of hardware item. As indicated in following list; unless noted otherwise in Door Hardware Schedule or on drawings.
   1. Mounting heights in compliance with ADA Standards:
      a. Locksets: 40-5/16 inch.
      b. Push Plates/Pull Bars: 42 inch.
      c. Deadlocks (Deadbolts): 48 inch.
      d. Exit Devices: 40-5/16 inch.

G. Set exterior door thresholds with full-width bead of elastomeric sealant at each point of contact with floor providing a continuous weather seal; anchor thresholds with stainless steel countersunk screws.

3.02 FIELD QUALITY CONTROL

A. Perform field inspection and testing under provisions of Section 01 40 00 - Quality Requirements.

B. Provide an Architectural Hardware Consultant (AHC) to inspect installation and certify that hardware and installation has been furnished and installed in accordance with manufacturer's instructions and as specified.

3.03 ADJUSTING

A. Adjust work under provisions of Section 01 70 00 - EXECUTION AND CLOSEOUT REQUIREMENTS.

B. Adjust hardware for smooth operation.

C. Adjust gasketing for complete, continuous seal; replace if unable to make complete seal.

3.04 CLEANING

A. Clean finished hardware in accordance with manufacturer's written instructions after final adjustments have been made.

B. Clean adjacent surfaces soiled by hardware installation.

C. Replace items that cannot be cleaned to manufacturer's level of finish quality at no additional cost.

3.05 PROTECTION

A. Protect finished Work under provisions of Section 01 70 00 - EXECUTION AND CLOSEOUT REQUIREMENTS.

B. Do not permit adjacent work to damage hardware or finish.

END OF SECTION

SECTION 08 80 00

GLAZING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Insulating glass units.

B. Glazing units.

C. Glazing compounds and accessories.

1.02 RELATED REQUIREMENTS

A. Section 07 92 00 - Joint Sealants: Sealants for other than glazing purposes.

B. Section 08 11 13 - HOLLOW METAL DOORS AND FRAMES: Glazed lites in doors and borrowed lites.

C. Section 08 14 16 - Flush Wood Doors: Glazed lites in doors.

D. Section 08 43 13 - Aluminum-Framed Storefronts: Glazing furnished as part of storefront assembly.

E. Section 08 51 13 - Aluminum Windows: Glazing furnished by window manufacturer.

F. Section 08 83 00 - Mirrors.

G. Section 10 28 00 - Toilet, Bath, and Laundry Accessories: Mirrors.

1.03 REFERENCE STANDARDS

A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials.

B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings, Safety Performance Specifications and Methods of Test.

C. ASCE 7 - Minimum Design Loads for Buildings and Other Structures.

D. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers.

E. ASTM C1036 - Standard Specification for Flat Glass.

F. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass.

G. ASTM C1172 - Standard Specification for Laminated Architectural Flat Glass.

H. ASTM C1376 - Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass.

I. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings.

J. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation.

K. GANA (GM) - GANA Glazing Manual.

L. GANA (SM) - GANA Sealant Manual.

M. ITS (DIR) - Directory of Listed Products.

N. NFRC 100 - Procedure for Determining Fenestration Product U-factors.

O. NFRC 200 - Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence.

P. NFRC 300 - Test Method for Determining the Solar Optical Properties of Glazing Materials and Systems.

Q. UL (DIR) - Online Certifications Directory.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by each of the affected installers.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data on Insulating Glass Unit, Glazing Unit, Plastic Sheet Glazing Unit, and Plastic Film Glazing Types: Provide structural, physical and environmental characteristics, size limitations, special handling and installation requirements.

1. Glazing Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.

C. Samples: Submit two samples 12 by 12 inch in size of glass units.

D. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning glazing components.

1.06 QUALITY ASSURANCE

A. Perform Work in accordance with GANA (GM) and GANA (SM) for glazing installation methods.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

C. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years documented experience.

D. Single-Source Responsibility: Obtain glass and glazing products from one source for each type of product specified.

1.07 DELIVERY, STORAGE, AND PROTECTION

A. Protect glazing materials in accordance with manufacturer's requirements and as needed to prevent damage to glass and glazing materials from condensation, sun exposure, temperature changes, or other causes.

1.08 FIELD CONDITIONS

A. Environmental Conditions: Do not proceed with glazing when ambient and substrate temperature conditions are outside the limits permitted by glazing materials manufacturer or when glazing channel substrates are wet from rain, frost, condensation, or other causes.

B. Do not install glazing when ambient temperature is less than 50 degrees F.

C. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.09 WARRANTY

A. See Section 01 78 00 - CLOSEOUT SUBMITTALS, for additional warranty requirements.

B. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

C. Insulating Glass Units: Provide a ten (10) year manufacturer warranty to include coverage for seal failure, interpane dusting or misting, including replacement of failed units.

D. Laminated Glass: Provide a ten (10) year manufacturer warranty to include coverage for delamination, including replacement of failed units.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Float Glass Manufacturers:

1. AGC Glass Company North America, Inc: www.us.agc.com.
2. Cardinal Glass Industries: www.cardinalcorp.com.
3. Guardian Industries Corp: www.sunguardglass.com.
4. Pilkington North America Inc: www.pilkington.com/na.
5. PPG Industries, Inc: www.ppgideascapes.com.
6. Oldcastle Building Envelope: www.obe.com.

7. Substitutions: Refer to Section 01 60 00 - PRODUCT REQUIREMENTS.

B. Laminated Glass Manufacturers:
   1. Cardinal Glass Industries: www.cardinalcorp.com.
   2. Viracon, Architectural Glass segment of Apogee Enterprises, Inc: www.viracon.com.
   3. Substitutions: Refer to Section 01 60 00 - PRODUCT REQUIREMENTS.

2.02 PERFORMANCE REQUIREMENTS - EXTERIOR GLAZING ASSEMBLIES

A. Provide type and thickness of exterior glazing assemblies to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of glass.
   1. Design Pressure: Calculated in accordance with ASCE 7.
   2. Comply with ASTM E1300 for design load resistance of glass type, thickness, dimensions, and maximum lateral deflection of supported glass.
   3. Provide glass edge support system sufficiently stiff to limit the lateral deflection of supported glass edges to less than 1/175 of their lengths under specified design load.
   4. Glass thicknesses listed are minimum.

B. Vapor Retarder and Air Barrier Seals: Provide completed assemblies that maintain continuity of building enclosure vapor retarder and air barrier.
   1. In conjunction with vapor retarder and joint sealer materials described in other sections.
   2. To utilize the inner pane of multiple pane insulating glass units for the continuity of the vapor retarder and air barrier seal.
   3. To maintain a continuous vapor retarder and air barrier throughout the glazed assembly from glass pane to heel bead of glazing sealant.

C. Thermal and Optical Performance: Provide exterior glazing products with performance properties as indicated. Performance properties are in accordance with manufacturer's published data as determined with the following procedures and/or test methods:
   1. Center of Glass U-Value: Comply with NFRC 100 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
   2. Center of Glass Solar Heat Gain Coefficient (SHGC): Comply with NFRC 200 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
   3. Solar Optical Properties: Comply with NFRC 300 test method.

2.03 GLASS MATERIALS

A. Float Glass: Provide float glass based glazing unless otherwise indicated.
   1. Annealed Type: ASTM C1036, Type I - Transparent Flat, Class 1 - Clear, Quality - Q3.
   2. Kind HS - Heat-Strengthened Type: Complies with ASTM C1048.
   3. Kind FT - Fully Tempered Type: Complies with ASTM C1048.
   4. Fully Tempered Safety Glass: Complies with ANSI Z97.1 or 16 CFR 1201 criteria for safety glazing used in hazardous locations.

B. Laminated Glass: Float glass laminated in accordance with ASTM C1172.
   1. Laminated Safety Glass: Complies with ANSI Z97.1 - Class B or 16 CFR 1201 - Category II impact test requirements.

2.04 INSULATING GLASS UNITS

A. Manufacturers:
   1. Cardinal Glass Industries: www.cardinalcorp.com.
   2. PPG Industries, Inc: www.ppgideascapes.com.
   3. Substitutions: Refer to Section 01 60 00 - PRODUCT REQUIREMENTS.

B. Insulating Glass Units: Types as indicated.
   1. Durability: Certified by an independent testing agency to comply with ASTM E2190.
   2. Coated Glass: Comply with requirements of ASTM C1376 for pyrolytic (hard-coat) or magnetic sputter vapor deposition (soft-coat) type coatings on flat glass; coated vision glass, Kind CV; coated overhead glass, Kind CO; or coated spandrel glass, Kind CS.
   3. Metal Edge Spacers: Aluminum, bent and soldered corners.

4. Spacer Color: Black.
5. Edge Seal:
    a. Dual-Sealed System: Provide polyisobutylene sealant as primary seal applied between spacer and glass panes, and silicone sealant as secondary seal applied around perimeter.
    b. Color: Black.
6. Purge interpane space with dry air, hermetically sealed.

C. Type IG-1 - Insulating Glass Units: Vision glass, double glazed.
1. Applications: Exterior glazing unless otherwise indicated.
2. Space between lites filled with air.
3. Outboard Lite: Annealed float glass, 1/4 inch thick, minimum.
    a. Tint: Gray.
    b. Coating: Low-E (passive type), on #2 surface.
4. Inboard Lite: Fully tempered float glass, 1/4 inch thick, minimum.
    a. Tint: Clear.
5. Total Thickness: 5/8 - 1 inch.
6. Thermal Transmittance (U-Value), Winter - Center of Glass: less than 0.36, nominal.
7. Visible Light Transmittance (VLT): _____ percent, nominal.
8. Solar Heat Gain Coefficient (SHGC): _____, nominal.
9. Glazing Method: Dry glazing method, gasket glazing.

D. Type IG-2 - Insulating Glass Units: Vision glass.
1. Applications: Units for north facing clerestory and shaded clerestory.
2. Space between lites filled with air.
3. Outboard Lite: Annealed float glass, 1/8 inch thick, minimum.
    a. Tint: Gray.
    b. Coating: Low-E (passive type), on #2 surface.
4. Inboard Lite: Fully tempered float glass, 1/8 inch thick, minimum.
    a. Tint: Clear.
5. Total Thickness: 5/8 -1 inch.
6. Thermal Transmittance (U-Value), Winter - Center of Glass: less than 0.36, nominal.
7. Visible Light Transmittance (VLT): 35 - 40 percent, maximum.
8. Solar Heat Gain Coefficient (SHGC): 0.34 percent, maximum.
9. Glazing Method: Dry glazing method, gasket glazing.

E. Type IG-3 - Insulating Glass Units: Spandrel glazing.
1. Applications: Lighter view glass and doors.
2. Space between lites filled with air.
3. Outboard Lite: Annealed float glass, 1/8 inch thick, minimum.
    a. Tint: Gray.
    b. Coating: Low-E (passive type), on #2 surface.
4. Inboard Lite: Fully tempered float glass, 1/4 inch thick.
    a. Tint: Clear.
5. Total Thickness: 5/8 - 1 inch.
6. Thermal Transmittance (U-Value), Winter - Center of Glass: Less than 0.36, nominal.
7. Visible Light Transmittance (VLT): 18-25 percent, maximum.
8. Solar Heat Gain Coefficient (SHGC): 0.26 percent, maximum.
9. Glazing Method: Dry glazing method, gasket glazing.

F. Type IG-7 - Insulating Glass Units: Safety glazing.
1. Applications:
    a. Glazed lites in exterior doors.
    b. Glazed sidelights and panels next to doors.
    c. Other locations required by applicable federal, state, and local codes and regulations.
    d. Other locations indicated on drawings.
2. Space between lites filled with air.

3. Glass Type: Same as other vision glazing except use fully tempered float glass for both outboard and inboard lites.
4. Tint: Clear.
5. Glazing Method: Dry glazing method, gasket glazing.

2.05 GLAZING UNITS

A. Type G-2 - Monolithic Interior Vision Glazing:
1. Applications: Interior glazing unless otherwise indicated.
2. Glass Type: Annealed float glass.
3. Tint: Clear.
4. Thickness: 1/4 inch, nominal.

B. Type G-4 - Fire-Protection-Rated Glazing: Type, thickness, and configuration of glazing that contains flame, smoke, and does not block radiant heat, as required to achieve fire-doors indicated fire-rating period of 90 minutes or less.
1. Applications:
a. Glazing in fire-rated door assembly.
b. Glazing in fire-rated window assembly.
c. Other locations as indicated on drawings.
2. Thickness: 1/4 inch.
3. Provide products listed by ITS (DIR) or UL (DIR) and approved by authorities having jurisdiction.
4. Safety Glazing Certification: 16 CFR 1201 Category II.
5. Glazing Method: As required for fire rating.
6. Fire-Rating Period: As indicated on drawings.

C. Type G-5 - Monolithic Safety Glazing: Non-fire-rated.
1. Applications:
a. Glazed lites in doors, except fire doors.
b. Sliding glass doors.
c. Glazed sidelights to doors, except in fire-rated walls and partitions.
d. Other locations required by applicable federal, state, and local codes and regulations.
e. Other locations indicated on drawings.
2. Glass Type: Fully tempered safety glass as specified.
3. Tint: Clear.
4. Thickness: 1/4 inch, nominal.

D. Type G-12 - Back-Painted Safety Glass: Back-painted on one surface and highly opaque.
1. Applications: Locations as indicated on drawings.
2. Glazing Type: Monolithic; laminated safety glass; low iron.
3. Thickness: As required for application.
4. Size: As indicated on drawings
5. Cutting: Straight; prior to heat-treatment.
6. Colors: As selected by Architect from manufacturers standard line.
7. Finish: Glossy surface.
8. Glazing Method: Dry glazing method, gasket glazing.

2.06 ACCESSORIES

A. Setting Blocks: Silicone, with 80 to 90 Shore A durometer hardness; ASTM C864 Option II. Length of 0.1 inch for each square foot of glazing or minimum 4 inch by width of glazing rabbet space minus 1/16 inch by height to suit glazing method and pane weight and area.

B. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness; ASTM C864 Option II. Minimum 3 inch long by one half the height of the glazing stop by thickness to suit application, self adhesive on one face.

C. Edge Blocks: Neoprene of hardness required to limit glass lateral movement (side walking).

D. Glazing Tape: Closed cell polyvinyl chloride (PVC) foam, coiled on release paper over adhesive on two sides, maximum water absorption by volume of 2 percent, designed for compression of 25 percent to effect an air barrier and vapor retarder seal; ____x____ inch size.

E. Glazing Gaskets: Resilient silicone extruded shape to suit glazing channel retaining slot; ASTM C864 Option II; color black.

F. Glazing Clips: Manufacturer's standard type.

2.07 SOURCE QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

PART 3 EXECUTION

3.01 VERIFICATION OF CONDITIONS

A. Verify that openings for glazing are correctly sized and within tolerances, including those for size, squareness, and offsets at corners.

B. Verify that the minimum required face and edge clearances are being provided.

C. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and support framing is ready to receive glazing system.

D. Proceed with glazing system installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Clean contact surfaces with appropriate solvent and wipe dry within maximum of 24 hours before glazing. Remove coatings that are not tightly bonded to substrates.

B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.

C. Prime surfaces scheduled to receive sealant where required for proper sealant adhesion.

3.03 INSTALLATION, GENERAL

A. Install glazing in compliance with written instructions of glass, gaskets, and other glazing material manufacturers, unless more stringent requirements are indicated, including those in glazing referenced standards.

B. Do not exceed edge pressures around perimeter of glass lites as stipulated by glass manufacturer.

C. Set glass lites of system with uniform pattern, draw, bow, and similar characteristics.

D. Set glass lites in proper orientation so that coatings face exterior or interior as indicated.

E. Prevent glass from contact with any contaminating substances that may be the result of construction operations such as, and not limited to the following; weld splatter, fire-safing, plastering, mortar droppings, etc.

3.04 INSTALLATION - DRY GLAZING METHOD (GASKET GLAZING)

A. Application - Exterior and/or Interior Glazed: Set glazing infills from either the exterior or the interior of the building.

B. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners.

C. Rest glazing on setting blocks and push against fixed stop with sufficient pressure on gasket to attain full contact.

D. Install removable stops without displacing glazing gasket; exert pressure for full continuous contact.

3.05 INSTALLATION - DRY GLAZING METHOD (TAPE AND GASKET SPLINE GLAZING)

A. Application - Exterior Glazed: Set glazing infills from the exterior of the building.

B. Cut glazing tape to length; install on glazing pane. Seal corners by butting tape and sealing junctions with butyl sealant.

C. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners.

D. Rest glazing on setting blocks and push against fixed stop with sufficient pressure to attain full contact.

E. Install removable stops without displacing glazing spline. Exert pressure for full continuous contact.

F. Carefully trim protruding tape with knife.

3.06 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Glass and Glazing product manufacturers to provide field surveillance of the installation of their products.

C. Monitor and report installation procedures and unacceptable conditions.

3.07 MANUFACTURER'S FIELD SERVICES

A. Glass and Glazing product manufacturer to provide field surveillance of the installation of their products.

B. Monitor and report installation procedures and unacceptable conditions.

3.08 CLEANING

A. See Section 01 74 19 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL, for additional requirements.

B. Remove excess glazing materials from finish surfaces immediately after application using solvents or cleaners recommended by manufacturers.

C. Remove non-permanent labels immediately after glazing installation is complete.

D. Clean glass and adjacent surfaces after sealants are fully cured.

E. Clean glass on both exposed surfaces not more than 4 days prior to Date of Substantial Completion in accordance with glass manufacturer's written recommendations.

3.09 PROTECTION

A. After installation, mark pane with an 'X' by using removable plastic tape or paste; do not mark heat absorbing or reflective glass units.

B. Remove and replace glass that is damaged during construction period prior to Date of Substantial Completion.

C. Protect glass from contact with contaminating substances resulting from construction operations including weld splatter. If contaminating substances do come into contact with glass, remove them immediately as recommended by glass manufacturer.

D. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for build-up of dirt, alkali deposits, or stains and remove as recommended by glass manufacturer.

E. Remove and replace glass that is broken, chipped, cracked, abraded, or damaged in any way, including natural causes, accidents and vandalism, during the construction period.

END OF SECTION

SECTION 08 83 00
MIRRORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Glass mirrors.

1.02 RELATED REQUIREMENTS

A. Section 10 28 00 - Toilet, Bath, and Laundry Accessories: Metal mirror frames.

1.03 REFERENCE STANDARDS

A. ASTM C1036 - Standard Specification for Flat Glass.

B. ASTM C1193 - Standard Guide for Use of Joint Sealants.

C. ASTM C1503 - Standard Specification for Silvered Flat Glass Mirror.

D. GANA (GM) - GANA Glazing Manual.

E. GANA (SM) - GANA Sealant Manual.

F. GANA (TIPS) - Mirrors: Handle with Extreme Care (Tips for the Professional on the Care and Handling of Mirrors).

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data on Mirror Types: Submit structural, physical and environmental characteristics, size limitations, special handling and installation requirements.

C. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning mirrors.

1.05 QUALITY ASSURANCE

A. Perform Work in accordance with GANA (GM) and GANA (SM) for glazing installation methods.

B. Provide products obtained from one source for each type of mirror indicated.

C. Fabricate, store, transport, receive, install, and clean mirrors in accordance with manufacturer's recommendations.

1.06 FIELD CONDITIONS

A. Do not install mirrors when ambient temperature is less than 50 degrees F.

B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.07 WARRANTY

A. See Section 01 78 00 - CLOSEOUT SUBMITTALS, for additional warranty requirements.

B. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

C. Provide five year manufacturer warranty for reflective coating on mirrors and replacement of same.

PART 2 PRODUCTS

2.01 MANUFACTURERS

2.02 MATERIALS

A. Mirror Design Criteria: Select materials and/or provide supports as required to limit mirror material deflection to 1/200, or to the flexure limit of glass, with full recovery of glazing materials, whichever is less.

B. Mirror Glass: ASTM C1036, Type 1 - Transparent Flat, Class 1 - Clear, Quality - Q1 (high-quality mirrors); silvering, protective coating, and quality requirements in compliance with ASTM C1503.
   1. Size: As scheduled.

2.03 ACCESSORIES

A. Setting Blocks: Neoprene, 80 to 90 Shore A durometer hardness.

B. Glazing Clips: Manufacturer's standard type.

C. Mirror Attachment Accessories: Stainless steel clips.

D. Mirror Adhesive: Silicone pre-polymer based, chemically compatible with mirror coating and wall substrate.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that openings for mirrored glazing are correctly sized and within tolerance.

B. Verify that surfaces of mirror frames or recesses are clean, free of obstructions, and ready for installation of mirrors.

3.02 PREPARATION

A. Clean contact surfaces with solvent and wipe dry.

B. Seal porous mirror frames or recesses with substrate compatible primer or sealer. Prime surfaces scheduled to receive sealant.

C. Prepare installation in accordance with ASTM C1193 for solvent release sealants, and install sealant in accordance with manufacturer's instructions.

3.03 INSTALLATION

A. Install mirrors in accordance with manufacturer's recommendations.

B. Set mirrors plumb and level, and free of optical distortion.

C. Set mirrors with edge clearance free of surrounding construction including countertops or backsplashes.

D. Installation in Frames:
   1. Cut glazing tape to length and set against permanent stops, projecting 1/16 inch above sight line.
   2. Place setting blocks at 1/4 points with edge block no more than 6 inches from corners.
   3. Rest mirrors on setting blocks and push against tape to ensure full contact at perimeter of pane or unit.
   4. Place glazing tape on free perimeter of mirrors in same manner described above.
   5. Install removable stop without displacement of tape. Exert pressure on tape for full continuous contact.
   6. Trim protruding tape edge.

3.04 CLEANING

A. Remove wet glazing materials from finish surfaces.

B. Remove labels after work is complete.

C. Clean mirrors and adjacent surfaces.

3.05 PROTECTION

A. After installation, mark pane with an 'X' by using removable plastic tape or paste.

B. Protect mirrored glass from breakage and contaminating substances resulting from construction operations.

C. Wash glass by methods recommended in NAMM document and by manufacturer. Use water or glass cleaners free of deleterious substances capable of damaging mirror.

END OF SECTION

SECTION 09 05 61

COMMON WORK RESULTS FOR FLOORING PREPARATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. This section applies to floors identified in contract documents that are receiving the following types of floor coverings:
   1. Resilient tile and sheet.
   2. Broadloom carpet.
   3. Carpet tile.
   4. Thin-set ceramic tile and stone tile.

B. Removal of existing floor coverings.

C. Preparation of new and existing concrete floor slabs for installation of floor coverings.

D. Testing of concrete floor slabs for moisture and alkalinity (pH).

E. Remediation of concrete floor slabs due to unsatisfactory moisture or alkalinity (pH) conditions.
   1. Contractor shall perform all specified remediation of concrete floor slabs. If such remediation is indicated by testing agency's report and is due to a condition not under Contractor's control or could not have been predicted by examination prior to entering into the contract, a contract modification will be issued.

F. Patching compound.

G. Remedial floor coatings.

1.02 RELATED REQUIREMENTS

A. Section 01 22 00 - Unit Prices: Bid pricing for remediation treatments if required.

B. Section 01 40 00 - Quality Requirements: Additional requirements relating to testing agencies and testing.

C. Section 03 30 00 - CAST-IN-PLACE CONCRETE: Moisture emission reducing curing and sealing compound for slabs to receive adhered flooring, to prevent moisture content-related flooring failures; to remain in place, not to be removed.

D. Section 03 30 00 - CAST-IN-PLACE CONCRETE: Concrete admixture for slabs to receive adhered flooring, to prevent moisture content-related flooring failures.

E. Section 03 54 00 - Cast Underlayment: Self-leveling underlayment applied as remediation treatment.

1.03 PRICE AND PAYMENT PROCEDURES

A. Unit Prices: See Section 01 22 00 - Unit Prices.

B. Unit Price for Alternate Flooring Adhesive: Do not include the cost of the alternate adhesive in the base bid; state on the bid form the unit price per square foot for using the alternate adhesive, in the event such remediation is required.
   1. Base the unit price on a total quantity calculated by assuming that only _____ of the flooring will require the alternate adhesive.

C. Unit Price for Remedial Floor Coating or Sheet Membrane: Do not include the cost of the floor coating or underlayment in the base bid; state on the bid form the unit price per square foot for the floor coating or underlayment, installed, in the event such remediation is required.
   1. Base the unit price on a total quantity calculated by assuming that only _____ of the flooring will require the alternate adhesive.

1.04 REFERENCE STANDARDS

A. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or (50-mm) Cube Specimens).

B. ASTM C472 - Standard Test Methods for Physical Testing of Gypsum, Gypsum Plasters and Gypsum Concrete.

C. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.

D. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.

E. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes.

F. RFCI (RWP) - Recommended Work Practices for Removal of Resilient Floor Coverings; Resilient Floor Covering Institute.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordinate scheduling of cleaning and testing, so that preliminary cleaning has been completed for at least 24 hours prior to testing.

1.06 SUBMITTALS

A. Visual Observation Report: For existing floor coverings to be removed.

B. Floor Covering and Adhesive Manufacturers' Product Literature: For each specific combination of substrate, floor covering, and adhesive to be used; showing:
   1. Moisture and alkalinity (pH) limits and test methods.
   2. Manufacturer's required bond/compatibility test procedure.

C. Testing Agency's Report:
   1. Description of areas tested; include floor plans and photographs if helpful.
   2. Summary of conditions encountered.
   3. Moisture and alkalinity (pH) test reports.
   4. Copies of specified test methods.
   5. Recommendations for remediation of unsatisfactory surfaces.
   6. Submit report to Hoffman.
   7. Submit report not more than two business days after conclusion of testing.

D. Adhesive Bond and Compatibility Test Report.

E. Copy of RFCI (RWP).

F. Remedial Materials Product Data: Manufacturer's published data on each product to be used for remediation.
   1. Manufacturer's qualification statement.
   2. Manufacturer's statement of compatibility with types of flooring applied over remedial product.
   3. Test reports indicating compliance with specified performance requirements, performed by nationally recognized independent testing agency.
   4. Manufacturer's installation instructions.
   5. Specimen Warranty: Copy of warranty to be issued by coating manufacturer and certificate of underwriter's coverage of warranty.

1.07 QUALITY ASSURANCE

A. Moisture and alkalinity (pH) testing shall be performed by an independent testing agency employed and paid by Contractor.

B. Contractor may not perform adhesive and bond test with Contractor's own personnel, hire a testing agency.

C. Testing Agency Qualifications: Independent testing agency experienced in the types of testing specified.
   1. Submit evidence of experience consisting of at least 3 test reports of the type required, with project Owner's project contact information.

D. Contractor's Responsibility Relating to Independent Agency Testing:
   1. Provide access for and cooperate with testing agency.
   2. Confirm date of start of testing at least 10 days prior to actual start.
   3. Allow at least 4 business days on site for testing agency activities.

4. Achieve and maintain specified ambient conditions.
5. Notify Hoffman when specified ambient conditions have been achieved and when testing will start.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, handle, and protect products in accordance with manufacturer's instructions and recommendations.

B. Deliver materials in manufacturer's packaging; include installation instructions.

C. Keep materials from freezing.

1.09 FIELD CONDITIONS

A. Maintain ambient temperature in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 65 degrees F or more than 85 degrees F.

B. Maintain relative humidity in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 40 percent and not more than 60 percent.

PART 2 PRODUCTS

2.01 MATERIALS

A. Patching Compound: Floor covering manufacturer's recommended product, suitable for conditions, and compatible with adhesive and floor covering. In the absence of any recommendation from flooring manufacturer, provide a product with the following characteristics:
   1. Cementitious moisture-, mildew-, and alkali-resistant compound, compatible with floor, floor covering, and floor covering adhesive, and capable of being feathered to nothing at edges.
   2. Latex or polyvinyl acetate additions are permitted; gypsum content is prohibited.
   3. Compressive Strength: 3000 psi, minimum, after 28 days, when tested in accordance with ASTM C109/C109M or ASTM C472, whichever is appropriate.

B. Remedial Floor Coating: Single- or multi-layer coating or coating/overlay combination intended by its manufacturer to resist water vapor transmission to degree sufficient to meet flooring manufacturer's emission limits, resistant to the level of alkalinity (pH) found, and suitable for adhesion of flooring without further treatment.

PART 3 EXECUTION

3.01 CONCRETE SLAB PREPARATION

A. Perform following operations in the order indicated:
   1. Existing concrete slabs (on-grade and elevated) with existing floor coverings:
      a. Visual observation of existing floor covering, for adhesion, water damage, alkaline deposits, and other defects.
      b. Removal of existing floor covering.
         1) Asbestos-containing flooring to be removed by abatement contractor retained by the owner.
         2) Hoffman to coordinate this section with abatement contractor.
         3) Asbestos-containing mastic or adhesive to be mechanically removed; chemical abatement is prohibited.
   2. Preliminary cleaning.
   3. Moisture vapor emission tests; 3 tests in the first 1000 square feet and one test in each additional 1000 square feet, unless otherwise indicated or required by flooring manufacturer.
   4. Internal relative humidity tests; in same locations as moisture vapor emission tests, unless otherwise indicated.
   5. Alkalinity (pH) tests; in same locations as moisture vapor emission tests, unless otherwise indicated.
   6. Specified remediation, if required.

7. Patching, smoothing, and leveling, as required.
8. Other preparation specified.
9. Adhesive bond and compatibility test.
10. Protection.

B. Remediations:
1. Active Water Leaks or Continuing Moisture Migration to Surface of Slab: Correct this condition before doing any other remediation; re-test after correction.
2. Excessive Moisture Emission or Relative Humidity: If an adhesive that is resistant to the level of moisture present is available and acceptable to flooring manufacturer, use that adhesive for installation of the flooring; if not, apply remedial floor coating or remedial sheet membrane over entire suspect floor area.
3. Excessive Alkalinity (pH): If remedial floor coating is necessary to address excessive moisture, no additional remediation is required; if not, if an adhesive that is resistant to the level present is available and acceptable to the flooring manufacturer, use that adhesive for installation of the flooring; otherwise, apply a skim coat of specified patching compound over entire suspect floor area.

3.02 REMOVAL OF EXISTING FLOOR COVERINGS

A. Comply with local, State, and federal regulations and recommendations of RFCI Recommended Work Practices for Removal of Resilient Floor Coverings, as applicable to floor covering being removed.

B. Dispose of removed materials in accordance with local, State, and federal regulations and as specified.

3.03 PRELIMINARY CLEANING

A. Clean floors of dust, solvents, paint, wax, oil, grease, asphalt, residual adhesive, adhesive removers, film-forming curing compounds, sealing compounds, alkaline salts, excessive laitance, mold, mildew, and other materials that might prevent adhesive bond.

B. Do not use solvents or other chemicals for cleaning.

3.04 MOISTURE VAPOR EMISSION TESTING

A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.

B. Where this specification conflicts with the referenced test method, comply with the requirements of this section.

C. Test in accordance with ASTM F1869 and as follows.

D. Plastic sheet test and mat bond test may not be substituted for the specified ASTM test method, as those methods do not quantify the moisture content sufficiently.

E. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if test values exceed 3 pounds per 1000 square feet per 24 hours.

F. Report: Report the information required by the test method.

3.05 INTERNAL RELATIVE HUMIDITY TESTING

A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.

B. Where this specification conflicts with the referenced test method, comply with the requirements of this section.

C. Test in accordance with ASTM F2170 Procedure A and as follows.

D. Testing with electrical impedance or resistance apparatus may not be substituted for the specified ASTM test method, as the values determined are not comparable to the ASTM test values and do not quantify the moisture content sufficiently.

E. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if any test value exceeds 75 percent relative humidity.

F. Report: Report the information required by the test method.

3.06 ALKALINITY TESTING

A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.

B. The following procedure is the equivalent of that described in ASTM F710, repeated here for the Contractor's convenience.

C. Use a wide range alkalinity (pH) test paper, its associated chart, and distilled or deionized water.

D. Place several drops of water on a clean surface of concrete, forming a puddle approximately 1 inch in diameter. Allow the puddle to set for approximately 60 seconds, then dip the alkalinity (pH) test paper into the water, remove it, and compare immediately to chart to determine alkalinity (pH) reading.

E. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if alkalinity (pH) test value is over 10.

3.07 PREPARATION

A. See individual floor covering section(s) for additional requirements.

B. Comply with requirements and recommendations of floor covering manufacturer.

C. Fill and smooth surface cracks, grooves, depressions, control joints and other non-moving joints, and other irregularities with patching compound.

D. Do not fill expansion joints, isolation joints, or other moving joints.

3.08 ADHESIVE BOND AND COMPATIBILITY TESTING

A. Comply with requirements and recommendations of floor covering manufacturer.

3.09 APPLICATION OF REMEDIAL FLOOR COATING

A. Comply with requirements and recommendations of coating manufacturer.

3.10 PROTECTION

A. Cover prepared floors with building paper or other durable covering.

END OF SECTION

SECTION 09 21 16
GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Performance criteria for gypsum board assemblies.

B. Metal stud wall framing.

C. Metal channel ceiling framing.

D. Acoustic insulation.

E. Gypsum sheathing.

F. Cementitious backing board.

G. Gypsum wallboard.

H. Joint treatment and accessories.

I. Tile backing panels.

J. Textured finish system.

K. Acoustical sealants.

1.02 RELATED REQUIREMENTS

A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 05 40 00 - Cold-Formed Metal Framing: Exterior wind-load-bearing metal stud framing.

C. Section 06 10 00 - Rough Carpentry: Building framing and sheathing.

D. Section 06 10 00 - Rough Carpentry: Wood blocking product and execution requirements.

E. Section 07 25 00 - WEATHER BARRIERS: Water-resistive barrier over sheathing.

F. Section 07 84 00 - Firestopping: Top-of-wall assemblies at fire rated walls.

G. Section 07 92 00 - Joint Sealants: Sealing acoustical gaps in construction other than gypsum board or plaster work.

1.03 REFERENCE STANDARDS

A. ANSI A108.11 - American National Standard Specifications for Interior Installation of Cementitious Backer Units.

B. ANSI A118.9 - American National Standard Specifications for Test Methods and Specifications for Cementitious Backer Units.

C. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.

D. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members.

E. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.

F. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.

G. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board.

H. ASTM C954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness.

I. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.

J. ASTM C1047 - Standard Specification for Accessories For Gypsum Wallboard and Gypsum Veneer Base.

K. ASTM C1325 - Specification for Non-Asbestos Fiber-Mat Reinforced Cementitious Backer Units.

L. ASTM C1396/C1396M - Standard Specification for Gypsum Board.

M. ASTM C1629/C1629M - Standard Classification for Abuse-Resistant Nondecorated Interior Gypsum Panel Products and Fiber-Reinforced Cement Panels.

N. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.

O. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.

P. ASTM E413 - Classification for Rating Sound Insulation.

Q. GA-216 - Application and Finishing of Gypsum Board.

R. GA-226 - Application of Gypsum Board to Form Curved Surfaces; Gypsum Association.

S. GA-600 - Fire Resistance Design Manual.

T. UL (FRD) - Fire Resistance Directory.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on metal framing, gypsum board, accessories, and joint finishing system.
   1. Test Reports: For stud framing products that do not comply with ASTM C645 or ASTM C754, provide independent laboratory reports showing maximum stud heights at required spacings and deflections.
   2. Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.
   3. Indicate special details associated with fireproofing and acoustic seals.

C. Samples: Submit two samples of gypsum board finished with each proposed texture application, 24 x 24 inches square in size, illustrating finish color and texture.

1.06 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing gypsum board installation and finishing, with minimum five years of documented experience.

B. Single-Source Responsibility: Obtain finishing products from same manufacturer of gypsum board or panel products, or from a manufacturer acceptable to gypsum board manufacturer.

C. Comply with requirements of GA-600 for fire-rated assemblies.

1.07 DELIVERY, STORAGE AND PROTECTION

A. Deliver materials in original packages, containers, or bundles bearing the brand name and product identification of manufacturer.

B. Store materials inside under cover and keep dry. Neatly stack gypsum panels flat to prevent sagging of the ground or slab.

C. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

D. Stack gypsum board where directed by Hoffman. Space stacks across floor. Do not exceed live load capacity of floor system.

1.08 PROJECT CONDITIONS

A. Do not install or finish gypsum board unless environmental conditions comply with ASTM C840 or with gypsum board manufacturer's recommendations.

B. Ventilate spaces as required for drying joint and finish materials. Avoid drafts to prevent finishing materials from drying too rapidly.

PART 2 PRODUCTS

2.01 GYPSUM BOARD ASSEMBLIES

A. Provide completed assemblies complying with ASTM C840 and GA-216.

B. Interior Partitions, Indicated as Acoustic: Provide completed assemblies with the following characteristics:
   1. Acoustic Attenuation: STC of 50-54 calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.

C. Fire Rated Assemblies: Provide completed assemblies complying with applicable code.
   1. Gypsum Association File Numbers: Comply with requirements of GA-600 for the particular assembly.
   2. UL Assembly Numbers: Provide construction equivalent to that listed for the particular assembly in the current UL (FRD).

2.02 METAL FRAMING MATERIALS

A. Manufacturers - Metal Framing, Connectors, and Accessories:
   1. Clarkwestern Dietrich Building Systems LLC: www.clarkdietrich.com.
   2. Marino: www.marinoware.com.
   3. Substitutions: See Section 01 60 00 - PRODUCT REQUIREMENTS.

B. Non-Loadbearing Framing System Components: ASTM C645; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of L/120 at 5 psf.
   1. Exception: The minimum metal thickness and section properties requirements of ASTM C645 are waived provided steel of 40 ksi minimum yield strength is used, the metal is continuously dimpled, the effective thickness is at least twice the base metal thickness, and maximum stud heights are determined by testing in accordance with ASTM E 72 using assemblies specified by ASTM C 754.
   2. Studs: "C" shaped with flat or formed webs with knurled faces.
   3. Runners: U shaped, sized to match studs.
   4. Ceiling Channels: C-shaped.
   5. Furring: Hat-shaped sections, minimum depth of 7/8 inch.
   6. Resilient Furring Channels: Single or double leg configuration; 1/2 inch channel depth.
      a. Products:
         1) Substitutions: See Section 01 60 00 - PRODUCT REQUIREMENTS.

C. Partition Head To Structure Connections: Provide track fastened to structure with legs of sufficient length to accommodate deflection, for friction fit of studs cut short and fastened as indicated on drawings.

2.03 BOARD MATERIALS

A. Manufacturers - Gypsum-Based Board:
   1. CertainTeed Corporation: www.certainteed.com.
   2. Georgia-Pacific Gypsum: www.gpgypsum.com.
   3. National Gypsum Company: www.nationalgypsum.com.
   4. USG Corporation: www.usg.com.
   5. Substitutions: See Section 01 60 00 - PRODUCT REQUIREMENTS.

B. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
   1. Application: Use for vertical surfaces and ceilings, unless otherwise indicated.

2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
    a. Mold-resistant board is required whenever board is being installed before the building is enclosed and conditioned.
    b. Mold resistant board is required at all toilet rooms, kitchens, and high humidity locations.
3. At Assemblies Indicated with Fire-Rating: Use type required by indicated tested assembly; if no tested assembly is indicated, use Type X board, UL or WH listed.
    a. Note the use of Type C board where required by the UL assembly, particularly for horizontal applications.
4. Thickness:
    a. Vertical Surfaces: 5/8 inch.
    b. Ceilings: 5/8 inch.
5. Paper-Faced Products:
    a. CertainTeed Corporation; ProRoc Brand Gypsum Board.
    b. LaFarge North America Inc; Regular Drywall and Firecheck Type X and Type C.
    c. National Gypsum Company; Gold Bond Brand Gypsum Wallboard.
    d. USG Corporation; Sheetrock Brand Gypsum Panels.
    e. Georgia-Pacific Gypsum; ToughRock, ToughRock Fireguard X or C.
    f. Substitutions: See Section 01 60 00 - PRODUCT REQUIREMENTS.
6. Mold Resistant Paper Faced Products:
    a. CertainTeed Corporation; ProRoc Brand Moisture & Mold Resistant Gypsum Board.
    b. National Gypsum Company; Gold Bond Hi-Abuse Brand XP Wallboard.
    c. Georgia-Pacific Gypsum; ToughRock Mold-Guard.
    d. National Gypsum Company; Gold Bond XP Gypsum Board.
    e. USG Corporation; Sheetrock Brand Mold Tough Gypsum Panels.

C. Impact Resistant Wallboard:
1. Application: High-traffic areas indicated.
2. Surface Abrasion: Level 3, minimum, when tested in accordance with ASTM C1629/C1629M.
3. Indentation: Level 1, minimum, when tested in accordance with ASTM C1629/C1629M.
4. Soft Body Impact: Level 3, minimum, when tested in accordance with ASTM C1629/C1629M.
5. Hard Body Impact: Level 2, minimum, when tested in accordance with ASTM C1629/C1629M.
6. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
7. Type: Fire resistance rated Type X, UL or WH listed.
8. Thickness: 5/8 inch.
9. Edges: Tapered.

D. Backing Board For Wet Areas:
1. Application: Surfaces in wet areas including tub and shower surrounds, shower ceilings, and shower walls.
2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
3. ANSI Cement-Based Board: Non-gypsum-based; aggregated Portland cement panels with glass fiber mesh embedded in front and back surfaces complying with ANSI A118.9 or ASTM C1325.
    a. Thickness: 5/8 inch.
    b. Products:
        1) Custom Building Products; Wonderboard: www.custombuildingproducts.com/#sle.
        2) National Gypsum Company; PermaBase Cement Board: www.nationalgypsum.com/#sle.
        3) USG Corporation, Durock: www.usg.com.
        4) Substitutions: See Section 01 60 00 - PRODUCT REQUIREMENTS.

E. Backing Board For Non-Wet Areas: Water-resistant gypsum backing board as defined in ASTM C1396/C1396M; sizes to minimum joints in place; ends square cut.
   1. Application: All toilet rooms except in wet areas.
   2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
   3. At Assemblies Indicated with Fire-Rating: Use type required by indicated tested assembly; if no tested assembly is indicated, use Type X board, UL or WH listed.
   4. Type X Thickness: 5/8 inch.
   5. Type C Thickness: 5/8 inch.
   6. Regular Board Thickness: 5/8 inch.
   7. Edges: Tapered.
   8. Products:
      a. Georgia-Pacific Gypsum; DensShield Tile Backer.
      b. National Gypsum Company; Gold Bond XP Gypsum Board.
      c. Lafarge North America Inc; Mold Defense Drywall.
      d. USG Corporation; Sheetrock Brand Mold Tough Gypsum Panels.
      e. Substitutions: See Section 01 60 00 - PRODUCT REQUIREMENTS.

F. Exterior Sheathing Board: As specified in Section 05 40 00.

G. Shaftwall and Coreboard: Type X; 1 inch thick by 24 inches wide, beveled long edges, ends square cut.

2.04 GYPSUM WALLBOARD ACCESSORIES

A. Acoustic Insulation - Interior Fire Rated Partition Walls: ASTM C665; preformed mineral fiber, friction fit type, unfaced rock wool similar to Thermafiber Sound Attenuation Fire Blanket (SAFB) as manufactured by Thermafiber, Inc.
   1. Density: 2.5 pcf (nominal).

B. Acoustic Insulation - Interior Partition Walls: ASTM C665; preformed mineral fiber, friction fit type, unfaced rock wool similar to Thermafiber FS 15 as manufactured by Thermafiber, Inc.
   1. Density: 3.0 pcf (nominal).

C. Acoustic Joint Sealant: Manufacturer's standard nonsag, paintable, non-staining latex sealant complying with ASTM C 834. Sealant shall effectively reduce airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
   1. Products:
      a. Grabber Construction Products: Acoustical Sealant GSC.
      b. Hilti, Inc; CP 506 Smoke and Acoustical Sealant: www.us.hilti.com/#sle.
      c. Hilti, Inc; CP 572 Smoke and Acoustical Spray Sealant: www.us.hilti.com/#sle.
      d. Pecora Corporation; AC-20 + Silicone Acrylic Latex Caulking Compound: www.pecora.com.
      e. Pecora Corporation; AC-20 FTR Acoustical and Insulation Sealant: www.pecora.com.
      f. Specified Technologies, Inc.: Smoke N Sound Acoustical Sealant
      g. USG Corporation; Sheetrock Acoustical Sealant.
      h. Substitutions: See Section 01 60 00 - PRODUCT REQUIREMENTS.

D. Water-Resistive Barrier: As specified in Section 07 25 00.

E. Finishing Accessories: ASTM C1047, galvanized steel or rolled zinc, unless noted otherwise.
   1. Corner Beads: Paper faced, similar to B1 series by USG.
   2. Corner Reinforcement: Galvanized steel, similar to Dur-A-Bead manufactured by USG.
   3. Control Joint: Bent zinc sheet formed with V shaped slot, covered with plastic tape, with perforated flanges and complying with ASTM C1047.
      a. Width: As required or detailed.
   4. Types: As detailed or required for finished appearance.
   5. Products:
      a. Same manufacturer as framing materials.
      b. Substitutions: See Section 01 60 00 - PRODUCT REQUIREMENTS.

F. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.
   1. Tape: 2 inch wide, creased paper tape for joints and inside corners, except as otherwise indicated.
   2. Joint Compound: Drying type, vinyl-based, ready-mixed.
      a. Products:
         1) National Gypsum ProForm All Purpose Joint Compound.
         2) Substitutions: See Section 01 60 00 - PRODUCT REQUIREMENTS.
   3. Joint Compound: Setting type, field-mixed.
      a. Products:
         1) National Gypsum ProForm Quick Set Setting Compound.
         2) Substitutions: See Section 01 60 00 - PRODUCT REQUIREMENTS.

G. High Build Drywall Surfacer: Vinyl acrylic latex-based coating for spray application, designed to take the place of skim coating and separate paint primer in achieving Level 5 finish.

H. Textured Finish Materials: Latex-based compound; plain.

I. Screws for Fastening of Gypsum Panel Products to Cold-Formed Steel Studs Less than 0.033 inch in Thickness and Wood Members: ASTM C1002; self-piercing tapping screws, corrosion resistant.

J. Screws for Fastening of Gypsum Panel Products to Steel Members from 0.033 to 0.112 inch in Thickness: ASTM C954; steel drill screws, corrosion resistant.

K. Hanger Wire: 8 gauge, galvanized wire.

L. Tie Wire: 18 gauge, galvanized wire.

M. Anchorage to Substrate: Tie wire, nails, screws, and other metal supports, of type and size to suit application; to rigidly secure materials in place.

N. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels directly to substrate.
   1. Laminating adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that project conditions are appropriate for work of this section to commence.
   1. Prepared surfaces are sized and located in accordance with drawings.
   2. Framing, reinforcement, and anchoring devices are correct type and are located in accordance with shop drawings.

B. Installer's Examination:
   1. Examine conditions under which installation is to be performed; submit written notification if such conditions are unacceptable.
   2. Installation activities before unacceptable conditions have been corrected is prohibited.
   3. Installation indicates installer's acceptance of conditions.

3.02 FRAMING INSTALLATION

A. Metal Framing: Install in accordance with ASTM C754 and manufacturer's instructions.

B. Suspended Ceilings and Soffits: Space framing and furring members as indicated.
   1. Level ceiling system to a tolerance of 1/600.
   2. Laterally brace entire suspension system.

C. Studs: Space studs at 16 inches on center.
   1. Extend partition framing to structure in all locations.
   2. Partitions Terminating at Ceiling: Attach ceiling runner securely to ceiling track in accordance with manufacturer's instructions.

3. Partitions Terminating at Structure: Attach extended leg top runner to structure, maintain clearance between top of studs and structure, and brace both flanges of studs with continuous bridging.
4. Extend stud framing through ceiling to structure above. Maintain clearance under structural building members to avoid deflection transfer to studs. Provide extended leg ceiling runners.
5. Extend stud framing to ceiling where indicated

D. Openings: Reinforce openings as required for weight of doors or operable panels, using not less than double studs at jambs.

E. Standard Wall Furring: Install at concrete and masonry walls scheduled to receive gypsum board, not more than 4 inches from floor and ceiling lines and abutting walls. Secure in place on alternate channel flanges at maximum 24 inches on center.
1. Orientation: Horizontal.
2. Spacing: At 16 inches on center unless otherwise noted.

F. Acoustic Furring: Install resilient channels at maximum 24 inches on center. Locate joints over framing members.

G. Furring for Fire Ratings: Install as required for fire resistance ratings indicated and to GA-600 requirements.

3.03 ACOUSTIC ACCESSORIES INSTALLATION

A. Acoustic Insulation: Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.

B. Acoustic Sealant: Install in accordance with manufacturer's instructions.
1. Place two beads continuously on substrate before installation of perimeter framing members.
2. Place continuous bead at perimeter of each layer of gypsum board.
3. Seal around all penetrations by conduit, pipe, ducts, and rough-in boxes, except where firestopping is provided.

3.04 BOARD INSTALLATION

A. Comply with ASTM C840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.

B. Single-Layer Non-Rated: Install gypsum board in most economical direction, with ends and edges occurring over firm bearing.

C. Double-Layer Non-Rated: Use gypsum board for first layer, placed parallel to framing or furring members, with ends and edges occurring over firm bearing. Use glass mat faced gypsum board at exterior walls and at other locations as indicated. Place second layer perpendicular to framing or furring members. Offset joints of second layer from joints of first layer.

D. Fire-Rated Construction: Install gypsum board in strict compliance with requirements of assembly listing.
1. Single-Layer Fire-Rated: Install gypsum board vertically, with edges and ends occurring over firm bearing, unless otherwise indicated or required by fire-resistance-rated assembly.

E. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.

F. Cementitious Backing Board: Install over steel framing members and plywood substrate where indicated, in accordance with ANSI A108.11 and manufacturer's instructions.

G. Installation on Metal Framing: Use screws for attachment of gypsum board except face layer of non-rated double-layer assemblies, which may be installed by means of adhesive lamination.

H. Curved Surfaces: Apply gypsum board to curved substrates in accordance with GA-226.

I. Moisture Protection: Treat cut edges and holes in moisture resistant gypsum board and exterior gypsum soffit board with sealant.

3.05 INSTALLATION OF TRIM AND ACCESSORIES

A. Control Joints: Place control joints consistent with lines of building spaces and as indicated.
   1. Where partitions, furring, or column fireproofing abuts a structural element or dissimilar wall or ceiling (except floors).
   2. Ceiling or soffit abuts a structural element, dissimilar wall or partition, or other vertical penetration.
   3. Not more than 30 feet for walls and partitions.
   4. Not more than 50 feet in either direction for ceilings with perimeter relief, 30 feet without relief.
   5. At locations of control joints that occur in the building.
   6. Wings of "L", "U", and "T" shaped ceiling areas that are common or joined.
   7. Construction changes within the plane of a partition or ceiling.

B. Corner Beads: Install at external corners, using longest practical lengths.

C. Edge Trim: Install at locations where gypsum board abuts dissimilar materials.

3.06 JOINT TREATMENT

A. Paper Faced Gypsum Board: Use paper joint tape, embed with ready mixed, vinyl based joint compound and finish with ready mixed, vinyl based joint compound.
   1. Use a setting/hardening type compound where assemblies may be exposed to elevated humidity levels or moisture.

B. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
   1. Level 5: Walls and ceilings to receive semi-gloss or gloss paint finish and other areas specifically indicated.
   2. Level 4: Areas to receive light-textured finishes and flat paints over light textures.
   3. Level 3: Walls to receive textured wall finish.
   4. Level 3: In utility areas, behind cabinetry.
   5. Level 1: Fire rated wall areas above finished ceilings, whether or not accessible in the completed construction.
   6. Level 1: Ceiling plenum areas, concealed areas, and as indicated, unless a higher level of finish is required for fire resistive/rated or sound-rated assemblies.
   7. Level 0: Temporary partitions.

C. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
   1. Feather coats of joint compound so that camber is maximum 1/32 inch.

D. Tape and finish wallboard for a minimum of 6 inches above finish ceiling elevation.

E. Apply joint tape over gypsum board joints except those with trim or accessories having concealed face flanges not requiring taping to prevent cracks from occuring.

F. Where Level 5 finish is indicated, spray apply high build drywall surfacer over entire surface after joints have been properly treated; achieve a flat and tool mark-free finish.

G. Fill and finish joints and corners of cementitious backing board as recommended by manufacturer.

3.07 TEXTURE FINISH

A. Apply finish texture coating by means of spraying apparatus in accordance with manufacturer's instructions and to match approved sample.

B. Prevent texture finishes from coming in contact with surfaces not scheduled to receive texture finishes. Cover with visqueen or other masking agents as required.

C. Finish shall extend a minimum of 6 inches above ceiling elevation.

D. Immediately remove finish materials from surfaces not scheduled to received finish to prevent damage,

3.08 CLEANUP

A. Cleanup, remove from the site, and legally dispose of all materials related to work in this section.

3.09 TOLERANCES

A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet in any direction.

END OF SECTION

SECTION 09 30 00

TILING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Tile for floor applications.

B. Tile for wall applications.

C. Stone thresholds.

D. Ceramic trim.

E. Safing.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-In-Place Concrete: Tile floor substrate.

B. Section 04 20 00 - Unit Masonry: Masonry substrate for tile.

C. Section 07 92 00 - Joint Sealants: Sealing joints between tile work and adjacent construction and fixtures.

D. Section 09 21 16 - Gypsum Board Assemblies: Tile backer board.

1.03 REFERENCE STANDARDS

A. ANSI A108.1a - American National Standard Specifications for Installation of Ceramic Tile in the Wet-Set Method, with Portland Cement Mortar.

B. ANSI A108.1b - American National Standard Specifications for Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set or Latex-Portland Cement Mortar.

C. ANSI A108.1c - Specifications for Contractors Option: Installation of Ceramic Tile in the Wet-Set Method with Portland Cement Mortar or Installation of Ceramic Tile on a Cured Portland Cement Mortar Bed with Dry-Set or Latex-Portland Cement.

D. ANSI A108.4 - American National Standard Specifications for Installation of Ceramic Tile with Organic Adhesives or Water Cleanable Tile-Setting Epoxy Adhesive.

E. ANSI A108.5 - American National Standard Specifications for Installation of Ceramic Tile with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar.

F. ANSI A108.6 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant, Water Cleanable Tile-Setting and -Grouting Epoxy.

G. ANSI A108.8 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant Furan Resin Mortar and Grout.

H. ANSI A108.9 - American National Standard Specifications for Installation of Ceramic Tile with Modified Epoxy Emulsion Mortar/Grout.

I. ANSI A108.10 - American National Standard Specifications for Installation of Grout in Tilework.

J. ANSI A108.12 - American National Standard for Installation of Ceramic Tile with EGP (Exterior Glue Plywood) Latex-Portland Cement Mortar.

K. ANSI A108.13 - American National Standard for Installation of Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone.

L. ANSI A118.3 - American National Standard Specifications for Chemical Resistant, Water Cleanable Tile-Setting and -Grouting Epoxy and Water Cleanable Tile-Setting Epoxy Adhesive.

M. ANSI A118.10 - American National Standard Specifications for Load Bearing, Bonded, Waterproof Membranes For Thin-Set Ceramic Tile And Dimension Stone Installation.

N. ANSI A118.12 - American National Standard Specifications for Crack Isolation Membranes for Thin-Set Ceramic Tile and Dimension Stone Installation.

O. ANSI A136.1 - American National Standard for Organic Adhesives for Installation of Ceramic Tile.

P. ASTM C847 - Standard Specification for Metal Lath.

Q. TCNA (HB) - Handbook for Ceramic, Glass, and Stone Tile Installation.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by all affected installers.
   1. Require attendance of installation material manufacturer, tile supplier, tile installer and installers for related work.
   2. Review the following:
      a. Installation procedures and coordination required with related work.
      b. Surface preparation.
      c. Waterproofing techniques and locations.
      d. Crack isolation techniques and locations.
      e. Tile and installation material compatibility.
      f. Edge protection and transitions.
      g. Safing materials and details.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturers' data sheets on tile, mortar, grout, and accessories. Include instructions for using grouts and adhesives.
   1. Shop Drawings: Indicate tile layout, patterns, color arrangement, perimeter conditions, junctions with dissimilar materials, control and expansion joints, thresholds, ceramic accessories, and setting details.

C. Maintenance Data: Include recommended cleaning methods, cleaning materials, and stain removal methods.

D. Samples: Provide tile and grout samples for color selection and/or confirmation.

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - PRODUCT REQUIREMENTS, for additional provisions.
   2. Extra Tile: 2 percent of each size, color, and surface finish combination, but not less than 10 of each type.
   3. Store in location as directed by Hoffman.
   4. Ensure materials are boxed and identified by manufacturer, type and color.

1.06 QUALITY ASSURANCE

A. Single Source Responsibility:
   1. Obtain each type and color tile material required from a single source.
   2. Obtain setting and grouting materials from one manufacturer to ensure compatibility.
   3. Obtain membrane from same manufacturer as setting material or from manufacturer approved by setting material manufacturer to ensure compatibility.

B. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, with minimum five years of documented experience.

C. Installer Qualifications: Company specializing in performing tile installation, with minimum of five years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Labeling: Comply with ANSI A137.1.

B. Deliver materials in manufacturer's unopened containers, fully identified with name, brand, type and grade.

C. Protect materials from contamination, dampness, freezing, or overheating in accordance with manufacturer's instructions.

D. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

E. Broken, cracked, chipped, stained, or damaged tile will be rejected, whether built-in or not.

F. Protect mortar and grout materials against moisture, soiling, or staining.

1.08 FIELD CONDITIONS

A. Comply with requirements of referenced standards and recommendations of material manufacturers for environmental conditions before, during, and after installation.

1.09 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Project Warranty: Submit a written warranty, executed by the Installer and Manufacturer, agreeing to repair or replace tile that fails in materials or workmanship within the specified warranty period.
   1. Warranty Period: 2 years after date of Substantial Completion.

PART 2 PRODUCTS

2.01 CERAMIC TILE

A. Manufacturers: Refer to Room Finish Schedule.

2.02 PAVER TILE

2.03 TRIM AND ACCESSORIES

A. Ceramic Trim: Matching bullnose, double bullnose, cove base, and cove ceramic shapes in sizes coordinated with field tile.
   1. Manufacturers: Same as for tile.

B. Thresholds: Marble, white or gray, honed finish; 2 inches wide by full width of wall or frame opening; 1/2 inch thick; beveled one long edge with radiused corners on top side; without holes, cracks, or open seams.

2.04 SETTING MATERIALS

A. Epoxy Adhesive and Mortar Bond Coat: ANSI A118.3.
   1. Products:
      a. LATICRETE International, Inc; LATICRETE LATAPOXY 300 Adhesive: www.laticrete.com/#sle.
      b. Merkrete, by Parex USA, Inc; Merkrete Pro Epoxy: www.merkrete.com/#sle.
      c. Substitutions: See Section 01 60 00 - PRODUCT REQUIREMENTS.

B. Organic Adhesive: ANSI A136.1, thinset mastic type.
   1. Use Type I in areas subject to prolonged moisture exposure.
   2. Products:
      a. American Olean: www.americanolean.com.
      b. ARDEX Engineered Cements; ARDEX D14: www.ardexamericas.com/#sle.
      c. Bonsal American, IncNone - N/A: www.sakrete.com
      d. Dal-Tile Corporation: www.daltile.com
      e. Mapei.
      f. Summitville Tiles, Inc: www.summitville.com.

2.05 GROUTS

A. Manufacturers:
   1. Bostik Inc: www.bostik-us.com/#sle.
   2. Custom Building Products.
   3. Mapei Corporation: www.mapei.com .
   4. Substitutions: See Section 01 60 00 - PRODUCT REQUIREMENTS.

2.06 MAINTENANCE MATERIALS

2.07 ACCESSORY MATERIALS

A. Concrete Floor Slab Crack Isolation Membrane: Material complying with ANSI A118.12; not intended as waterproofing.
   1. Thickness: 20 mils, maximum.
   2. Crack Resistance: No failure at 1/16 inch gap, minimum.

B. Waterproofing Membrane at Showers and Tiled Tubs: Specifically designed for bonding to cementitious substrate under thick mortar bed or thin-set tile; complying with ANSI A118.10.
   1. Mortar Bonded Sheet Type:
      a. Material: PVC sheet membrane, 40 mils, thick, minimum.

C. Metal Lath: ASTM C847, Flat diamond mesh, of weight to suit application, galvanized finish.

D. Waterproofing Membrane at Walls: Composite PVC sheet with laminated polyester fabric, each face, minimum 25 mil thickness, complying with ANSI A118.10 similar to Wall Seal as manufactured by The Noble Company.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that sub-floor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive tile.

B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive tile.

C. Verify that sub-floor surfaces are dust-free and free of substances that could impair bonding of setting materials to sub-floor surfaces.

D. Verify that concrete sub-floor surfaces are ready for tile installation by testing for moisture emission rate and alkalinity; obtain instructions if test results are not within limits recommended by tile manufacturer and setting materials manufacturer.

E. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

A. Protect surrounding work from damage.

B. Vacuum clean surfaces and damp clean.

C. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances.

D. Prepare substrate surfaces for adhesive installation in accordance with adhesive manufacturer's instructions.

3.03 WATERPROOFING MEMBRANE

A. Install waterproofing in strict compliance with manufacturer's instructions.

B. Flash floor waterproofing up adjacent walls in accordance with manufacturer's details to a height of 6 inches.

C. Install wall waterproofing membrane at all corners for a height of 6'-0" for a minimum distance of 12 inches out from corners, with additional membrane as required by code(s).

D. Flood test waterproof membranes after fully curing.

E. Do not allow construction traffic on membrane.

3.04 INSTALLATION - GENERAL

A. Install tile, thresholds, and stair treads and grout in accordance with applicable requirements of ANSI A108.1a through ANSI A108.13, manufacturer's instructions, and TCNA (HB) recommendations.

B. Lay tile to pattern indicated. Do not interrupt tile pattern through openings.

C. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align floor joints.

D. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make grout joints without voids, cracks, excess mortar or excess grout, or too little grout.

E. Form internal angles square and external angles bullnosed.

F. Install thresholds where indicated.

G. Sound tile after setting. Replace hollow sounding units.

H. Keep control and expansion joints free of mortar, grout, and adhesive.

I. Keep expansion joints free of adhesive or grout. Apply sealant to joints.

J. Prior to grouting, allow installation to completely cure; minimum of 48 hours.

K. Grout tile joints unless otherwise indicated. Use standard grout unless otherwise indicated.

L. At changes in plane and tile-to-tile control joints, use tile sealant instead of grout, with either bond breaker tape or backer rod as appropriate to prevent three-sided bonding.

M. Apply sealer to all cementitious grouts per manufacturer's instructions.

N. Apply sealant to junction of tile and dissimilar materials and junction of dissimilar planes.

O. Leave finished tile work clean and free of cracked, chipped, broken, unbonded, or otherwise defective tile work.

3.05 INSTALLATION - FLOORS - THIN-SET METHODS

A. Over interior concrete substrates, install in accordance with TCA Handbook Method F113, dry-set or latex-portland cement bond coat, with standard grout, unless otherwise indicated.
   1. Where waterproofing membrane is indicated, install in accordance with TCA Handbook Method F122, with latex-portland cement grout.
   2. Where epoxy bond coat and grout are indicated, install in accordance with TCNA (HB) Method F131.

3.06 INSTALLATION - FLOORS - MORTAR BED METHODS

A. Over interior concrete substrates, install in accordance with TCNA (HB) Method F111, with cleavage membrane, unless otherwise indicated.
   1. Where waterproofing membrane is indicated, with standard grout or no mention of grout type, install in accordance with TCNA (HB) Method F121.

B. Cleavage Membrane: Lap edges and ends.

C. Mortar Bed Thickness: 5/8 inch, unless otherwise indicated.

3.07 INSTALLATION - WALL TILE

A. Over cementitious backer units install in accordance with TCNA (HB) Method W223, organic adhesive.

B. Over gypsum wallboard on wood or metal studs install in accordance with The Tile Council of North America Handbook Method W243, thin-set with dry-set or latex-portland cement bond coat, unless otherwise indicated.

C. Over interior concrete and masonry install in accordance with The Tile Council of North America Handbook Method W202, thin-set with dry-set or latex-portland cement bond coat.

3.08 CLEANING

A. Clean tile and grout surfaces.

3.09 PROTECTION

A. Do not permit traffic over finished floor surface for 7 days after installation.

END OF SECTION

SECTION 09 51 00
ACOUSTICAL CEILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Suspended metal grid ceiling system.

B. Acoustical units.

C. Supplementary acoustical insulation above ceiling.

1.02 RELATED REQUIREMENTS

A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 21 13 00 - FIRE SUPPRESSION SPRINKLER SYSTEM: Sprinkler heads in ceiling system.

1.03 REFERENCE STANDARDS

A. ASTM C635/C635M - Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.

B. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels.

C. ASTM E580/E580M - Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions.

D. ASTM E1264 - Standard Classification for Acoustical Ceiling Products.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Sequence work to ensure acoustical ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.

B. Do not install acoustical units until after interior wet work is dry.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on suspension system components and acoustical units.
   1. Manufacturer's Installation Instructions: Indicate special procedures

C. Samples: Submit two full size samples illustrating material and finish of acoustical units.

D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - PRODUCT REQUIREMENTS, for additional provisions.
   2. Extra Acoustical Units: Quantity equal to the lesser of 5% percent of the project tile total or 10 cases of ceiling tile for each type of acoustical unit

1.06 QUALITY ASSURANCE

A. Single-Source Responsibility: Provide acoustical panel units and grid components by a single manufacturer.

B. Suspension System Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

C. Acoustical Unit Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

D. Coordination of Work: Coordinate acoustical ceiling work with installers of related work including, but not limited to building insulation, gypsum board, light fixtures, mechanical systems, electrical systems, and fire protection systems.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical ceiling units to project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical ceiling units, permit them to reach room temperature and a stabilized moisture content.

C. Handle acoustical ceiling units carefully to avoid chipping edges or damaged units in any way.

1.08 FIELD CONDITIONS

A. Maintain uniform temperature of minimum 60 degrees F, and maximum humidity of 40 percent prior to, during, and after acoustical unit installation.

1.09 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Project Warranty: Submit a written warranty, executed by the Installer and Manufacturer, agreeing to repair or replace tile that fails in materials or workmanship within the specified warranty period.
   1. Sag Resistance: Provide Ten (10) Year Limited Warranty that products will be free from sagging and warpage
   2. Mold and Mildew Resistance: Provide Ten (10) Year Limited Warranty that products are free from growth of mold and mildew.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acoustic Tiles/Panels:
   1. Armstrong World Industries, Inc: www.armstrong.com.
   2. CertainTeed Corporation: www.certainteed.com.
   3. USG: www.usg.com.
   4. Substitutions: See Section 01 60 00 - PRODUCT REQUIREMENTS.

B. Suspension Systems:
   1. Same as for acoustical units.

2.02 ACOUSTICAL UNITS

A. Acoustical Units - General: ASTM E1264, Class A.

B. Acoustical Panels Type ACT-1: ASTM E1264 Type III, Painted mineral fiber, conforming to the following:
   1. Size: 24 by 24 inches.
   2. Thickness: 5/8 inches.
   3. Composition: Water felted.
   4. Sag Resistance: Provide 10-year warranty.
   5. STC Range: 35 to 39.
   6. Edge: Square.
   7. Surface Color: White.
   8. Surface Pattern: Non-directional fissured.
   9. Suspension System: Exposed grid Type DX.

C. Acoustical Tile Type ACT-2: Plastic faced mineral fiber, ASTM E1264 Type IV, with the following characteristics:
   1. Size: 24 x 24 inches.
   2. Thickness: 5/8 inches.
   3. Composition: Water felted.
   4. STC Range: 35 to 39.
   5. Edge: Beveled tegular.
   6. Surface Color: White.

7. Surface Pattern: Non-directional fissured.
8. Suspension System: Exposed grid Type DX.

D. Acoustical Panels Type ACT-3: ASTM E1264 Type IV,Vinyl faced gypsum, conforming to the following:
1. Size: 24 by 24 inches.
2. Thickness: 1/2 inches.
3. Composition: Wet felted.
4. Edge: Square.
5. Surface Color: White.
6. Surface Pattern: Embossed stipple pattern.
7. Suspension System: Exposed grid Type DX.

2.03 SUSPENSION SYSTEM

A. Manufacturers:
1. Armstrong World Industries, Inc: www.armstrong.com.
2. CertainTeed Corporation: www.certainteed.com.
3. Chicago Metallic Corporation: www.chicagometallic.com.
4. USG: www.usg.com.
5. Substitutions: See Section 01 60 00 - Product Requirements.

B. Metal Suspension Systems - General: Complying with ASTM C635/C635M; die cut and interlocking components, with stabilizer bars, clips, splices, perimeter moldings, and hold down clips as required.

C. Interior Exposed Steel Suspension System: Formed galvanized steel, commercial quality cold rolled; Intermediate-duty.
1. Profile: Tee; 15/16 inch wide face.
2. Construction: Double web.
3. Finish: White painted.

2.04 ACCESSORIES

A. Support Channels and Hangers: Galvanized steel; size and type to suit application and ceiling system flatness requirement specified.

B. Perimeter Moldings: Same material and finish as grid or the ceiling system specified.
1. At Exposed Grid: Provide L-shaped molding for mounting at same elevation as face of grid.

C. Acoustical Insulation: Specified in Section 07 21 00.

D. Touch-up Paint: Type and color to match acoustical and grid units.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that layout of hangers will not interfere with other work.

C. Do not proceed with installation until all wet work such as concrete, terrazzo, plastering and painting has been completed and thoroughly dried out, unless expressly permitted by manufacturer's printed recommendation.

3.02 INSTALLATION - SUSPENSION SYSTEM

A. Install suspension system in accordance with ASTM C636/C636M, ASTM E580/E580M, and manufacturer's instructions and as supplemented in this section.

B. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.

C. Lay out system to a balanced grid design with edge units no less than 50 percent of acoustical unit size.

D. Install after major above-ceiling work is complete. Coordinate the location of hangers with other work.

E. Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.

F. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.

G. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.

H. Support fixture loads using supplementary hangers located within 6 inches of each corner, or support components independently.

I. Do not eccentrically load system or induce rotation of runners.

J. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
   1. Use longest practical lengths.
   2. Overlap and rivet corners.

3.03 INSTALLATION - ACOUSTICAL UNITS

A. Install acoustical units in accordance with manufacturer's instructions.

B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.

C. Fit border trim neatly against abutting surfaces.

D. Install units after above-ceiling work is complete.

E. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.

F. Cutting Acoustical Units:
   1. Cut to fit irregular grid and perimeter edge trim.
   2. Make field cut edges of same profile as factory edges.
   3. Double cut and field paint exposed reveal edges.

G. Where round obstructions occur, provide preformed closures to match perimeter molding.

H. Install hold-down clips on panels within 20 ft of an exterior door.

3.04 TOLERANCES

A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.

B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

3.05 CLEAN UP

A. Remove cut-offs and carton waste to dumpster or as designated. Leave rooms clean.

B. Replace damaged and broken panels.

C. Clean exposed surfaces of acoustical ceilings, including trim, edge moldings, and suspension members. Comply with manufacturer's instructions for cleaning and touch up of minor finish damage. Remove and replace work that cannot be successfully cleaned and repaired to eliminate evidence of damage.

D. Deliver extra stock to Owner at close-out.

END OF SECTION

SECTION 09 65 00
RESILIENT FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Resilient base.

B. Resilient stair accessories.

C. Installation accessories.

1.02 REFERENCE STANDARDS

A. ASTM F1861 - Standard Specification for Resilient Wall Base.

B. FS RR-T-650 - Treads, Metallic and Nonmetallic, Skid Resistant; Federal Specifications and Standards.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.
   1. Shop Drawings: Indicate seaming plans and floor patterns.

C. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

D. Selection Samples: Submit manufacturer's complete set of color samples for Hoffman's initial selection.

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - PRODUCT REQUIREMENTS, for additional provisions.
   2. Extra Wall Base: 10 linear feet of each type and color.
   3. Extra Stair Materials: Quantity equivalent to 5 percent of each type and color.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing specified flooring with minimum three years documented experience.

B. Installer Qualifications: Company specializing in installing specified flooring with minimum three years documented experience.

C. Testing Agency Qualifications: Independent firm specializing in performing concrete slab moisture testing and inspections of the type specified in this section.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Upon receipt, immediately remove any shrink-wrap and check materials for damage and the correct style, color, quantity and run numbers.

B. Store all materials off of the floor in an acclimatized, weather-tight space.

C. Protect roll materials from damage by storing on end.

1.06 FIELD CONDITIONS

A. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F.

1.07 WARRANTY

A. See Section 01 78 00 - CLOSEOUT SUBMITTALS, for additional warranty requirements.

B. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to, and not a limitation of, other rights Owner may have under the Contract Documents.

PART 2 PRODUCTS

2.01 STAIR COVERING

A. Stair Treads: Rubber; full width and depth of stair tread in one piece; tapered thickness.
   1. Minimum Requirements: Comply with FS RR-T-650 requirements corresponding to type specified.
   2. Nosing: Square.

B. Stair Risers: Full height and width of tread in one piece, matching treads in material and color.
   1. Thickness: 0.080 inch.

C. Stair Stringers: Full height in one piece and in maximum available lengths, matching treads in material and color.
   1. Nominal Thickness: 0.080 inch.

2.02 RESILIENT BASE

A. Resilient Base[RB-1, RB-2, RB-3]: ASTM F1861, Type TS rubber, vulcanized thermoset; top set Style B, Cove.
   1. Height: 4 inch.
   2. Thickness: 0.125 inch.
   3. Finish: Satin.
   4. Length: 4 foot sections.
   5. Color: To be selected by Hoffman from manufacturer's full range.
   6. Accessories: Premolded external corners and internal corners.

2.03 ACCESSORIES

A. Subfloor Filler: White premix latex; type recommended by adhesive material manufacturer.

B. Primers, Adhesives, and Seaming Materials: Waterproof; types recommended by flooring manufacturer. Zero-VOC water-based acrylic spray adhesives, particularly non-toxic aerosol product, are preferable where applicable and approved by the flooring manufacturer.

C. Filler for Coved Base: Plastic.

D. Rubber landing and floor tile: Type and pattern to match stair treads

E. Sealer and Wax: Types recommended by flooring manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.

B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive resilient base.

C. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

A. Remove sub-floor ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with sub-floor filler to achieve smooth, flat, hard surface.

B. Prohibit traffic until filler is fully cured.

C. Clean substrate.

D. Apply primer as required to prevent "bleed-through" or interference with adhesion by substances that cannot be removed.

3.03 INSTALLATION - GENERAL

A. Starting installation constitutes acceptance of sub-floor conditions.

B. Install in accordance with manufacturer's written instructions.

C. Adhesive-Applied Installation:
   1. Spread only enough adhesive to permit installation of materials before initial set.
   2. Fit joints and butt seams tightly.
   3. Set flooring in place, press with heavy roller to attain full adhesion.

D. Where type of floor finish, pattern, or color are different on opposite sides of door, terminate flooring under centerline of door.

E. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated.

F. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.

3.04 INSTALLATION - RESILIENT BASE

A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches between joints.

B. Miter internal corners. At external corners, use premolded units. At exposed ends, use premolded units if available.

C. Install base on solid backing. Bond tightly to wall and floor surfaces.

D. Scribe and fit to door frames and other interruptions.

3.05 INSTALLATION - STAIR COVERINGS

A. Install stair coverings in one piece for full width and depth of tread.

B. Install stringers configured tightly to stair profile.

C. Adhere over entire surface. Fit accurately and securely.

3.06 CLEANING

A. Remove excess adhesive from floor, base, and wall surfaces without damage.

B. Clean in accordance with manufacturer's written instructions.

3.07 PROTECTION

A. Prohibit traffic on resilient flooring for 48 hours after installation.

END OF SECTION

SECTION 09 65 19

RESILIENT TILE FLOORING

PART 2 PRODUCTS

1.01 MANUFACTURERS

A. Basis of Design: Metroflor Corporation; Aspecta Five LVT: www.aspectaflooring.com/#sle.

B. Substitutions: See Section 01 60 00 - PRODUCT REQUIREMENTS.

1.02 RESILIENT TILE FLOORING

A. Luxury Vinyl Plank and Tile:
   1. Pattern: Refer to Room Finish Schedule.
   2. Color: Refer to Room Finish Schedule.
   3. Physical Properties:
      a. Construction: Phthalate-free solid plank and tile made from 100 percent virgin vinyl.
      b. Wear Layer Thickness: 28 mil.
      c. Total Thickness (Gauge): 0.126 inch.
      d. Finish: Urethane coating with ceramic bead particles.

1.03 ACCESSORIES

A. Moldings, Transition and Edge Strips: Same material as flooring.

B. Adhesives:
   1. VOC Content Limits: As specified in Section 01 61 16.
   2. Products:
      a. Metroflor Corporation; Prevail® 3100 Acrylic Spray Adhesive.
      b. Substitutions: See Section 01 60 00 - PRODUCT REQUIREMENTS.

C. Finishes and Cleaners:
   1. VOC Content Limits: As specified in Section 01 61 16.
   2. Products:
      a. Metroflor Corporation; Prevail® Matte Finish.
      b. Substitutions: See Section 01 60 00 - PRODUCT REQUIREMENTS.

PART 3 EXECUTION

2.01 EXAMINATION - SEE ALSO SECTION 01 7000.

A. Install flooring and accessories after other operations (including painting) have been completed.

B. Acceptance of Conditions: Carefully examine all installation areas with installer/applicator present, for compliance with requirements affecting work performance.
   1. Verify that field measurements, product, adhesives, substrates, surfaces, structural support, tolerances, levelness, temperature, humidity, moisture content level, pH, cleanliness and other conditions are as required by the manufacturer, and ready to receive work.

C. Verify that substrate is contaminant-free, including old adhesives and abatement chemicals.

D. Test substrates as required by manufacturer to verify proper conditions exist.

E. Verify that required floor-mounted utilities are in correct location.

2.02 PREPARATION

A. Flooring installation should not begin until all site conditions have been assessed, testing has been completed and subfloor conditions have been approved.

B. Prepare per manufacturer's written instructions, Section 01 70 00, and as follows:
   1. Prepare substrates to ensure proper adhesion of Luxury Vinyl Plank & Tile.
   2. Concrete Substrates: Prepare substrate per ASTM F710.
      a. Verify that subfloor is clean, flat, smooth, free of dirt, rust, paint, oil, wax or any contaminant that will interfere with adhesive bonding.

b. Mechanically remove substrate coatings that are not compatible with adhesives, such as sealers, curing, hardening or parting compounds, soap, wax, oil, etc.
    1) Do not use solvents or adhesive removers.
c. Expansion joints, isolation joints, or other moving joints must be honored and must not be filled with underlayment products or other materials, and floor coverings must not be laid over them. Expansion joint covering systems should be detailed by the architect or engineer, and based upon intended usage and aesthetic considerations.
d. Surface cracks, grooves, depressions, control joints or other non-moving joints, and other irregularities shall be filled or smoothed with high-quality Portland cement or calcium aluminate based patching or underlayment compound for filling or smoothing, or both.
    1) Do not skim-coat large areas with patching compound, especially slick power-troweled surfaces.
    2) Sand smooth per manufacturer's instructions.
e. Slick surfaces such as power-troweled concrete shall be profiled as needed to allow for a mechanical bond between the adhesive and subfloor.
f. Do not use gypsum-based underlayment products and do not skim coat concrete subfloors.
g. Self-Leveling Underlayments: Provide a dry and smoothly-sanded underlayment substrate ready for installation of Luxury Vinyl Plank & Tile. Underlayment compound shall be moisture-resistant, mildew-resistant, and alkali-resistant and must have a minimum of 3,000 psi compressive strength per ASTM C109/C109M.
h. Lightweight concrete shall have a compressive strength greater than 90 pounds per cubic foot with minimum compression strength of 2,500 psi or greater.

3. Existing and Other Substrates:
    a. Refer to manufacturer's professional installation guide and/or contact manufacturer, as special conditions may exist.

2.03 INSTALLATION

A. Installation per manufacturer's written instructions, Section 01 70 00, and as follows:
1. Layout shall be specified by Architect, Designer or End User.
2. Follow layout and ensure installation reference lines are square.
3. Field tiles shall be installed with directional arrows on back aligned in the same direction, or may be installed in quarter-turned fashion.
4. Check cartons for and do not mix dye lots.
5. Expansion Joints: Locate expansion, isolation, and other moving joints prior to installation.
    a. Do not fill expansion, isolation, and other moving joints with patching compound nor cover with resilient flooring.
    b. Install movement joint systems per manufacturer's instructions and per Section 07 92 00 and Section 07 95 13.
6. Adhesives: Adhere flooring to substrate using the full spread method resulting in a completed installation without gaps, voids, raised edges, bubbles or any other surface imperfections.
    a. Select appropriate adhesive, trowel and follow manufacturer's instructions.
    b. Periodically spot-check transfer of adhesive to back of tile during installation.
    c. Roll floor with a 100 pound roller to ensure proper transfer of adhesive and bonding.
    d. Protect floor from traffic per manufacturer's instructions.
    e. Do not wet mop floor until the adhesive has properly set per written instructions.

2.04 FIELD QUALTITY CONTROL

A. Site tests and inspections per Section 01 40 00 and as follows:
1. Inspect flooring installation for non-conforming work including (but not limited to) the following:
    a. Lack of adhesion.
    b. Bubbles, loose tiles or raised edges.
    c. Dirt and debris underneath flooring.

d. Excessive gaps.
e. Improper substrate preparation (as indicated by telegraphing).
f. Damage to tiles, including: dents/indentations, cuts, cracks, burns or punctures.

B. Non-conforming work per General Conditions and as follows:
1. Repair or replace damaged material if not acceptable to the Hoffman.

2.05 CLEANING

A. Waste Management per Section 01 70 00 and Section 01 74 19, and as follows:
1. Coordinate material reclamation program with manufacturer, if applicable.
a. Store and return cartons and pallets to manufacturer or recycler for reuse or recycling.

B. Provide progress cleaning per manufacturer's written instructions, Section 01 70 00, and as follows:
1. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the work.
a. Clean and protect completed construction until Date of Substantial Completion.
b. During installation, remove wet adhesive from surface of flooring per manufacturer's instructions.
2. Site: Maintain project site free of waste materials and debris.

C. Provide final cleaning immediately prior to Date of Substantial Completion inspection per manufacturer's written instructions and Section 01 70 00.
1. Protection: Remove manufacturer's and other installed protection immediately prior to Date of Substantial Completion inspection, unless required otherwise.
2. Clean floor with a neutral 6-8 pH cleaner.

2.06 MAINTENANCE

A. Initial maintenance per flooring manufacturer’s written instructions and as follows:
1. Allow the adhesive to cure for at least 48 hours prior to wet cleaning the floor.
2. Sweep, dust mop or vacuum the floor thoroughly to remove all loose dirt, dust, grit and debris. Do not use vacuums with a beater bar assembly.
3. Remove any dried adhesive residue from the surface with mineral spirits applied to a clean, lint-free cloth.
4. Damp mop the floor using a cleaner recommended by the flooring manufacturer.
5. If necessary, scrub the floor using an auto scrubber or rotary machine (300 rpm or less) with a cleaner recommended by the flooring manufacturer. Maintain the proper dilution ratio and use the appropriate scrubbing brush or pad.
6. Thoroughly rinse the entire floor with fresh, clean water. Remove the dirty residue with a wet-vacuum or clean mop and allow the floor to dry completely.

2.07 PROTECTION

A. Protect materials from construction operations until Date of Substantial Completion or Owner occupancy, whichever occurs first.
1. Protect finished floor from abuse and damage by using heavy non-staining kraft paper, drop cloths or equivalent. Use additional, non-damaging protective materials as needed.
2. Light foot traffic on a newly installed floor can be permitted after 24 hours.
3. Keep heavy traffic and rolling loads off the newly installed LVT flooring for 48 hours.
4. Protect the floor from rolling loads by covering with protective boards.

END OF SECTION

SECTION 09 65 66
RESILIENT ATHLETIC FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Rubber sheet flooring, adhesively installed.

B. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 03 30 00 - CAST-IN-PLACE CONCRETE: Restrictions on curing compounds for concrete slabs and floors.

C. Section 09 65 00 - Resilient Flooring.

1.03 REFERENCE STANDARDS

A. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's printed data sheets for products specified.

C. Selection Samples: Manufacturer's color charts for flooring materials specified and game line paints, indicating full range of colors and textures available.

1.05 QUALITY ASSURANCE

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to project site in unopened containers clearly labeled with manufacturer's name and identification of contents.

B. Store materials in dry and clean location until needed for installation. During installation, handle in a manner that will prevent marring and soiling of finished surfaces.

1.07 FIELD CONDITIONS

A. Maintain temperature in spaces to receive adhesively installed resilient flooring within range of 70 to 95 degrees F for not less than 48 hours before the beginning of installation and for not less than 48 hours after installation has been completed. Subsequently, do not allow temperature in installed spaces to drop below 50 degrees F or to go above 100 degrees F.

PART 2 PRODUCTS

2.01 PREFORMED ATHLETIC FLOORING

A. Manufacturers: All products by the same manufacturer.
   1. Encore Athletic

B. Rubber Sheet Flooring: Recycled SBR (styrene butadiene rubber) and colored EPDM granules with urethane binder, lengths to avoid transverse seams.
   1. Thickness: Minimum 1/4 inch.
   2. Sheet Width: Minimum 48 inches.
   3. Tensile Strength: Minimum 150 psi, per ASTM D412.
   4. Color: Refer to Room Finish Schedule.

2.02 ACCESSORIES

A. Leveling Compound: Latex-modified cement formulation as recommended by flooring manufacturer for substrate conditions.

B. Adhesive: Water-resistant type recommended by flooring manufacturer for project conditions.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates for conditions detrimental to installation of athletic flooring. Proceed with installation only after unsatisfactory conditions have been corrected.

B. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of athletic flooring to substrate.

C. Cementitious Sub-floor Surfaces: Verify that substrates are dry enough and ready for resilient flooring installation by testing for moisture and pH.
   1. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.

3.02 PREPARATION

A. Concrete: Use leveling compound as necessary to achieve substrate flatness of plus or minus 1/8 inch within 10 ft radius.

B. Remove coatings that are incompatible with flooring adhesives, using methods recommended by flooring manufacturer.

C. Broom clean areas to receive athletic flooring immediately before beginning installation.

3.03 INSTALLATION

A. Starting installation constitutes acceptance of sub-floor conditions.

B. Install in accordance with manufacturer's written instructions.

C. Resilient Sheet Flooring:
   1. Unroll flooring and allow to relax before beginning installation.
   2. Mix adhesive thoroughly and apply to substrate with notched trowel. Roll flooring into fresh adhesive, overlapping end seams and double cutting, butting factory edges and compression fitting.
   3. Roll entire flooring surface with steel roller to assure adhesion to substrate and eliminate air bubbles.
   4. Immediately remove any adhesive from flooring surface, using chemical recommended by flooring manufacturer.
   5. Weld seams using techniques and equipment recommended by manufacturer.
   6. Lay out game lines using tape and taping machine approved by flooring manufacturer. Apply game line paint with roller, and allow to dry before removing tape.
   7. Apply transparent top coat over flooring if recommended by manufacturer, to achieve a uniform finished appearance.

3.04 CLEANING

A. Clean flooring using methods recommended by manufacturer.

3.05 PROTECTION

A. Protect finished athletic flooring from construction traffic to ensure that it is without damage upon Date of Substantial Completion.

END OF SECTION

SECTION 09 67 00
FLUID APPLIED FLOORING

PART 1 GENERAL

1.01 SCOPE

A. This specification section has USGBC LEED point ramifications. Contractor(s) will execute all work in full compliance to LEED requirements associated with this and related specification sections. The LEED project manual has been included as a part of the general and special requirements of this specification and applies to this and all other sections of the specification. Where discrepancies exist between specification references, the most stringent shall apply.

1.02 SECTION INCLUDES

A. Fluid-applied flooring and base.

1.03 RELATED REQUIREMENTS

A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 03 30 00 - Cast-In-Place Concrete: Concrete substrate.

1.04 REFERENCE STANDARDS

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns and colors available.

C. Samples: Submit two samples, ____by____ inch in size illustrating color and pattern for each floor material for each color specified.

D. Manufacturer's Installation Instructions: Indicate special procedures.

E. Maintenance Data: Include maintenance procedures, recommended maintenance materials, procedures for stain removal, repairing surface, and suggested schedule for cleaning.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - PRODUCT REQUIREMENTS, for additional provisions.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

B. Supervisor Qualifications: Trained by product manufacturer, under direct full time supervision of manufacturer's own foreman.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store resin materials in a dry, secure area.

B. Store materials for three days prior to installation in area of installation to achieve temperature stability.

1.08 FIELD CONDITIONS

A. Maintain minimum temperature in storage area of 55 degrees F.

B. Store materials in area of installation for minimum period of 24 hours prior to installation.

C. Maintain ambient temperature required by manufacturer 72 hours prior to, during, and 24 hours after installation of materials.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fluid-Applied Flooring:
   1. Sherwin-Williams; Ceramic Carpet

2.02 FLUID-APPLIED FLOORING SYSTEMS

A. Fluid-Applied Flooring: Epoxy, two component, thermosetting, colored with mineral filler, with aggregate embedded in base coat.
   1. Base Coat: 1/8 inch thick; color as selected from standard colors.
      a. Tensile Strength: 2,000 psi at 7 days in accordance with ASTM C 307.
      b. Compressive Strength: 10,000 psi at 7 days in accordance with ASTM C 579.
      c. Water Absorption: 0.10 percent in accordance with ASTM C 413.
      d. Abrasion Resistance: Maximum weight loss of 0.1 g/1000 cycles, CS-17 wheel, in accordance with ASTM D 4060, Taber Abrader.
      e. Impact Resistance: No indentation, no cracking, chipping, or delamination when tested in accordance with MIL-D-3134J.
      f. Hardness: 85 in accordance with ASTM D 2240, Shore D.
      g. Flammability: Self-extinguishing in accordance with ASTM D 635.
      h.
      i. Bond Strength: Exceeding 400 psi (100% concrete failure) in accordance with ASTM D 4541.
      j. Modulus of Elasticity: 500,000 psi at 7 days in accordance with ASTM C 580.
      k. Flexural Strength: 3,100 psi at 7 days in accordance with ASTM C 580.
      l. Mildew Resistance: No growth.
   2. Aggregate: Small quartz chips, selected from standard color.
   3. Top Coat: Epoxy, two component, thermosetting, minimum 1/16 inch thickness; clear color.
      a. Tensile Strength: 3,900 psi at 7 days in accordance with ASTM D 638.
      b. Compressive Strength: 7,900 psi at 7 days in accordance with ASTM C 579.
      c. Water Absorption: 0.10 percent in accordance with ASTM C 413.
      d. Abrasion Resistance: Maximum weight loss of 0.3 g/1000 cycles, CS-17 wheel, in accordance with ASTM D 4060, Taber Abrader.
      e. Hardness: 85 in accordance with ASTM D 2240, Shore D.
      f. Flammability: Self-extinguishing in accordance with ASTM D 635.
      g. Bond Strength: Exceeding 400 psi (100% concrete failure) in accordance with ASTM D 4541.
      h. Flexural Strength: 3,700 psi at 7 days in accordance with ASTM D 790.
      i. Mildew Resistance: No growth.

2.03 ACCESSORIES

A. Cant Strips: Molded of flooring resin material.

B. Subfloor Filler: Type recommended by fluid-applied flooring manufacturer.

C. Primer: Type recommended by fluid-applied flooring manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that sub-floor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive flooring.

B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive flooring.

C. Verify that sub-floor surfaces are dust-free and free of substances that could impair bonding of materials to sub-floor surfaces.

D. Verify that concrete sub-floor surfaces are ready for flooring installation by testing for moisture emission rate and alkalinity; obtain instructions if test results are not within limits recommended by flooring materials manufacturer.

E. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

A. Remove sub-floor ridges and bumps. Fill low spots, cracks, joints, holes, and other defects with sub-floor filler.

B. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Grind irregularities above the surface level. Prohibit traffic until filler is cured.

C. Vacuum clean substrate.

D. Apply primer to surfaces required by flooring manufacturer.

3.03 INSTALLATION - FLOORING

A. Apply in accordance with manufacturer's instructions.

B. Apply each coat to minimum thickness indicated.

C. Finish to smooth level surface.

D. Cove at vertical surfaces.

3.04 PROTECTION

A. Prohibit traffic on floor finish for 48 hours after installation.

B. Barricade area to protect flooring until fully cured.

END OF SECTION

SECTION 09 68 13

TILE CARPETING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Carpet tile, fully adhered.

1.02 RELATED REQUIREMENTS

A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 03 30 00 - CAST-IN-PLACE CONCRETE: Restrictions on curing compounds for concrete slabs and floors.

C. Section 09 68 16 - Sheet Carpeting: Broadloom carpet.

1.03 REFERENCE STANDARDS

A. CRI 104 - Standard for Installation of Commercial Carpet.

B. CRI (GLP) - Green Label Plus Testing Program - Certified Products; www.carpet-rug.org.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.
   1. Manufacturer's Installation Instructions: Indicate special procedures.

C. Samples: Submit two carpet tiles illustrating color and pattern design for each carpet color selected.

D. Submit two, 12 inch long samples of edge strip, base cap, and stair nosing.

E. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - PRODUCT REQUIREMENTS, for additional provisions.
   2. Extra Carpet Tiles: Quantity equal to 5 percent of total installed of each color and pattern installed.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing specified carpet tile with minimum three years documented experience.

B. Installer Qualifications: Company specializing in installing carpet tile with minimum three years documented experience and approved by carpet tile manufacturer.

1.06 FIELD CONDITIONS

A. Store materials in area of installation for minimum period of 24 hours prior to installation.

1.07 WARRANTY

A. See Section 01 78 00 - CLOSEOUT SUBMITTALS, for additional warranty requirements.

B. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to, and not a limitation of, other rights Owner may have under the Contract Documents.

C. Provide Manufacturer's Lifetime Warranty to include the following:
   1. Face fiber wear.
   2. Staining/Soiling Resistance.
   3. Color pattern permanency.
   4. Delamination of backing.
   5. Edge ravel and tuft bind.
   6. Floor compatibility.

7. Antistatic and cushion resiliency.
8. Antimicrobial protection when specified.
9. Flammability compliance at time of shipment.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Tile Carpeting:
   1. Interface, Inc; The Standard: www.interfaceinc.com/#sle.
   2. Mohawk Group; Learn & Live Collection, Color Balance, First Step II
   3. Mannington Commercial; Charge

2.02 MATERIALS

A. Tile Carpeting, Type CPT-1, CPT-2, CPT-3, CPT-4, WOC-1, WOC-2: Tufted, manufactured in one color dye lot.
   1. VOC Content: Provide CRI (GLP) certified product; in lieu of labeling, independent test report showing compliance is acceptable.
      a. Carpet: Documentation/product information maintaining total product VOC emission factor limit: 0.50 mg/m2/hr.
      b. Cushion: Documentation/product information maintaining total product VOC emission factor limit: 1.00 mg/m2/hr.

2.03 ACCESSORIES

A. Sub-Floor Filler: White premix latex; type recommended by flooring material manufacturer.

B. Edge Strips: Vinyl, as selected by Hoffman color.

C. Adhesives:
   1. Acceptable to manufacturer and compatible with materials being adhered; maximum VOC content of 50 g/L; CRI (GLP) certified; in lieu of labeled product, independent test report showing compliance is acceptable.

D. Carpet Tile Adhesive: Recommended by carpet tile manufacturer; releasable type.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that sub-floor surfaces are smooth and flat within tolerances specified for that type of work and are ready to receive carpet tile.

B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive carpet tile.

C. Verify that sub-floor surfaces are dust-free and free of substances that could impair bonding of adhesive materials to sub-floor surfaces.

D. Cementitious Sub-floor Surfaces: Verify that substrates are dry enough and ready for flooring installation by testing for moisture and pH.
   1. Obtain instructions if test results are not within limits recommended by flooring material manufacturer and adhesive materials manufacturer.

E. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.

B. Remove sub-floor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with sub-floor filler.

C. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Prohibit traffic until filler is cured.

D. Vacuum clean substrate.

3.03 INSTALLATION

A. Starting installation constitutes acceptance of sub-floor conditions.
B. Install carpet tile in accordance with manufacturer's instructions and CRI 104 (Commercial).
C. Blend carpet from different cartons to ensure minimal variation in color match.
D. Cut carpet tile clean. Fit carpet tight to intersection with vertical surfaces without gaps.
E. Locate change of color or pattern between rooms under door centerline.
F. Fully adhere carpet tile to substrate.
G. Trim carpet tile neatly at walls and around interruptions.
H. Complete installation of edge strips, concealing exposed edges.

3.04 CLEANING

A. Remove excess adhesive without damage, from floor, base, and wall surfaces.
B. Clean and vacuum carpet surfaces.

END OF SECTION

SECTION 09 91 13
EXTERIOR PAINTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints.

C. Scope: Finish exterior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated, including the following:
   1. Exposed surfaces of steel lintels and ledge angles.
   2. Steel ladders and stairs.
   3. Railings and bollards.

D. Do Not Paint or Finish the Following Items:
   1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
   2. Items indicated to receive other finishes.
   3. Items indicated to remain unfinished.
   4. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
   5. Non-metallic roofing and flashing.
   6. Stainless steel, anodized aluminum, bronze, terne coated stainless steel, zinc, and lead.
   7. Marble, granite, slate, and other natural stones.
   8. Floors, unless specifically indicated.
   9. Ceramic and other types of tiles.
   10. Brick, glass unit masonry, architectural concrete, cast stone, integrally colored plaster and stucco.
   11. Glass.
   12. Concealed pipes, ducts, and conduits.

1.02 RELATED REQUIREMENTS

A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 05 50 00 - Metal Fabrications: Shop-primed items.

C. Section 09 91 23 - Interior Painting.

1.03 DEFINITIONS

A. Comply with ASTM D16 for interpretation of terms used in this section.

1.04 REFERENCE STANDARDS

A. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications.

B. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Base Materials.

C. MPI (APL) - Master Painters Institute Approved Products List; Master Painters and Decorators Association.

D. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual.

E. SSPC-SP 1 - Solvent Cleaning.

F. SSPC-SP 2 - Hand Tool Cleaning.

G. SSPC-SP 6 - Commercial Blast Cleaning.

H. SSPC-SP 13 - Surface Preparation of Concrete; (Reaffirmed 2015).

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide complete list of products to be used, with the following information for each:
   1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
   2. MPI product number (e.g. MPI #47).
   3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.
   4. Manufacturer's installation instructions.
   5. Certification: By manufacturer that paints and finishes comply with VOC limits specified.

C. Samples: Submit two paper chip samples, 6 by 6 inch in size illustrating range of colors and textures available for each surface finishing product scheduled.

D. Maintenance Data: Submit data including product technical data sheets, care and cleaning instructions, touch-up procedures, repair of painted and finished surfaces, and color samples of each color and finish used.

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - PRODUCT REQUIREMENTS, for additional provisions.
   2. Extra Paint and Finish Materials: 1 gallon of each color; from the same product run, store where directed.
   3. Label each container with color in addition to the manufacturer's label.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum three years experience.

C. All materials, preparation and workmanship shall conform to requirements of the latest edition of the Architectural Painting Specification Manual by the Master Painters Institute (MPI) (hereafter referred to as the MPI Painting Manual) as issued by the local MPI Accredited Quality Assurance Association having jurisdiction.

D. All paint manufacturers and products used shall be as listed under the Approved Product List section of the MPI Painting Manual.

E. The painting contractor shall receive written confirmation of the specific surface preparation procedures and primers used for all fabricated steel items from the fabricator / supplier to ascertain appropriate and manufacturer compatible finish coat materials to be used before painting any such work.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

D. Where toxic and/or volatile, explosive, or flammable materials are being used, provide adequate fireproof storage lockers and take all necessary precautions and post adequate warnings as required.

E. Take all necessary precautionary and safety measures to prevent fire hazards and spontaneous combustion and to protect the environment from hazard spills.

F. Comply with requirements of authorities having jurisdiction, in regard to the use, handling, storage and disposal of hazardous materials.

1.08 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Do not apply exterior paint and finishes during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.

D. Minimum Application Temperatures for Latex Paints: 50 degrees F for exterior; unless required otherwise by manufacturer's instructions.

E. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide paints and finishes from the same manufacturer.
   1. In the event that a single manufacturer cannot provide specified products, minor exceptions will be permitted provided approval by Hoffman is obtained using the specified procedures for substitutions.

B. Paints:
   1. Base Manufacturer: Sherwin-Williams Company.

C. Transparent Finishes:
   1. Sherwin-Williams Company.
   2. Diamond Vogel Paints: www.diamondvogel.com.

D. Stains:
   1. ICI Paints.
   2. Diamond Vogel Paints: www.diamondvogel.com.
   3. Sherwin-Williams Company

E. Primer Sealers: Same manufacturer as top coats.

F. Substitutions: See Section 01 60 00 - PRODUCT REQUIREMENTS.

2.02 PAINTS AND FINISHES - GENERAL

A. Paints and Finishes: Ready mixed, unless required to be a field-catalyzed paint.
   1. Where MPI paint numbers are specified, provide products listed in Master Painters Institute Approved Product List, current edition available at www.paintinfo.com, for specified MPI categories, except as otherwise indicated.
   2. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
   3. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
   4. For opaque finishes, tint each coat including primer coat and intermediate coats, one-half shade lighter than succeeding coat, with final finish coat as base color.
   5. Supply each paint material in quantity required to complete entire project's work from a single production run.
   6. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

B. Volatile Organic Compound (VOC) Content: Comply with Section 01 61 16.

C. Flammability: Comply with applicable code for surface burning characteristics.

D. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Hoffman from the manufacturer's full line.

E. Colors: As indicated on drawings.

2.03 PAINT SYSTEMS - EXTERIOR

A. Exterior Surfaces to be Painted, Unless Otherwise Indicated: Including concrete, concrete masonry units, primed wood, and primed metal.
   1. Two top coats and one coat primer.

B. Masonry/Concrete, Opaque, Latex, 2 Coat:
   1. One coat of block filler.

C. Ferrous Metals, Unprimed, Latex, 3 Coat:
   1. One coat of latex primer.
   2. Gloss: Two coats of latex enamel.

D. Ferrous Metals, Primed, Latex, 2 Coat:
   1. Touch-up with rust-inhibitive primer recommended by top coat manufacturer.
   2. Gloss: Two coats of latex enamel.

E. Galvanized Metals, Latex, 3 Coat:
   1. One coat galvanize primer.

F. Aluminum, Unprimed, Alkyd, 3 Coat:
   1. One coat etching primer.

2.04 PRIMERS

A. Primers: Provide the following unless other primer is required or recommended by manufacturer of top coats.
   1. Alkali Resistant Water Based Primer; MPI #3.
   2. Interior/Exterior Latex Block Filler; MPI #4.
      a. Products:
         1) Sherwin-Williams Company; CONFLEX Block Filler.
         2) Substitutions: Section 01 60 00 - PRODUCT REQUIREMENTS.
   3. Interior/Exterior Quick Dry Alkyd Primer for Metal; MPI #76.
   4. Water Based Primer for Galvanized Metal; MPI #134.
   5. Rust-Inhibitive Water Based Primer; MPI #107.
   6. Interior/Exterior Quick Dry Primer for Aluminum; MPI #95.
   7. Latex Primer for Exterior Wood; MPI #6.

2.05 ACCESSORY MATERIALS

A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.

B. Patching Material: Latex filler.

C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin application of paints and finishes until substrates have been properly prepared.

B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially effect proper application.

D. If substrate preparation is the responsibility of another installer, notify Hoffman of unsatisfactory preparation before proceeding.

E. Test shop-applied primer for compatibility with subsequent cover materials.

F. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
   1. Masonry, Concrete, and Concrete Masonry Units: 12 percent.
   2. Exterior Wood: 15 percent, measured in accordance with ASTM D4442.
   3. Concrete Floors and Traffic Surfaces: 8 percent.

3.02 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or repair existing paints or finishes that exhibit surface defects.

D. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces for finishing.

E. Seal surfaces that might cause bleed through or staining of topcoat.

F. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

G. Concrete:
   1. Remove release agents, curing compounds, efflorescence, and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.
   2. Prepare surface as recommended by top coat manufacturer and according to SSPC-SP 13.

H. Masonry:
   1. Remove efflorescence and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces or if alkalinity of mortar joints exceed that permitted in manufacturer's written instructions. Allow to dry.
   2. Prepare surface as recommended by top coat manufacturer.

I. Exterior Gypsum Board: Fill minor defects with exterior filler compound. Spot prime defects after repair.

J. Concrete Floors and Traffic Surfaces: Remove contamination, acid etch, and rinse floors with clear water. Verify required acid-alkali balance is achieved. Allow to dry.

K. Aluminum: Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.

L. Galvanized Surfaces:
   1. Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.
   2. Prepare surface according to SSPC-SP 2.

M. Ferrous Metal:
   1. Solvent clean according to SSPC-SP 1.
   2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.
   3. Remove rust, loose mill scale, and other foreign substances using using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 "Commercial Blast Cleaning". Protect from corrosion until coated.

N. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

3.03 APPLICATION

A. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".

B. Where adjacent sealant is to be painted, do not apply finish coats until sealant is applied.

C. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

D. Apply each coat to uniform appearance.

E. Dark Colors and Deep Clear Colors: Regardless of number of coats specified, apply additional coats until complete hide is achieved.

F. Sand wood and metal surfaces lightly between coats to achieve required finish.

G. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

H. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

I. Spray paint door frames, brush applied coatings are not acceptable.

J. Do not paint over nameplates.

3.04 WALLS

A. Interior faces of all exterior concrete masonry and precast walls scheduled to be painted, are to be finished full height to bottom of decking. Finish to include block filler and specified second and third coats.

B. Interior walls scheduled to be painted are to be finished to a minimum height of 8 inches above finished ceiling elevation.

C. In areas where ceilings are not continuous, finish walls scheduled to receive paint full height to decking above.

3.05 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for general requirements for field inspection.

B. Painted surfaces shall be considered unacceptable if any of the following are evident under final lighting source, including daylight for interior surfaces:

1. Visible defects are evident on vertical surfaces when viewed at normal viewing angles from a distance of not less than 39 inches.
2. Visible defects are evident on horizontal surfaces when viewed at normal viewing angles from a distance of not less than 39 inches.
3. Visible defects are evident on ceiling, soffit and other overhead surfaces when viewed at normal viewing angles.
4. When the final coat on any surface exhibits a lack of uniformity of color, sheen, texture, and hiding across full surface area.

3.06 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.07 PROTECTION

A. Protect finishes until completion of project.

B. Protect work adjacent to painting operations from paint splatters and spills.

C. Immediately remove paint that falls on finished surfaces not scheduled to receive paint, using materials and techniques that will not damage affected surfaces.

D. Erect barriers or screens and post signs to provide warning as needed to direct traffic away or around work area.

E. Touch-up damaged finishes after Substantial Completion.

END OF SECTION

SECTION 09 91 23

INTERIOR PAINTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints.

C. Scope: Finish interior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated.
   1. Both sides and edges of plywood backboards for electrical and telecom equipment before installing equipment.
   2. Elevator pit ladders.
   3. Steel ladders and stairs.
   4. Prime surfaces to receive wall coverings.
   5. Mechanical and Electrical:
      a. In finished areas, paint insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, mechanical equipment, and electrical equipment, unless otherwise indicated.
      b. Paint interior surfaces of air ducts and convector and baseboard heating cabinets that are visible through grilles and louvers with one coat of flat black paint to visible surfaces.
      c. Paint dampers exposed behind louvers, grilles, and convector and baseboard cabinets to match face panels.

D. Do Not Paint or Finish the Following Items:
   1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
   2. Items indicated to receive other finishes.
   3. Items indicated to remain unfinished.
   4. Fire rating labels, equipment serial number and capacity labels, bar code labels, and operating parts of equipment.
   5. Floors, unless specifically indicated.
   6. Ceramic and other tiles.
   7. Brick, architectural concrete, cast stone, integrally colored plaster and stucco.
   8. Glass.
   9. Acoustical materials, unless specifically indicated.
   10. Concealed pipes, ducts, and conduits.

1.02 RELATED REQUIREMENTS

A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 05 50 00 - Metal Fabrications: Shop-primed items.

C. Section 07 05 53 - Fire and Smoke Assembly Identification.

D. Section 09 91 13 - Exterior Painting.

1.03 DEFINITIONS

A. Comply with ASTM D16 for interpretation of terms used in this section.

1.04 REFERENCE STANDARDS

A. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications.

B. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Base Materials.

C. MPI (APL) - Master Painters Institute Approved Products List; Master Painters and Decorators Association.

D. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual.

E. SSPC-SP 1 - Solvent Cleaning.

F. SSPC-SP 2 - Hand Tool Cleaning.

G. SSPC-SP 6 - Commercial Blast Cleaning.

H. SSPC-SP 13 - Surface Preparation of Concrete; (Reaffirmed 2015).

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide complete list of products to be used, with the following information for each:
   1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
   2. MPI product number (e.g. MPI #47).
   3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.
   4. Manufacturer's installation instructions.
   5. Certification: By manufacturer that paints and finishes comply with VOC limits specified.
   6. Manufacturer's Instructions: Indicate special surface preparation procedures.

C. Samples: Submit two paper chip samples, nominal 4 x 10 inch in size illustrating range of colors and textures available for each surface finishing product scheduled.

D. Maintenance Data: Submit data including product technical data sheets, care and cleaning instructions, touch-up procedures, repair of painted and finished surfaces, and color samples of each color and finish used.

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - PRODUCT REQUIREMENTS, for additional provisions.
   2. Extra Paint and Finish Materials: 1 gallon of each color; store where directed.
   3. Label each container with color in addition to the manufacturer's label.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum three years experience.

C. All materials, preparation and workmanship shall conform to requirements of the latest edition of the Architectural Painting Specification Manual by the Master Painters Institute (MPI) (hereafter referred to as the MPI Painting Manual) as issued by the local MPI Accredited Quality Assurance Association having jurisdiction.

D. All paint manufacturers and products used shall be as listed under the Approved Product List section of the MPI Painting Manual.

E. The painting contractor shall receive written confirmation of the specific surface preparation procedures and primers used for all fabricated steel items from the fabricator / supplier to ascertain appropriate and manufacturer compatible finish coat materials to be used before painting any such work.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

D. Where toxic and/or volatile, explosive, or flammable materials are being used, provide adequate fireproof storage lockers and take all necessary precautions and post adequate warnings as required.

E. Take all necessary precautionary and safety measures to prevent fire hazards and spontaneous combustion and to protect the environment from hazard spills.

F. Comply with requirements of authorities having jurisdiction, in regard to the use, handling, storage and disposal of hazardous materials.

1.08 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Do not apply materials when relative humidity exceeds 85 percent; at temperatures less than 5 degrees F above the dew point; or to damp or wet surfaces.

D. Minimum Application Temperatures for Paints: 50 degrees F for interiors unless required otherwise by manufacturer's instructions.

E. Provide lighting level of 30 ft candles measured mid-height at substrate surface.

F. Lead Paint: It is not expected that lead paint will be encountered in the Work.
   1. If suspected lead paint is encountered, do not disturb; immediately notify Architect and Owner.

G. Lead Paint: Lead paint is present in buildings and structures to be painted. A report on the presence of lead paint is on file for review and use. Examine report to become aware of locations where lead paint is present.
   1. Do not disturb lead paint or items suspected of containing hazardous materials except under procedures specified.
   2. Perform preparation for painting of substrates known to include lead paint in accordance with EPA Renovation, Repair and Painting Rule and additional requirements of authorities having jurisdiction.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide paints and finishes from the same manufacturer to the greatest extent possible.
   1. In the event that a single manufacturer cannot provide specified products, minor exceptions will be permitted provided approval by Hoffman is obtained using the specified procedures for substitutions.

B. Paints:
   1. Base Manufacturer: Sherwin-Williams.

C. Transparent Finishes:
   1. Diamond Vogel Paints: www.diamondvogel.com.
   2. ICI Paints.
   3. Sherwin-Williams Company

D. Stains:
   1. Diamond Vogel Paints: www.diamondvogel.com.
   2. ICI Paints.
   3. Sherwin-Williams Company

E. Primer Sealers: Same manufacturer as top coats.

F. Substitutions: See Section 01 60 00 - PRODUCT REQUIREMENTS.

2.02 PAINTS AND FINISHES - GENERAL

A. Paints and Finishes: Ready mixed, unless intended to be a field-catalyzed paint.

1. Where MPI paint numbers are specified, provide products listed in Master Painters Institute Approved Product List, current edition available at www.paintinfo.com, for specified MPI categories, except as otherwise indicated.
2. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
3. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
4. For opaque finishes, tint each coat including primer coat and intermediate coats, one-half shade lighter than succeeding coat, with final finish coat as base color.
5. Supply each paint material in quantity required to complete entire project's work from a single production run.
6. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

B. Volatile Organic Compound (VOC) Content: Comply with Section 01 61 16.

C. Flammability: Comply with applicable code for surface burning characteristics.

D. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Hoffman from the manufacturer's full line.

E. Colors: Color selections per Architect and/or as indicated on drawings.
1. Extend colors to surface edges; colors may change at any edge as directed by Hoffman.
2. In finished areas, finish pipes, ducts, conduit, and equipment the same color as the wall/ceiling they are mounted on/under.

2.03 PAINT SYSTEMS - INTERIOR

A. Interior Surfaces to be Painted, Unless Otherwise Indicated: Including gypsum board, concrete, concrete masonry units, brick, wood, plaster, uncoated steel, shop primed steel, and galvanized steel.
1. Two top coats and one coat primer.
2. Top Coat Sheen:
3. Primer: As recommended by top coat manufacturer for specific substrate.

B. Medium Duty Door/Trim: For surfaces subject to frequent contact by occupants, including metals:
1. Medium duty applications include doors, door frames, railings, handrails, guardrails, and balustrades.
2. Two top coats and one coat primer.

C. Dry Fall: Metals; exposed structure and overhead-mounted services in utilitarian spaces, including shop primed steel deck, structural steel, metal fabrications, galvanized ducts, galvanized conduit, and galvanized piping.
1. One top coat.
2. Primer: As recommended by top coat manufacturer for specific substrate.

D. Transparent Finish on Wood.
1. 2 top coats over stain.

E. Wood, Transparent, Varnish, Stain:
1. One coat of stain; V.O.C. Compliant wiping stain.
2. One coat sealer.
3. Satin: Two coats of varnish; polyurethane.

F. Concrete/Masonry, Opaque, Latex, 3 Coat:
1. One coat of block filler.
2. Semi-gloss: Two coats of latex enamel.

G. Aluminum, Unprimed, Latex, 3 Coat:
1. One coat etching primer.

2. Semi-gloss: Two coats of latex enamel; ____.

2.04 PRIMERS

A. Primers: Provide the following unless other primer is required or recommended by manufacturer of top coats.
   1. Interior Institutional Low Odor/VOC Primer Sealer; MPI #149.
   2. Interior/Exterior Latex Block Filler; MPI #4.
      a. Products:
         1) Sherwin-Williams Company; CONFLEX Block Filler.
         2) Substitutions: Section 01 60 00 - PRODUCT REQUIREMENTS.
   3. Interior Latex Primer Sealer; MPI #50.
   4. Latex Primer for Interior Wood; MPI #39.

2.05 ACCESSORY MATERIALS

A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.

B. Patching Material: Latex filler.

C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin application of paints and finishes until substrates have been properly prepared.

B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially effect proper application.

D. If substrate preparation is the responsibility of another installer, notify Hoffman of unsatisfactory preparation before proceeding.

E. Test shop-applied primer for compatibility with subsequent cover materials.

F. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
   1. Gypsum Wallboard: 12 percent.
   2. Plaster and Stucco: 12 percent.
   3. Masonry, Concrete, and Concrete Masonry Units: 12 percent.
   4. Interior Wood: 15 percent, measured in accordance with ASTM D4442.

3.02 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or repair existing paints or finishes that exhibit surface defects.

D. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.

E. Seal surfaces that might cause bleed through or staining of topcoat.

F. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

G. Concrete:
   1. Remove release agents, curing compounds, efflorescence, and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.
   2. Prepare surface as recommended by top coat manufacturer and according to SSPC-SP 13.

H. Masonry:
   1. Remove efflorescence and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces or if alkalinity of mortar joints exceed that permitted in manufacturer's written instructions. Allow to dry.
   2. Prepare surface as recommended by top coat manufacturer.

I. Gypsum Board: Fill minor defects with filler compound. Spot prime defects after repair.

J. Plaster: Fill hairline cracks, small holes, and imperfections with latex patching plaster. Make smooth and flush with adjacent surfaces. Wash and neutralize high alkali surfaces.

K. Galvanized Surfaces:
   1. Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.
   2. Prepare surface according to SSPC-SP 2.

L. Ferrous Metal:
   1. Solvent clean according to SSPC-SP 1.
   2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.
   3. Remove rust, loose mill scale, and other foreign substances using using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 "Commercial Blast Cleaning". Protect from corrosion until coated.

M. Wood Surfaces to Receive Opaque Finish: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats. Back prime concealed surfaces before installation.

N. Glue-Laminated Beams: Prior to finishing, wash surfaces with solvent, remove grease and dirt.

O. Wood Doors to be Field-Finished: Seal wood door top and bottom edge surfaces with clear sealer.

P. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

3.03 APPLICATION

A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.

B. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".

C. Where adjacent sealant is to be painted, do not apply finish coats until sealant is applied.

D. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

E. Apply each coat to uniform appearance in thicknesses specified by manufacturer.

F. Dark Colors and Deep Clear Colors: Regardless of number of coats specified, apply as many coats as necessary for complete hide.

G. Sand wood and metal surfaces lightly between coats to achieve required finish.

H. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

I. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

J. Spray paint door frames, brush applied coatings are not acceptable.

K. Do not paint over nameplates.

3.04 WALLS

A. Interior faces of all exterior concrete masonry and precast walls scheduled to be painted, are to be finished full height to bottom of decking. Finish to include block filler and specified second and third coats.

B. Interior walls scheduled to be painted are to be finished to a minimum height of 8 inches above finished ceiling elevation.

C. In areas where ceilings are not continuous, finish walls scheduled to receive paint full height to decking above.

3.05 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for general requirements for field inspection.

B. Painted surfaces shall be considered unacceptable if any of the following are evident under final lighting source, including daylight for interior surfaces:

1. Visible defects are evident on vertical surfaces when viewed at normal viewing angles from a distance of not less than 39 inches.
2. Visible defects are evident on horizontal surfaces when viewed at normal viewing angles from a distance of not less than 39 inches.
3. Visible defects are evident on ceiling, soffit and other overhead surfaces when viewed at normal viewing angles.
4. When the final coat on any surface exhibits a lack of uniformity of color, sheen, texture, and hiding across full surface area.

3.06 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.07 PROTECTION

A. Protect finishes until completion of project.

B. Touch-up damaged finishes after Substantial Completion.

C. Protect work adjacent to painting operations from paint splatters and spills.

D. Immediately remove paint that falls on finished surfaces not scheduled to receive paint, using materials and techniques that will not damage affected surfaces.

E. Erect barriers or screens and post signs to provide warning as needed to direct traffic away or around work area.

END OF SECTION

SECTION 11 30 13
RESIDENTIAL APPLIANCES

PART 1 GENERAL

1.01 SCOPE

A. This specification section has USGBC LEED point ramifications. Contractor(s) will execute all work in full compliance to LEED requirements associated with this and related specification sections. The LEED project manual has been included as a part of the general and special requirements of this specification and applies to this and all other sections of the specification. Where discrepancies exist between specification references, the most stringent shall apply.

1.02 SECTION INCLUDES

A. Kitchen appliances.

1.03 RELATED REQUIREMENTS

A. Section 22 10 05 - Plumbing Piping: Plumbing connections for appliances.

1.04 REFERENCE STANDARDS

A. UL (DIR) - Online Certifications Directory.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's data indicating dimensions, capacity, and operating features of each piece of residential equipment specified.

1.06 WARRANTY

A. See Section 01 78 00 - CLOSEOUT SUBMITTALS, for additional warranty requirements.

B. Copies of Warranties: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

PART 2 PRODUCTS

2.01 KITCHEN APPLIANCES

A. Supply all products from a single manufacturer.

B. Cooking Exhaust: Range hood.
   1. Size: 30 inches wide.
   2. Fan: Two-speed, 500 cfm
   3. Exhaust: Rectangular, recirculated.
   4. Features: Include cooktop light and removable grease filter.
   5. Exterior Finish: Painted steel, color as indicated.
   6. Manufacturers:
      a. Frigidaire Home Products: www.frigidaire.com/#sle.
      b. GE Appliances: www.geappliances.com/#sle.
      c. Whirlpool Corp: www.whirlpool.com/#sle.
      d. Substitutions: See Section 01 60 00 - PRODUCT REQUIREMENTS.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify utility rough-ins are provided and correctly located.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

3.03 ADJUSTING

A. Adjust equipment to provide efficient operation.

3.04 CLEANING

A. Remove packing materials from equipment and properly discard.

B. Wash and clean equipment.

END OF SECTION

SECTION 11 40 00
FOOD SERVICE EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Foodservice equipment.

B. Connections to utilities.

1.02 RELATED REQUIREMENTS

A. Section 07 92 00 - Joint Sealants: Sealing joints between equipment and adjacent walls, floors, and ceilings.

B. Section 26 05 83 - Wiring Connections: Electrical characteristics and wiring connections.

1.03 REFERENCE STANDARDS

A. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.

B. FM (AG) - FM Approval Guide.

C. ITS (DIR) - Directory of Listed Products.

D. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations.

E. SMACNA (KVS) - Kitchen Ventilation Systems and Food Service Equipment Fabrication and Installation Guidelines.

F. UL (DIR) - Online Certifications Directory.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week before starting work of this section.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on appliances; indicate configuration, sizes, materials, finishes, locations, and utility service connection locations, service characteristics, and wiring diagrams.

C. Shop Drawings:
   1. Indicate in large scale detail, fabricated equipment showing construction methods, type and gage of metal, hardware and fittings, plan, front elevation, a minimum of one cross-section, and utility requirements as to types and sizes and locations.
   2. Illustrate complicated parts of typical items in cut-away perspective.

D. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention.

E. Operation Data: Provide operating data for the specified equipment .

F. Maintenance Data: Provide lubrication and periodic maintenance requirement schedules .

G. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

A. All items of equipment shall be manufactured according to NSF standards and shall bear the NSF seal.

B. When the drawings exceed the written specifications, the drawings shall govern and vice versa.

C. Furnish all food service equipment-related permits, approvals and inspections as required for complete project.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store products clear of floor in a manner to prevent damage.

B. Coordinate size of access and route to place of installation.

C. Cover and protect for duration of construction.

1.08 WARRANTY

A. See Section 01 78 00 - CLOSEOUT SUBMITTALS, for additional warranty requirements.

B. Correct defective work of this section within a five year period after Date of Substantial Completion.

C. Provide five year manufacturer warranty for replacement or repair of scheduled equipment, refrigerant and compressors, including disconnection and removal of defective unit, and connection of replacement unit.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Foodservice Equipment:
   1. Denlar Fire Protection - D1030-I-DF.

2.02 REGULATORY REQUIREMENTS

A. Comply with applicable codes for utility requirements.

B. Products Requiring Electrical Connection: Listed and classified by FM (AG), ITS (DIR), UL (DIR), or testing agency acceptable to local authorities having jurisdiction as suitable for the purpose specified and indicated.

2.03 EQUIPMENT

A. Equipment Schedule: Refer to schedule at end of this section.
   1. Exhaust Hoods: Comply with NFPA 96 and SMACNA (KVS).

B. Installation Accessories: Provide rough-in hardware, supports and connections, attachment devices, closure trim, and accessories as required for complete installation.

2.04 MATERIALS

A. Stainless Steel Sheet: ASTM A666 Type 304 commercial grade, No. 4 finish.

B. Finish Hardware: Manufacturer's standard.

C. Service Outlet Covers and Escutcheons: Stainless Steel.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify ventilation outlets, service connections, and supports are correct and in required location.

B. Verify that electric power is available and of the correct characteristics.

3.02 INSTALLATION

A. Install items in accordance with manufacturers' instructions.

B. Insulate to prevent electrolysis between dissimilar metals.

C. Weld and grind joints in steel work tight, without open seams, where necessary due to limitations of sheet sizes or installation requirements.

D. Sequence installation and erection to ensure correct mechanical and electrical utility connections are achieved.

E. Cut, fit, and patch where necessary. Provide cutting and patching of items of this section required for installation or services of equipment.

F. Use anchoring devices appropriate for equipment and expected usage.

G. Provide sealant to achieve clean joint with adjacent building finishes and between abutting components.

3.03 ADJUSTING

A. Adjust equipment and apparatus to ensure proper working order and conditions.

B. Remove and replace equipment creating excessive noise or vibration.

3.04 CLEANING

A. Remove masking or protective covering from stainless steel and other finished surfaces.

B. Wash and clean equipment.

C. Polish glass, plastic, hardware, accessories, fixtures, and fittings.

3.05 CLOSEOUT ACTIVITIES

A. At completion of work, provide qualified and trained personnel to demonstrate operation of each item of equipment and instruct Owner in operating procedures and maintenance.
   1. Test equipment prior to demonstration.
   2. Individual Performing Demonstration: Fully knowledgeable of all operating and service aspects of equipment.

3.06 PROTECTION

A. Remove protective coverings from prefinished work.

B. Protect finished work from damage.

3.07 FOODSERVICE EQUIPMENT SCHEDULE

A. Exhaust Hood:
   1. Disconnect Switch: Factory mount disconnect switch _____.
      a. Activation
         1) At suppression system discharge.
         2) Once predetermined temperature is reached by the range element
   2. Integral lighting kit with intergral on/off switch
   3. Pre-installed alarm contact for integration of trouble and discharge alarms with the building alarm panel

END OF SECTION

SECTION 11 52 13
PROJECTION SCREENS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Front projection screen assemblies.

1.02 RELATED REQUIREMENTS

A. Section 09 51 00 - Acoustical Ceilings: Suspended panel ceilings for recessed screens.

B. Section 26 05 83 - Wiring Connections: Electrical supply, conduit, and wiring for electric motor operated projection screens.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's catalog cuts and descriptive information on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.
   4. Wiring diagrams for motor operators and actuators, and controls and switches.
   5. Shop Drawings: For custom installations, indicate dimensions, verified field measurements, mounting details, and interface with adjacent construction.

C. Operation and Maintenance Data: Provide manufacturer's operation and maintenance instructions.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than five years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver projection screens to project site in manufacturer's original unopened packaging, and inspect for damage and proper size before accepting delivery.

B. Store in a protected, clean, dry area with temperature maintained above 50 degrees F, and stack in accordance with manufacturer's recommendations.

C. Acclimate screens to building temperatures for 24 hours prior to installation, in accordance with manufacturer's recommendations.

1.06 FIELD CONDITIONS

A. Maintain interior of building between 60 degrees F and __ degrees F during and after installation of projection screens.

1.07 WARRANTY

A. See Section 01 78 00 - CLOSEOUT SUBMITTALS, for additional warranty requirements.

B. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

C. Provide one year manufacturer warranty for projection screen assembly.

PART 2 PRODUCTS

2.01 FRONT PROJECTION SCREENS

A. Front Projection Screens: Factory assembled unless otherwise indicated.
   1. Dimensions: As indicated on drawings.

B. Masking Borders: White, on four sides.

C. Extra Drops: White; 11 inch wide.

D. Exposed Screen Cases: Steel, with integral roller brackets.
   1. Finish: Baked enamel.
   2. Color: White.
   3. End Caps: Steel; finished to match case.
   4. Mounting: Wall.

E. Provide mounting hardware, brackets, supports, fasteners, and other mounting accessories required for a complete installation, in accordance with manufacturer's recommendations for specified substrates and mountings.

2.02 ELECTRICAL COMPONENTS

A. Electrical Components: Listed and classified by UL as suitable for the purpose specified and indicated.

B. Motors: Direct drive, 110 V, 60 Hz.

C. Controls: Three (3) position control switch with plate.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate is finished and ready to accept screen installation.

B. If substrate preparation is the responsibility of another installer, notify Hoffman of unsatisfactory preparation before proceeding.

C. Verify type and location of electrical connections.

D. Do not install projection screens until climate control systems are in place and interior painting and other finishes are completed.

3.02 PREPARATION

A. Coordinate screen installation with installation of projection systems.

B. Coordinate installation with adjacent construction and fixtures, including ceilings, walls, lighting, fire suppression, and registers and grilles.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions, using manufacturer's recommended hardware for relevant substrates.

B. Do not field cut screens.

C. Install screens in mountings as specified and as indicated on drawings.

D. Install plumb and level.

E. Install electrically operated screens ready for connection to power and control systems by others.

F. Adjust projection screens and related hardware in accordance with manufacturer's instructions for proper placement and operation.

G. Test electrical screens for proper working condition. Adjust as needed.

3.04 PROTECTION

A. Protect installed products until completion of project.

B. Touch up, repair, or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 12 24 00
WINDOW SHADES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Interior manual roller shades.

B. Interior motorized roller shades.

C. Motor controls.

1.02 REFERENCE STANDARDS

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Where motorized shades are to be controlled by control systems provided under other sections, coordinate the work with other trades to provide compatible products.
   2. Coordinate the work with other trades to provide rough-in of electrical wiring as required for installation of hardwired motorized shades.

B. Preinstallation Meeting: Convene one week prior to commencing work related to products of this section; require attendance of affected installers.

C. Sequencing:
   1. Do not fabricate shades until field dimensions for each opening have been taken with field conditions in place.
   2. Do not install shades until final surface finishes and painting are complete.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets including materials, finishes, fabrication details, dimensions, profiles, mounting requirements, and accessories.

C. Shop Drawings: Include shade schedule indicating size, location and keys to details, head, jamb and sill details, mounting dimension requirements for each product and condition, and operation direction.

D. Manufacturer's Instructions: Include instructions for storage, handling, protection, examination, preparation, and installation of product.

E. Operation and Maintenance Data: List of all components with part numbers, sources of supply, and operation and maintenance instructions; include copy of shop drawings.

F. Warranty: Submit sample of manufacturer's warranty and documentation of final executed warranty completed in Owner's name and registered with manufacturer.

G. Maintenance contracts.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than five years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver shades in manufacturer's unopened packaging, labeled to identify each shade for each opening.

B. Handle and store shades in accordance with manufacturer's recommendations.

1.07 FIELD CONDITIONS

A. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.08 WARRANTY

A. See Section 01 78 00 - CLOSEOUT SUBMITTALS, for additional warranty requirements.

B. Provide manufacturer's warranty from Date of Substantial Completion, covering the following:
   1. Shade Hardware: One year.
   2. Electric Motors: One year.
   3. Electronic Control Equipment: One year.
   4. Fabric: One year.
   5. Aluminum and Steel Coatings: One year.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Interior Manually Operated Roller Shades:
   1. Lutron Electronics Co., Inc: www.lutron.com/#sle.
   2. MechoShade Systems LLC; Mecho/5 System: www.mechoshade.com/#sle.
   3. Substitutions: See Section 01 60 00 - PRODUCT REQUIREMENTS.

2.02 ROLLER SHADES

A. General:
   1. Provide shade system components that are easy to remove or adjust without removal of mounted shade brackets.
   2. Provide shade system that operates smoothly when shades are raised or lowered.

B. Roller Shades:
   1. Description - Interior Roller Shades: Single roller, manually operated fabric window shade system complete with mounting brackets, roller tubes, hembars, hardware, and accessories.
      a. Drop Position: Regular roll.
      b. Roll Direction: Roll down, closed position is at window sill.
      c. Size: As indicated on drawings.
      d. Fabric: As indicated under Shade Fabric article.
   2. Brackets and Mounting Hardware: As recommended by manufacturer for mounting indicated and to accommodate shade fabric roll-up size and weight.
   3. Roller Tubes: As required for type of shade operation.
   4. Hembars: Designed to maintain bottom of shade straight and flat.
   5. Manual Operation for Interior Shades:
      a. Clutch Operator: Manufacturer's standard material and design, permanently lubricated.
      b. Drive Chain: Continuous loop beaded ball chain, 95 pounds minimum breaking strength. Provide upper and lower limit stops.

2.03 SHADE FABRIC

A. Fabric for Room-Darkening Shades: Non-flammable, color-fast, impervious to heat and moisture, and able to retain its shape under normal operation.
   1. Material: Vinyl coated polyester.
   2. Openness Factor: 1%.

2.04 ROLLER SHADE FABRICATION

A. Field measure finished openings prior to ordering or fabrication.

B. Dimensional Tolerances: Fabricate shades to fit openings within specified tolerances.
   1. Vertical Dimensions: Fill openings from head to sill with 1/2 inch space between bottom bar and window stool.
   2. Horizontal Dimensions - Inside Mounting: Fill openings from jamb to jamb.
   3. Horizontal Dimensions - Inside Mounting: Provide symmetrical light gaps on both sides of shade not to exceed 3/4 inch total.
   4. Horizontal Dimensions - Outside Mounting: Cover window frames, trim, and casings completely.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine finished openings for deficiencies that may preclude satisfactory installation.

B. If substrate preparation is the responsibility of another installer, notify Hoffman of unsatisfactory preparation before proceeding.

C. Start of installation shall be considered acceptance of substrates.

3.02 PREPARATION

A. Prepare surfaces using methods recommended by manufacturer for achieving best result for substrate under the project conditions.

B. Coordinate with window installation and placement of concealed blocking to support shades.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions and approved shop drawings, using mounting devices as indicated.

B. Adjust level, projection, and shade centering from mounting bracket. Verify there is no telescoping of shade fabric. Ensure smooth shade operation.

3.04 CLEANING

A. Clean soiled shades and exposed components as recommended by manufacturer.

B. Replace shades that cannot be cleaned to "like new" condition.

3.05 MAINTENANCE

A. See Section 01 70 00 - EXECUTION AND CLOSEOUT REQUIREMENTS, for additional requirements relating to maintenance service.

B. Provide to Owner, a proposal as an alternate to the base bid, a separate renewable maintenance contract for the service and maintenance of a motorized shade system for one year from date of Substantial Completion. Include a complete description of preventive maintenance, systematic examination, adjustment, parts and labor, cleaning, and testing, with a detailed schedule.

END OF SECTION

SECTION 12 32 00
MANUFACTURED WOOD CASEWORK

PART 1 GENERAL

1.01 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Blocking and nailers for anchoring casework.

B. Section 07 92 00 - Joint Sealants: Sealing joints between casework and countertops and adjacent walls, floors, and ceilings.

C. Section 09 22 16 - NON-LOADBEARING METAL FRAMING: Reinforcements in metal-framed partitions for anchoring casework.

D. Section 12 36 00 - Countertops: Additional requirements for countertops.

E. Section 22 40 00 - Plumbing Fixtures: Sinks and fittings installed in casework.

F. Section 26 27 26 - Wiring Devices: Switches, receptacles installed in casework.

1.02 REFERENCE STANDARDS

A. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards.

B. BHMA A156.9 - American National Standard for Cabinet Hardware.

C. NEMA LD 3 - High-Pressure Decorative Laminates.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate casework types, sizes, and locations, using large scale plans, elevations, and cross sections. Include rough-in and anchors and reinforcements, placement dimensions and tolerances, clearances required, and keying information.

C. Samples for Finish Selection: Fully finished, for color selection. Minimum sample size: 2 inches by 3 inches.
   1. Plastic laminate samples, for color, texture, and finish selection.

D. Manufacturer's Qualification Statement.

E. Installer's Qualification Statement.

F. Maintenance Data: Manufacturer's recommendations for care and cleaning.

G. Finish touch-up kit for each type and color of materials provided.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of documented experience and approved by manufacturer.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Protect items provided by this section, including finished surfaces and hardware items during handling and installation. For metal surfaces, use polyethylene film or other protective material standard with the manufacturer.

B. Acceptance at Site:
   1. Do not deliver or install casework until the conditions specified under Part 3, Examination Article of this section have been met. Products delivered to sites that are not enclosed and/or improperly conditioned will not be accepted if warping or damage due to unsatisfactory conditions occurs.

C. Storage:

1. Store casework in the area of installation. If necessary, prior to installation, temporarily store in another area, meeting the environmental requirements specified under Part 3, "Site Verification of Conditions" Article of this section.

1.06 WARRANTY

A. See Section 01 78 00 - CLOSEOUT SUBMITTALS, for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion, at no additional cost to Owner. Defects include, but are not limited to:
   1. Ruptured, cracked, or stained finish coating.
   2. Discoloration or lack of finish integrity.
   3. Cracking or peeling of finish.
   4. Failure of hardware.

PART 2 PRODUCTS

2.01 CASEWORK, GENERAL

A. Quality Standard: AWI/AWMAC/WI (AWS), unless noted otherwise.

2.02 FABRICATION

A. Assembly: Shop assemble casework items for delivery to site in units easily handled and to permit passage through building openings.

B. Construction: As required for selected grade.

C. Edging: Fit shelves, doors, and exposed edges with specified edging. Do not use more than one piece for any single length.

2.03 PLASTIC-LAMINATE-CLAD CASEWORK

A. Plastic-Laminate-Clad Casework: Solid wood and wood panel construction; each unit self-contained and not dependent on adjacent units or building structure for rigidity; in sizes necessary to avoid field cutting except for scribes and filler panels. Include adjustable levelers for base cabinets.
   1. Style: Flush overlay. Ease doors and drawer fronts slightly at edges.
   2. Cabinet Nominal Dimensions: Unless otherwise indicated, provide cabinets of widths and heights indicated on drawings, and with following front-to-back dimensions:
   3. Plastic Laminate: Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline.
      a. Finish: Matte or suede, gloss rating of 5 to 20.
      b. Surface Color and Pattern: As indicated on drawings.
      c. Exposed Interior Surfaces: Thermally fused laminate.
         1) Color: White.
      d. Cap exposed plastic laminate finish edges with material of same finish and pattern.

2.04 COUNTERTOPS

A. Countertops: As specified in Section 12 36 00.

2.05 CABINET HARDWARE

A. Manufacturer's standard types, styles and finishes.

2.06 ACCESSORIES

A. Concealed Joint Fasteners: Corrosion-resistant, standard with manufacturer.

B. Grommets: Standard plastic, painted metal, or rubber grommets for cut-outs, in color to match adjacent surface.

C. Internal Light Fixtures: LED fixtures, with switch and heavy-duty cord and plug.
   1. Length: 18 inches, nominal.
   2. Illumination: _____ lumens, minimum.
   3. Lens: Clear acrylic.
   4. Finish: Baked enamel.

5. Color of Housing: Selected from manufacturer's standard range.

D. Sealant for Use in Casework Installation:
   1. Manufacturer's recommended type.

PART 3 EXECUTION

3.01 EXAMINATION

A. Site Verification of Environmental Conditions:
   1. Do not deliver casework until the following conditions have been met:
      a. Building has been enclosed (windows and doors sealed and weather-tight).
      b. An operational HVAC system that maintains temperature and humidity at occupancy levels has been put in place.
      c. Ceiling, overhead ductwork, piping, and lighting have been installed.
      d. Installation areas do not require further “wet work” construction.

B. For Base Cabinets Installation: Examine floor levelness and flatness of installation space. Do not proceed with installation if encountered floor conditions required more than 1/2 inch leveling adjustment. When installation conditions are acceptable, for each space, establish the high point of the floor. Set and make level and plumb first cabinet in relation to this high point.

C. For Wall Cabinets Installation: Examine wall surfaces in installation space. Do not proceed with installation if the following conditions are encountered:
   1. Maximum variation from plane of masonry wall exceeds 1/4 inch in 10 ft and 1/2 inch in 20 ft or more, and/or maximum variation from plumb exceeds 1/4 inchper story.
   2. Maximum Variation of finished gypsum board surface from true flatness: 1/8 inch in 10 feet in any direction.

D. Verify adequacy of support framing and anchors.

E. Verify that service connections are correctly located and of proper characteristics.

3.02 INSTALLATION

A. Perform installation in accordance with manufacturer's instructions.

B. Use anchoring devices to suit conditions and substrate materials encountered. Use concealed fasteners to the greatest degree possible. Use exposed fasteners only where allowed by approved shop drawings, or where concealed fasteners are impracticable.

C. Set casework items plumb and square, securely anchored to building structure.

D. Align cabinets to adjoining components, install filler and/or scribe panels where necessary to close gaps.

E. Fasten together cabinets in continuous runs, with joints flush, uniform and tight. Misalignment of adjacent units not to exceed 1/16 inch. In addition, do not exceed the following tolerances:
   1. Variation of Tops of Base Cabinets from Level: 1/16 inch in 10 feet.
   2. Variation of Faces of Cabinets from a True Plane: 1/8 inch in 10 feet.
   3. Variation of Adjacent Surfaces from a True Plane (Lippage): 1/32 inch.
   4. Variation in Alignment of Adjacent Door and Drawer Edges: 1/16 inch.

F. Base Cabinets: Fasten cabinets to service space framing and/or wall substrates, with fasteners spaced not more than 16 inches on center. Bolt adjacent cabinets together with joints flush, tight, and uniform.

G. Install hardware uniformly and precisely.

H. Countertops: Install countertops intended and furnished for field installation in one true plane, with ends abutting at hairline joints, and no raised edges.

I. Replace units that are damaged, including those that have damaged finishes.

3.03 PROTECTION

A. Do not permit finished casework to be exposed to continued construction activity.

B. Protect casework and countertops from ongoing construction activities. Prevent workmen from standing on, or storing tools and materials on casework or countertops.

C. Repair damage, including to finishes, that occurs prior to Date of Substantial Completion, using methods prescribed by manufacturer; replace units that cannot be repaired to like-new condition.

END OF SECTION

SECTION 12 36 00
COUNTERTOPS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Countertops for manufactured casework.

B. Wall-hung counters and vanity tops.

C. Sinks molded into countertops.

D. Epoxy resin sinks.

E. Sills.

1.02 RELATED REQUIREMENTS

A. Section 12 35 30 - PREMANUFACTURED CASEWORK.

B. Section 22 40 00 - Plumbing Fixtures: Sinks.

1.03 REFERENCE STANDARDS

A. ASTM D635 - Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

C. ISFA 2-01 - Classification and Standards for Solid Surfacing Material.

D. NEMA LD 3 - High-Pressure Decorative Laminates.

E. PS 1 - Structural Plywood.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Specimen warranty.
   4. Installation Instructions: Manufacturer's installation instructions and recommendations.
   5. Maintenance Data: Manufacturer's instructions and recommendations for maintenance and repair of countertop surfaces.

C. Shop Drawings: Complete details of materials and installation; combine with shop drawings of cabinets and casework specified in other sections.

D. Selection Samples: For each finish product specified, color chips representing manufacturer's full range of available colors and patterns.

E. Maintenance Data: Manufacturer's instructions and recommendations for maintenance and repair of countertop surfaces.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.07 FIELD CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2 PRODUCTS

2.01 COUNTERTOPS

A. Plastic Laminate Countertops: High-pressure decorative laminate (HPDL) sheet bonded to substrate.
   1. Laminate Sheet, Type ___: NEMA LD 3, Grade HGS, ____ inch nominal thickness.
      a. Manufacturers:
         1) Formica Corporation; _____: www.formica.com/#sle.
         2) Wilsonart; _____: www.wilsonart.com/#sle.
      b. Surface Burning Characteristics: Flame spread index of 25, maximum; smoke developed index of 450, maximum; when tested in accordance with ASTM E84.
      c. NSF approved for food contact.
      d. Wear Resistance: In addition to specified grade, comply with NEMA LD 3 High Wear Grade requirements for wear resistance.
      e. Laminate Core Color: Same as decorative surface.
      f. Finish: Matte or suede, gloss rating of 5 to 20.
      g. Surface Color and Pattern: As indicated on drawings.
   2. Exposed Edge Treatment: Postformed laminate; front edge substrate built up to minimum 1-1/4 inch thick with raised radiused edge, integral coved backsplash with radiused top edge.
   3. Back and End Splashes: Same material, same construction.

B. Epoxy Resin Countertops: Filled epoxy resin molded into homogenous, non-porous sheets; no surface coating and color and pattern consistent throughout thickness; with integral or adhesively seamed components.
   1. Flat Surface Thickness: 1 inch, nominal.
   2. Chemical-Resistance: Provide products that resist the following chemicals with not more than Moderate Effect when tested in accordance with NEMA LD 3:
   3. Flammability: Self-extinguishing, when tested in accordance with ASTM D635.
   4. Surface Finish: Smooth, non-glare.
   5. Color: Black.
   6. Back and End Splashes: Same material, same thickness; separate for field attachment.
   7. Sinks: Same material, same color; integrally molded with counter; bottom sloped to outlet; molded outlets; drain outlet located in back corner.
      a. Sides and Ends: 1/2 inch minimum thickness.
      b. Bottoms: 5/8 inch minimum thickness.
      c. Interior Corners: 1 inch minimum radius.
      d. Clamping collars for 1-1/2 or 2 inch diameter waste pipe, for sealed but not permanent connection.
      e. Steel channel supports front to back on each side, fastened to underside of top to support twice full sink weight.

C. Solid Surfacing Countertops: Solid surfacing sheet or plastic resin casting over continuous substrate.
   1. Flat Sheet Thickness: 1/2 inch, minimum.
   2. Solid Surfacing Sheet and Plastic Resin Castings: Complying with ISFA 2-01 and NEMA LD 3; acrylic or polyester resin, mineral filler, and pigments; homogenous, non-porous and capable of being worked and repaired using standard woodworking tools; no surface coating; color and pattern consistent throughout thickness.
      a. Surface Burning Characteristics: Flame spread index of 25, maximum; smoke developed index of 450, maximum; when tested in accordance with ASTM E84.
      b. NSF approved for food contact.
      c. Finish on Exposed Surfaces: Matte, gloss rating of 5 to 20.
      d. Color and Pattern: As indicated on drawings.
   3. Other Components Thickness: 1/2 inch, minimum.

4. Exposed Edge Treatment: Built up to minimum 1-1/4 inch thick; square edge; use marine edge at sinks.
5. Back and End Splashes: Same sheet material, square top; minimum 4 inches high.
6. Skirts: As indicated on drawings.

D. Window Sills:
1. Solid surfacing sheet or plastic resin casting.
a. Use treated plywood substrate at masonry or concrete walls.
b. Profile as detailed on drawings.

E. Support Brackets:
1. Countertop Supports: Brackets, legs and miscellaneous metal parts shall be furniture steel, welded, degreased, cleaned, treated and powder painted in color as selected.
2. High-pressure decorative laminate GP50 on 3/4 inch particleboard in locations as indicated.
3. Profiles and dimensions as indicated.
4. Mechanically fasten to wall at stud locations (where applicable) and to countertop.

2.02 MATERIALS

A. Wood-Based Components:
1. Wood fabricated from old growth timber is not permitted.

B. Plywood for Supporting Substrate: PS 1 Exterior Grade, A-C veneer grade, minimum 5-ply; minimum 3/4 inch thick; join lengths using metal splines.

C. Adhesives: Chemical resistant waterproof adhesive as recommended by manufacturer of materials being joined.

D. Cove Molding for Top of Splashes: Rubber with semi-gloss finish and T-spline to fit between splash and wall; 1/2 inch by 1/2 inch; color as selected.

E. Joint Sealant: Mildew-resistant silicone sealant, white.

2.03 FABRICATION

A. Fabricate tops and splashes in the largest sections practicable, with top surface of joints flush.
1. Join lengths of tops using best method recommended by manufacturer.
2. Fabricate to overhang fronts and ends of cabinets 1 inch except where top butts against cabinet or wall.
3. Prepare all cutouts accurately to size; replace tops having improperly dimensioned or unnecessary cutouts or fixture holes.

B. Provide back/end splash wherever counter edge abuts vertical surface unless otherwise indicated.
1. Secure to countertop with concealed fasteners and with contact surfaces set in waterproof glue.
2. Height: 4 inches, unless otherwise indicated.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Hoffman of unsatisfactory preparation before proceeding.

C. Verify that wall surfaces have been finished and mechanical and electrical services and outlets are installed in proper locations.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

A. Securely attach countertops to cabinets using concealed fasteners. Make flat surfaces level; shim where required.

B. Attach plastic laminate countertops using screws with minimum penetration into substrate board of 5/8 inch.

C. Attach wood countertops using screws with minimum penetration into substrate board of 5/8 inch.

D. Attach epoxy resin countertops using compatible adhesive.

E. Seal joint between back/end splashes and vertical surfaces.
   1. Where indicated use rubber cove molding.
   2. Where applied cove molding is not indicated use specified sealant.

3.04 CLEANING

A. Clean countertops surfaces thoroughly.

3.05 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 22 05 00

COMMON WORK RESULTS FOR PLUMBING

PART 1 - GENERAL

1.01 SCOPE

A. This section includes information common to two or more technical plumbing specification sections or items that are of a general nature, not conveniently fitting into other technical sections. Included are the following topics:

PART 1 - GENERAL
- Scope
- Related Work
- Standards
- Lead Free Requirements
- Quality Assurance
- Continuity of Existing Services
- Protection of Finished Surfaces
- Sleeves and Openings
- Sealing and Fire Stopping
- Equipment Furnished By Others
- Provisions for Future
- Off Site Storage
- Codes
- Certificates, Inspections, and Permits
- Existing Buildings
- Submittals
- Operating and Maintenance Instructions
- Training of Owner Personnel
- Record Drawings
- Electronic Media
- Warranty

PART 2 - PRODUCTS
- Access Panels and Doors
- Identification
- Bedding and Backfill
- Sealing and Fire Stopping

PART 3 - EXECUTION
- Demolition
- Excavation and Backfill
- Sheeting, Shoring and Bracing
- Dewatering
- Rock Excavation
- Surface Restoration
- Concrete Work
- Cutting and Patching
- Building Access
- Equipment Access
- Coordination
- Identification
- Lubrication
- Sleeves and Openings
- Sealing and Fire Stopping
- Training

1.02 RELATED WORK

A. Applicable provisions of Division 00 and 01 govern work under this section.

B. This section applies to all Division 22 Sections of Plumbing.

C. Section 07 84 00 - Fire Stopping

1.03 STANDARDS

A. Abbreviations of standards organizations referenced in this and other sections are as follows:

ABMA	American Boiler Manufacturers Association
ACPA	American Concrete Pipe Association
AGA	American Gas Association
AMCA	Air Movement and Control Association
ANSI	American National Standards Institute
ARI	Air Conditioning and Refrigeration Institute
ASME	American Society of Mechanical Engineers
ASPE	American society of Plumbing Engineers
ASSE	American Society of Sanitary Engineering
ASTM	American Society for Testing and Materials
AWWA	American Water Works Association
AWS	American Welding Society
CISPI	Cast Iron Soil Pipe Institute
CGA	Compressed Gas Association
CS	Commercial Standards, Products Standards Sections, Office of Engineering Standards Service, NBS
EPA	Environmental Protection Agency
FS	Federal Specifications, Superintendent of Documents, U.S. Government Printing Office
GAMA	Gas Appliance Manufacturers Association
IAPMO	International Association of Plumbing & Mechanical Officials
IEEE	Institute of Electrical and Electronics Engineers
ISA	Instrument Society of America
MCA	Mechanical Contractors Association
MICA	Midwest Insulation Contractors Association
MSS	Manufacturer's Standardization Society of the Valve & Fitting Industry, Inc.
NBS	National Bureau of Standards
NEC	National Electric Code
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
NSF	National Sanitation Foundation
PDI	Plumbing and Drainage Institute
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association. Inc.
STI	Steel Tank Institute
UL	Underwriters Laboratories Inc.

Standards referenced in this section:

ACI 614	Recommended Practice for Measuring, Mixing and Placing of Concrete
ASTM D1557	Standard Test Method for Moisture-Density Relations of Soils
ASTM E814	Standard Test Method for Fire Tests of Through-Penetration Fire Stops
ASTM E84	Standard Test Method for Surface Burning Characteristics of Building Materials
UL1479	Fire Tests of Through-Penetration Firestops
UL723	Surface Burning Characteristics of Building Materials

1.04 LEAD FREE REQUIREMENTS

A. All materials that contact potable water shall be lead free. Lead free refers to the wetted surface of pipe, fittings and fixtures in potable water systems that have a weighted average lead content ≤0.25% per the Federal Safe Drinking Water Act as amended January 4th 2011 Section 1417.

B. This requirement applies to all of the subsequent Plumbing Specification Sections and Plumbing Drawings and supersedes any part or model number that may conflict with this requirement.

1.05 QUALITY ASSURANCE

A. Refer to Division 00 and 01, Approved Equals, Substitutions, and Design Clarifications.

B. All products and materials used are to be new, undamaged, clean and in good condition. Existing products and materials are not to be reused unless specifically indicated.

C. Where equipment or accessories are used which differ in arrangement, configuration, dimensions, ratings, or engineering parameters from those indicated on the contract documents, the Contractor is responsible for all costs involved in integrating the equipment or accessories into the system and for obtaining the intended performance from the system into which these items are placed.

1.06 CONTINUITY OF EXISTING SERVICES

A. Do not interrupt or change existing services without prior written approval from the Owner's Project Representative. When interruption is required, coordinate scheduling of down-time with the Owner to minimize disruption to his activities. Unless specifically stated, all work involved in interrupting or changing existing services is to be done during normal working hours.

1.07 PROTECTION OF FINISHED SURFACES

A. Refer to Division 01, General Requirements, Protection of Finished Surfaces.

1.08 SLEEVES AND OPENINGS

A. Refer to Division 01, General Requirements, Cutting and Patching.

1.09 SEALING AND FIRE STOPPING

A. Sealing and firestopping of sleeves/openings between piping, etc. and the sleeve or structural opening shall be the responsibility of the contractor whose work penetrates the opening. The contractor responsible shall hire individuals skilled in such work to do the sealing and fireproofing. Provide all fire stopping of fire rated penetrations and sealing of smoke rated penetrations in compliance with Section 07 84 00 - Fire Stopping.

1.10 EQUIPMENT FURNISHED BY OTHERS

A.

1.11 PROVISIONS FOR FUTURE

A.

1.12 OFF SITE STORAGE

A. Prior approval by the owner and the A/E will be needed. Generally, sleeves, pipe/pipe fittings and similar rough-in material will not be accepted for off site storage. No material will be accepted for off-site storage unless shop drawings for the material have been approved.

1.13 CODES

A. Comply with requirements of Wisconsin Department of Safety and Professional Services (SPS).

1.14 CERTIFICATES, INSPECTIONS, AND PERMITS

A. Refer also to Division 00 and 01.

B. Obtain and pay for all required State installation inspections except those provided by the Architect/Engineer in accordance with Wisconsin Department of Safety and Professional Services Section ILHR 350.12. Deliver originals of these certificates to the Owner's Project Representative. Include copies of the certificates in the Operating and Maintenance Instructions.

1.15 EXISTING BUILDINGS

A. VISIT TO SITE

1. Before submitting the proposal for this Division, the Contractor shall visit the site and shall satisfy himself as to the nature and location of his work and the general and local conditions. He shall have full knowledge of conditions relative to transportation, handling and storage of materials, availability of electrical power of all other facilities in the area which will have a bearing on the performance of his work and the contract for which he submits his proposal. Pay special attention to existing items to be reused and relocated.
2. Existing Conditions
    a. This Contractor shall field verify existing conditions related to the requirements of this Division prior to submission of bid. This includes field verification of existing actual installed systems, equipment, ductwork, piping, etc. to ascertain locations, sizes and quantities. These documents depict existing conditions based on the best information available but may not accurately represent the actual installed condition. In the event the plans and specification are not representative of the actual installed conditions, this Contractor shall notify Engineer immediately at which time an addendum will be issued for clarification. If an addendum is not issued due to the bid submission date, this Contractor shall include in bid all necessary modifications necessary to meet the intent of the plans and specifications.
    b. If during the course of construction it is determined that the existing installed condition is not representative of the plans and specifications, this Contractor shall provide a written description identifying proposed modification and/or revisions to the system and/or design to meet the intent of the plans and specifications. No additional compensation shall be allowed.
3. Failure by the Contractor to acquaint himself with all the available information shall not relieve him from any responsibility for performing his work properly.
4. No additional compensation shall be allowed because of conditions that occur due to this Contractor's failure to become thoroughly familiar with the job site and other work, as previously described, for this project.
5. Submission of a bid will be considered an acknowledgment on the part of the bidder of his site verification for this project.
6. This Contractor shall arrange and provide all necessary equipment required to rig, lift or move equipment into final location. All work and equipment shall strictly comply with applicable OSHA regulations.

B. DIMENSIONS AND LOCATIONS
1. Verify measurements at the building, check levels and grades and be responsible for grading, fitting, joining or adjusting of work to adjoining work by other Contractors.
2. Before the work is installed, the Architects reserve the right to slightly change location of piping and equipment, etc., without additional pay to the Contractor.
3. Plumbing drawings are based on the best information available. For areas being remodeled, work shown reflects information shown on as-built plumbing plans (where available) and field observation; it is not guaranteed 100% accurate. This Contractor shall field verify existing conditions and make necessary adjustments without extra costs to the project to suit actual needs. This shall in include, but not be limited to, televising existing underground storm and/or sanitary building drain piping to determine location, elevation, and condition and x-raying floor slabs to determine the location of structural steel reinforcing and electrical conduit.

1.16 SUBMITTALS

A. Refer also to Division 00 of 01.

B. Shop drawing submittals are to be bound, labeled, contain the project manual cover page and a material index list page showing item designation, manufacturer and additional items supplied with the installation. Submit for all equipment and systems as indicated in the respective specification sections, marking each submittal with that specification section number. Mark general catalog sheets and drawings to indicate specific items being submitted and proper identification of equipment by name and/or number, as indicated in the contract documents. Include wiring diagrams of electrically powered equipment.

C. All costs for Engineering services in connection with evaluating substitutions of products not listed as acceptable, or value engineering items proposed by this contractor and making subsequent revisions to Drawings, Specifications and other documentation resulting there from, is the responsibility of this Contractor.

D. Submit sufficient quantities of data sheets and shop drawings to allow the distribution as required in Division 00 and 01.

1.17 OPERATING AND MAINTENANCE INSTRUCTIONS

A. Refer to Division 01.

B. Assemble material in three-ring or post binders, using an index at the front of each volume and tabs for each system or type of equipment. In addition to the data indicated in the General Requirements, include the following information:

- Copies of all approved shop drawings.
- Manufacturer's wiring diagrams for electrically powered equipment
- Records of tests performed to certify compliance with system requirements
- Certificates of inspection by regulatory agencies
- Parts lists for fixtures, equipment, valves and specialties.
- Manufacturers installation, operation and maintenance recommendations for fixtures, equipment, valves and specialties.
- Valve schedules
- Lubrication instructions, including list/frequency of lubrication
- Warranties
- Additional information as indicated in the technical specification sections

1.18 TRAINING OF OWNER PERSONNEL

A. Instruct user agency personnel in the proper operation and maintenance of systems and equipment provided as part of this project. Include not less than 1 hour of instruction, using the Operating and Maintenance manuals during this instruction. Demonstrate startup, operation and shutdown procedures for all equipment. All training to be during normal working hours.

1.19 RECORD DRAWINGS

A. Refer to Division 01.

B. Contractor shall provide Engineer with dimensional and graphic representation of all deviations from plans prior to concealment of piping. Failure to notify Engineer of deviations may result in removal and reinstallation of piping at Contractor’s cost for compliance with plans and specifications.

1.20 ELECTRONIC MEDIA

A. Refer to Division 01.

1.21 WARRANTY

A. Refer to Division 00.

PART 2 – PRODUCTS

2.01 ACCESS PANELS AND DOORS

A. Lay in Ceilings:
Removable lay-in ceiling tiles in 2 X 2 foot or 2 X 4 foot configuration provided under Section 09500 are sufficient; no additional access provisions are required unless specifically indicated.

B. Concealed Spline Ceilings:
Removable sections of ceiling tile held in position with metal slats or tabs compatible with the ceiling system used will be provided under Section 09500.

C. Metal Pan Ceilings:
Removable sections of ceiling tile held in position by a pressure fit will be provided under Section 09500.

D. Plaster Walls and Ceilings:
16 gauge frame with not less than a 20 gauge hinged door panel, prime coated steel for general applications, stainless steel for use in toilets, showers, and similar wet areas, concealed hinges, screwdriver operated cam latch for general applications, key lock for use in public or secured areas, UL listed for use in fire rated partitions if required by the application. Use the largest size access opening possible, consistent with the space and the item needing service; minimum size is 12" by 12".

E. Metal Security Ceilings:
1. Provided as part of ceiling system. Coordinate access location with trade installing metal ceiling.

F. Plaster Walls and Ceilings:
1. 14-gauge frame door panel, prime coated (stainless steel in toilet rooms and showers), rust proofed and steel with concealed spring hinges allowing opening to 175 degrees, cylinder lock keyed to Owner's master key system. Coordinate with Section 08700. UL listed for use in fire rated partitions if required by the application. Use the largest size access openings possible, consistent with the space and the equipment needing service; minimum size is 12" x 12". Unless used for wall cleanout, access in secure areas where smaller panel will provide adequate access.
   a. Approved Manufacturers:
   b. Milcor, "Style M"
   c. Karp Associates, Inc., "Model DSC-214M"
   d. J.L. Industries, Inc., "Model TM"
2. Access panels not permitted within cells.

2.02 IDENTIFICATION

A. Stencils:
Not less than 1 inch high letters/numbers for marking pipe and equipment.

B. Engraved Name Plates:
White letters on a black background, 1/16 inch thick plastic laminate, beveled edges, screw mounting, Setonply Style 2060 by Seton Name Plate Company or Emedolite Style EIP by EMED Co., or equal by W. H. Brady.

C. SNAP-AROUND PIPE MARKERS:
One-piece, preformed, vinyl construction, snap-around or strap-around pipe markers with applicable labeling and flow direction arrows, 3/4" min. size for lettering. Provide nylon ties on each end of pipe markers. Equal to Seton Setmark.

D. Valve Tags:
Round brass tags with 1/2 inch numbers, 1/4 inch system identification abbreviation, 1-1/4 inch minimum diameter, with brass jack chains or brass "S" hooks around the valve stem, available from EMED Co., Seton Name Plate Company, or W. H. Brady.

E. Underground Warning Tape:
Detectable underground warning tape, 5.0 mil overall thickness, 6" width, .0035" thick aluminum foil core with polyethylene jacket bonded to both sides. Color code tape and print caution along with name of buried service in bold letters on face of tape. Thor Enterprises Magnatek or equal by Carlton, MSI Marking Services, Seton.

2.03 BEDDING AND BACKFILL

A. Bedding up to a point 12" inches above the top of the pipe shall be thoroughly compacted sand or crushed stone chips meeting the following gradations:

Gradation For Bedding Sand			**Gradation For Crushed Stone Chip Bedding**	
Sieve Size	% Passing (by wt)		Sieve Size	% Passing (by Wt)
1 inch	100		1/2 inch	100
No. 16	45 – 80		No. 4	75 – 100
No. 200	2 – 10		No. 100	10 - 25

B. Backfill above the bedding in lawn areas shall be thoroughly compacted excavated material free of large stones, organic, perishable, and frozen materials.

C. Backfill above the bedding under existing and future utilities, paving, sidewalks, curbs, roads and buildings shall be granular materials, pit run sand, gravel, or crushed stone, free from large stones, organic, perishable, and frozen materials.

2.04 SEALING AND FIRE STOPPING

A. FIRE AND/OR SMOKE RATED PENETRATIONS:
   1. Provide all fire stopping of fire rated penetrations and sealing of smoke rated penetrations in compliance with Section 07 84 00 - Fire Stopping.

B. NON-RATED PENETRATIONS:
   1. In exterior wall openings below grade, use a modular mechanical type seal consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the uninsulated pipe and the cored opening or a water-stop type wall sleeve. The operating bolts of the mechanical type seal shall be accessible from the interior of the building.
   2. At pipe penetrations of non-rated interior partitions, floors and exterior walls, use urethane caulk in annular space between pipe insulation and sleeve. For non-rated drywall, plaster or wood partitions where sleeve is not required use urethane caulk in annular space between pipe insulation and wall material

PART 3 - EXECUTION

3.01 DEMOLITION

A. Perform all demolition as indicated on the drawings and as required to accomplish new work. Where demolition work is to be performed adjacent to existing work that remains in an occupied area, construct temporary dust partition to minimize the amount of contamination of the occupied space. Where pipe is removed and not reconnected with new work, cap ends of existing services as if they were new work. Coordinate work with the Owner to minimize disruption to the existing building occupants.

B. All pipe, fixtures, equipment, wiring and associated conduit, insulation and similar items demolished, abandoned, or deactivated are to be removed from the site by the Contractor except as specifically noted otherwise. All designated equipment is to be turned over to the user agency for their use at a place and time so designated. Maintain the condition of material and/or equipment that is indicated to be reused equal to that existing before work began.

3.02 EXCAVATION AND BACKFILL

A. Perform all excavation and backfill work necessary to accomplish indicated plumbing systems installation. Excavate to bottom of pipe and structure bedding, 4" in stable soils, 6" in rock or wet trenches and 8" in unstable soil. Finish bottoms of excavations to true, level surface.

B. Tunnel or remove sidewalk and curb in areas of excavation to the nearest joint. Remove pavements, curbs and gutters to neat and straight lines to the limits of removal. Make saw cut lines parallel to existing joints, or parallel or perpendicular to pavement edges to form a neat patch. Carefully remove remaining pavement within the saw cut area. Leave existing base materials between the area disturbed by the work and the saw cut line undisturbed by the saw cutting, pavement removal, or pavement replacement processes.

C. Strip topsoil from area to be excavated, free from subsoil and debris, and store for later respreading.

D. At no time place excavated materials where they will impede surface drainage unless such drainage is being safely rerouted away from the excavation.

E. Excavate whatever materials are encountered as required to place at the elevations shown, all pipe, manholes, and other work. Remove debris and rubbish from excavations before placing bedding and backfill material.

F. Remove surplus excavated materials from site.

G. Verify the locations of any water, drainage, gas, sewer, electric, telephone or steam lines which may be encountered in the excavation. Underpin and support all lines. Cut off service connections encountered which are to be removed at the limits of the excavation and cap.

H. Provide and maintain all fencing, barricades, signs, warning lights, and/or other equipment necessary to keep all excavation pits and trenches and the entire subgrade area safe under all circumstances and at all times. No excavation shall be left unattended without adequate protection.

I. Elevations shown on the plans are subject to such revisions as may be necessary to fit field conditions. No adjustment in compensation will be made for adjustments up to two (2) feet above or below the grades indicated on the plans.

J. Install lines passing under foundations with minimum clearance to concrete as indicated on structural drawings and insure there is no disturbance of bearing soil. Refer to structural drawing for detail.

K. Bed pipe up to a point 12" above the top of the pipe. Take care during bedding, compaction and backfill not to disturb or damage piping.

L. Mechanically compact bedding and backfill to prevent settlement. The initial compacted lift to not exceed 24" compacted to 95% density per Modified Proctor Test (ASTM D-1557). Subsequent lifts under pavements, curbs, walks and structures are not to exceed 12" and be compacted to 95% density per Modified Proctor Test. In all other areas where construction above the excavation is not anticipated within 2 years, mechanically compact backfill in lifts not exceeding 24" to 90% density per Modified Proctor Test. Route the equipment over each lift of the material so that the compaction equipment contacts all areas of the surface of the lift.

3.03 SHEETING, SHORING AND BRACING

A. Provide shoring, sheet piling and bracing in conformance with the Wisconsin Department of Safety and Professional Services (SPS), to prevent earth from caving or washing into the excavation. Shore and underpin to properly support adjacent or adjoining structures. Abandon in place shoring, sheet piling and underpinning below the top of the pipe, or, if approved in advance by the engineer, maintained in place until other permanent support approved by the engineer is provided.

3.04 DEWATERING

A. Provide, operate and maintain all pumps and other equipment necessary to drain and keep all excavation pits, trenches and the entire subgrade area free from water under all circumstances. Obtain general permit from the Wisconsin Department of Natural Resources district office for discharge of construction dewatering effluent. Obtain well permit from the Wisconsin Department of Natural Resources district office for dewatering wells discharging more than 70 GPM. Comply with permit requirements.

3.05 ROCK EXCAVATION

A. Remove rock encountered in the excavation to a minimum dimension of six (6) inches outside the pipe. Rock excavation includes all hard, solid rock in ledges, bedded deposits and unstratified masses, all natural conglomerate deposits so firmly cemented as to present all the characteristics of solid rock; which material is so hard or so firmly cemented that in the opinion of the Engineer it is not practical to excavate and remove same with a power shovel except after thorough and continuous drilling and blasting. Rock excavation includes rock boulders of 1/2 cubic yard or more in volume.

B. Rock excavation will be computed on the basis of the depth of rock removed and a trench width two (2) feet larger than the outside diameter of the pipe where one (1) pipe is laid in the trench and three (3) feet larger than the combined outside diameter where two (2) pipes are laid in the trench. Include 6" pipe and structure bedding in rock excavation. Include rock excavation shown on the plans in the Base Bid.

3.06 SURFACE RESTORATION

A. Completely restore the surface of all disturbed areas to a like condition of the surface prior to the work. Level off all waste disposal areas and clean up all areas used for the storage of materials or the temporary deposit of excavated earth. Remove all surplus material, tools and equipment.

3.07 CONCRETE WORK

A. Plumbing related cast-in-place concrete on the interior and exterior of the building to be provided by this Contractor in conformance with requirements of Division 03. This includes piping thrust restraints, pipe supports, equipment pads, hydrant supports, manholes, catch basins, grease traps, septic tanks, distribution boxes, valve pits, meter pits, cleanout cover pads, yard hydrant pads, etc.

3.08 CUTTING AND PATCHING

A. Refer to Division 01, General Requirements, Cutting and Patching.

3.09 BUILDING ACCESS

A. Arrange for the necessary openings in the building to allow for admittance or removal of all apparatus. When the building access was not previously arranged and must be provided by this contractor, restore any opening to its original condition after the apparatus has been brought into the building.

3.10 EQUIPMENT ACCESS

A. Install all piping, conduit, and accessories to permit access to equipment for maintenance. Coordinate the exact location of wall and ceiling access panels and doors with the General Contractor, making sure that access is available for all equipment and specialties. Where access is required in plaster walls or ceilings, furnish the access doors to the General Contractor.

3.11 COORDINATION

A. Coordinate all work with other contractors prior to installation. Any work that is not coordinated and that interferes with other contractor's work shall be removed or relocated at the installing contractor's expense.

B. Verify that all devices are compatible for the type of construction and surfaces on which they will be used.

3.12 IDENTIFICATION

A. Identify equipment in mechanical equipment rooms by stenciling equipment number and service with one coat of black enamel against a light background or white enamel against a dark background. Use a primer where necessary for proper paint adhesion.

B. Where stenciling is not appropriate for equipment identification, engraved name plates may be used.

C. Identify interior piping with snap around pipe markers not less than once every 30 feet, not less than once in each room, adjacent to each access door or panel, and on both side of the partition where accessible piping passes through walls or floors. Place flow directional arrows at each pipe identification location.

D. Identify all exterior buried piping for entire length with underground warning tape. Place tape 12" below finished grade along entire length of pipe. Extend tape to surface at building entrances, meters, hydrants and valves. Where existing underground warning tape is broken during excavation, replace with new tape identifying appropriate service and securely spliced to ends of existing tape.

1. Install tracer wire on all exterior non-metallic pipe per SPS 382.30(11)(h) and SPS 382.40(8)(k).

E. Identify valves with brass tags bearing a system identification and a valve sequence number. Valve tags are not required at a terminal device unless the valves are greater than ten feet from the device, located in another room or not visible from device. Provide a typewritten valve

schedule and pipe identification schedule indicating the valve number and the equipment or areas supplied by each valve and the symbols used for pipe identification; locate schedules in mechanical room and in each Operating and Maintenance manual. Schedule in mechanical room to be framed under clear plastic.

3.13 LUBRICATION

A. Lubricate all bearings with lubricant as recommended by the manufacturer before the equipment is operated for any reason. Once the equipment has been run, maintain lubrication in accordance with the manufacturer's instructions until the work is accepted by the Owner. Maintain a log of all lubricants used and frequency of lubrication; include this information in the Operating and Maintenance Manuals at the completion of the project.

3.14 SLEEVES AND OPENINGS

A. Pipe penetrations in new poured concrete horizontal construction requiring F and T rating: Form opening using hole form or core drill opening. Alternatively provide cast in place fire stopping devices/sleeves.

B. Pipe penetrations in new poured concrete horizontal construction requiring F rating but no T rating: Same as pipe penetrations in new poured concrete construction requiring F and T ratings except that schedule 40 steel sleeves may also be used.

C. Pipe penetrations in new poured concrete horizontal construction that do not require F or T ratings: Provide schedule 40 steel pipe sleeve, form opening using hole form or core drill opening.

D. Pipe penetrations in existing concrete floors: Core drill openings.

E. Pipe penetrations through existing floors located in food service areas that do not require a T rating: Core drill sleeve opening large enough to insert schedule 40 sleeve, extend sleeve 2 inches above the floor and grout area around sleeve with hydraulic setting, non-shrink grout. Size sleeve to allow insulated pipe to run through sleeve and paint the sleeve.

F. Where penetrating pipe or conduit weight is supported by floor, provide manufactured product or structural bearing collar designed to carry load.

3.15 SEALING AND FIRE STOPPING

A. FIRE AND/OR SMOKE RATED PENETRATIONS:

Provide all fire stopping of fire rated penetrations and sealing of smoke rated penetrations in compliance with section 07 84 00 Fire Stopping.

B. NON-RATED PARTITIONS:

1. At all interior partitions and exterior walls, pipe penetrations are required to be sealed. Apply sealant to both sides of the penetration in such a manner that the annular space between the pipe sleeve or cored opening and the pipe or insulation is completely blocked.

C. PENETRATIONS SUBJECT TO WATER INTRUSION:

1. For penetrations (both rated and non-rated) in floors subject to water intrusion or in rooms housing electrical equipment (but not within walls) provide one of the following:
   - Pipe penetration where steel pipe sleeve is used extend steel sleeve 2” above the floor.
   - Pipe penetration where cast in place fire stopping device/sleeve is used, extend device/sleeve 2” above the floor (provided it meets the device’s UL listing).
   - Pipe penetration where there is no steel sleeve or cast in place fire stopping

3. Provide waterproof caulk sealant top coating on fire stopping system (or other approved means to protect the fire stopping system from water) in areas subject to wash down such as Food Service and Dish Washing Areas.

END OF SECTION

SECTION 22 05 13

COMMON MOTOR REQUIREMENTS FOR PLUMBING EQUIPMENT

PART 1 – GENERAL

1.01 SCOPE

A. This section includes requirements for single and three phase motors that are used with equipment specified in other sections. Included are the following topics:

PART 1 - GENERAL
- Scope
- Related Work
- Reference
- Reference Standards
- Shop Drawings
- Operating and Maintenance Instructions
- Electrical Coordination
- Product Criteria

PART 2 - PRODUCTS
- Single Phase, Single Speed Motors

PART 3 - EXECUTION
- Installation

1.02 RELATED WORK

Division 26	Electrical For Power Wiring, Starters, and Other Electrical Devices
Section 22 30 00	Plumbing Equipment For Equipment Requiring Motors
Section 22 42 00	Commercial Plumbing Fixtures

1.03 REFERENCE

A. Applicable provisions of Division 00 and 01 govern work under this section.

1.04 REFERENCE STANDARDS

ANSI/IEEE 112	Test Procedure for Polyphase Induction Motors and Generators
ANSI/NEMA MG-1	Motors and Generators
ANSI/NFPA 70	National Electrical Code

1.05 SHOP DRAWINGS

A. Include with the equipment which the motor drives the following motor information: motor manufacturer, voltage, phase, hertz, RPM, full load efficiency, full load power factor, service factor, NEMA design designation, insulation class, and frame type.

1.06 OPERATING AND MAINTENANCE INSTRUCTIONS

A. Include manufacturer's instructions in the manuals with the specific equipment to which they apply.

1.07 ELECTRICAL COORDINATION

A. All starters, disconnects, relays, wire, conduit, pushbuttons, pilot lights, and other devices required for the control of motors or electrical equipment are provided by the Electrical Contractor, except as specifically noted elsewhere in this division of specifications.

B. Electrical drawings and/or specifications show number and horsepower rating of all motors furnished by this Contractor, together with their actuating devices if these devices are furnished by the Electrical Contractor. Should any discrepancy in size, horsepower rating, electrical characteristics or means of control be made to any motor or other electrical equipment after contracts are awarded, Contractor is to immediately notify the architect/engineer of such discrepancy. Costs involved in any changes required due to equipment substitutions initiated by this contractor will be the responsibility of this contractor.

C. Furnish project specific wiring diagrams to Electrical Contractor for all equipment and devices furnished by this Contractor and indicated to be wired by the Electrical Contractor.

D. All motor horsepower shall be rated per the current version of the NEC (National Electrical Code).

1.08 PRODUCT CRITERIA

A. Motors to conform to all applicable requirements of NEMA, IEEE, ANSI, and NEC standards and shall be listed by U.L. for the service specified.

B. Select motors for conditions in which they will be required to perform; i.e., general purpose, splashproof, explosion proof, standard duty, high torque or any other special type as required by the equipment or motor manufacturer's recommendations.

C. Furnish motors for starting in accordance with utility requirements and compatible with starters as specified.

PART 2 – PRODUCTS

2.01 SINGLE PHASE, SINGLE SPEED MOTORS

A. Use NEMA rated 115 volt, single phase, 60 hertz motors for all motors 1/3 HP and smaller.

B. Use permanent split capacitor or capacitor start, induction run motors equipped with permanently lubricated and sealed ball or sleeve bearings and Class A insulation. Service factor to be not less than 1.35.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Mount motors on a rigid base designed to accept a motor, using shims if required under each mounting foot to get a secure installation.

B. Lubricate all motors requiring lubrication. Record lubrication material used and the frequency of use. Include this in the maintenance manuals.

END OF SECTION

SECTION 22 05 14

PLUMBING SPECIALTIES

PART 1 - GENERAL

1.01 SCOPE

A. This section includes specifications for floor drains, roof drains, cleanouts, backflow preventers, water hammer arrestors and other miscellaneous plumbing specialties.

PART 1 - GENERAL
- Scope
- Related Documents
- Reference
- Reference Standards
- Quality Assurance
- Shop Drawings

PART 2 - PRODUCTS
- Floor Drains
- Trap Guards
- Hub Drains
- Roof Drains
- Cleanouts
- Water Hammer Arrestors
- Backflow Preventers
- Wall Hydrants
- Safings
- Vent Flashings
- Washing Machine Wall Boxes

PART 3 - EXECUTION
- Installation

1.02 RELATED DOCUMENTS

Section 22 05 23 General Duty Valves for Plumbing Piping
Section 22 11 00 Facility Water Distribution
Section 22 13 00 Facility Sanitary Sewerage
Section 22 14 00 Facility Storm Drainage

1.03 REFERENCE

A. Applicable provisions of Division 00 and 01 shall govern work under this Section.

1.04 REFERENCE STANDARDS

ANSI A112.21.1 Floor Drains
ANSI A112.21.2 Roof Drains
ANSI A112.26.1 Water Hammer Arrestors
/PDI WH-201
ASSE 1001 Pipe Applied Atmospheric Type Vacuum Breakers
ASSE 1010 Water Hammer Arrestors
ASSE 1011 Hose Connection Vacuum Breakers
ASSE 1012 Backflow Preventers with Intermediate Atmospheric Vent
ASSE 1013 Reduced Pressure Principle Backflow Preventers
ASSE 1018 Trap Seal Primer Valves
ASSE 1019 Wall Hydrants, Frost Proof Automatic Draining, Anti-Backflow Type

1.05 QUALITY ASSURANCE

A. Substitutions: Refer to Division 00 and 01.

B. Plumbing products requiring approval by the Wisconsin Department of Safety and Professional Services (SPS) must be approved or have pending approval at the time of shop drawing submission.
Note: Value engineering to change from cast iron body products to PVC will not be considered.

1.06 SHOP DRAWINGS

A. Include data concerning dimensions, capacities, materials of construction, ratings, certifications, weights, manufacturer's installation requirements, manufacturer's performance limitations, and appropriate identification.

PART 2 – PRODUCTS

2.01 FLOOR DRAINS

A. Manufacturer: Zurn, Josam, Smith, Watts.

B. FD-1: Jay R Smith 2005Y-A06NB or -B06NB, Dura coated cast iron body with 6”x6” square or round nickel bronze top leveling strainer. No hub outlet. Use square strainer in tile areas. Provide trap guard as called out below.

2.02 TRAP GUARDS

A. Manufacturer: ProSet Systems Trap Guard, JR Smith Quad Close “Stink Stopper” #2692, Sure Seal, or approved equal.

B. Flexible PVC construction diaphragm trap guard for installation in new and existing floor drains, hub drains, and trench drains. Trap guard to prevent trap evaporation and waste backflow. Size as applicable to the drain outlet size, up to 4” size. 1-1/2” to 6” size for Jay R Smith “Stink Stopper”.

2.03 HUB DRAINS

A. Manufacturer: Josam, Smith, Wade, Watts, Zurn

B. HD-1:3” cast iron hub section up 2” min. above floor level, with full-sized deep seal P-trap.

2.04 ROOF DRAINS

A. Manufacturer: Zurn, Josam, Smith, Wade, Watts.

B. RD-1: Jay R Smith #1015Y-C-CID 15” diameter Dura coated cast iron with adjustable extension under deck clamp and cast iron dome.

C. RD-2: Jay R Smith 1074Y-C-CID 15” diameter Dura coated cast iron with adjustable extension under deck clamp, cast iron dome, and 3” internal water dam.

D. DSN-1: Jay R Smith 1770T-NB nickel bronze body with threaded outlet.

2.05 CLEANOUTS

A. Manufacturer: Zurn, Josam, Smith, Wade, Watts
   1. Select cleanout with cleanout opening size in compliance with COMM. SPS382.35 (6).

B. INTERIOR CONCRETE FLOOR MECHANICAL ROOM: Adjustable floor cleanout, dura coated cast iron with heavy duty secured top.

C. INTERIOR CONCRETE FLOOR AREAS: Adjustable floor cleanout with light duty nickel bronze top and bronze plug.

D. INTERIOR CERAMIC TILE FLOOR AREAS: Adjustable floor cleanout, nickel bronze Square top and bronze plug.

E. INTERIOR VINYL TILE FLOOR AREAS: Square adjustable floor cleanout, with nickel bronze top with bronze plug.

F. INTERIOR CARPETED FLOOR AREAS: Jay R Smith #4024S-NB-Y Enameled cast iron body with round adjustable scoriated nickel bronze cover and secured carpet marker, tapered threaded bronze closure plug.

G. INTERIOR FINISHED WALL AREAS: Locate cleanout behind access panel. Refer to Section 22 05 00.

H. INTERIOR EXPOSED VERTICAL STACKS: Line type cleanout tee with tapered threaded bronze closure plug. Jay R Smith #4532Y-SS with stainless steel cover

I. INTERIOR HORIZONTAL LINES: Cast iron hub with tapped ferrule and tapered threaded bronze closure plug, or no-hub coupling and blind plug.

J. EXTERIOR PAVED AREAS: Cast iron hub or plug with tapered threaded ABS or PVC closure plug, cast iron frost sleeve and cover set in 24" square by 4" min. thick reinforced concrete pad top or surrounding pavement, crowned for drainage. Neenah R-1976 with non-ferrous securing screw. Jay R Smith #4254S with ABS plastic plug thru 5" or #4253S with bronze plug thru 8" size.

K. EXTERIOR UNPAVED AREAS: Cast iron hub or plug with tapered threaded ABS or PVC closure plug, cast iron or PVC frost sleeve and cover set in 24" square by 4" min. thick reinforced concrete pad top. Neenah R-1976 with non-ferrous securing screw. Jay R Smith #4254S with ABS plastic plug thru 5" or #4253S with bronze plug thru 8" size.

2.06 WATER HAMMER ARRESTORS

A. Manufacturer: PPP Industries, Wade, Watts, Jay R Smith.

B. ANSI A112.26.1, ASSE 1010; sized in accordance with PDI WH-201, precharged piston type constructed of hard drawn Type K copper, threaded brass adapter, brass piston with o-ring seals, FDA approved silicone lubricant, suitable for operation in temperature range 35 to 150 degrees F, maximum 250 psig working pressure, 1500 psig surge pressure. Jay R Smith #5000 series "Hydrotrol"

2.07 BACKFLOW PREVENTERS

A. Manufacturers: Beeco, Cla-Val, Conbraco, Febco, Watts, Wilkins, Cash Acme.

B. HOSE CONNECTION VACUUM BREAKERS: ASSE 1011, brass or bronze construction, EPDM diaphragm and seat, rated for 125 psig and 180°F. Cash Acme V-3 or Watts 8 (interior application).

C. LAB FAUCET VACUUM BREAKERS: ASSE 1035, brass or bronze construction, chrome plated, EPDM diaphragm and seat, stainless steel internals, rated for 125 psig and 160°F. Watts NLF9.

D. PIPE APPLIED ATMOSPHERIC TYPE VACUUM BREAKERS: ASSE 1001, same size as pipe, brass or bronze construction, silicone disc, rated for 125 psig and 160°F. Watts 288A.

E. ANTI-SIPHON PRESSURE TYPE VACUUM BREAKERS: ASSE 1020, same size as pipe, brass or bronze construction, silicone disc, plastic seat, stainless steel spring, inlet and outlet ball shutoff valves, test port ball valves, rated for 150 psig and 110°F. Watts 800M4QT.

F. REDUCED PRESSURE ZONE BACKFLOW PREVENTERS: ASSE 1013 reduced pressure zone backflow assembly complete with inlet strainer, inlet and outlet ball or non-rising stem gate isolation valves. Constructed of bronze or epoxy coated cast iron body with bronze and plastic internal parts, stainless steel springs, non-threaded vent outlet, 4 test cocks, rated for 175 psig and 210°F, with air gap apparatus on drain. Watts series 909-S-QT-AG/909-S-NRS.

2.08 WALL HYDRANTS

A. Manufacturer: Woodford, Josam, Smith, Wade, Watts, Zurn.

B. WH-1: Freezeproof automatic draining wall hydrant in flush mounted cast brass wall box with locking door, 3/4" inlet, 3/4" hose thread ASSE 1019-93 backflow preventer outlet, loose key operator, polished brass finish. Woodford model B65.

2.09 SAFINGS

A. Manufacturers: Noble, Oatey.

B. Chlorinated polyethylene sheeting, 40 mils thick, ASTM D4068, with CPE solvent; or 3 lb./sq. ft. sheet lead.

2.10 VENT FLASHINGS

A. Manufacturers: Semco, Oatey.

B. Formed 3 lb./sq. ft. lead flashing with minimum base size of 15"x17".

C. Single Ply Membrane Roofs: Flashing boot of material compatible with roofing membrane with base flange for adhering to membrane and stainless steel drawband for securing to vent pipe.

D. Pitched Roofs: 24 gauge rustproof galvanized base with no caulk neoprene collar.

2.11 WASHING MACHINE WALL BOXES

A. Manufacturers: Oatey, Guy Gray.

B. WMB-1: Epoxy paint coated steel recessed wall box with face flange, overflow lip, fastening tabs, 1/2" hot and cold bronze washing machine ¼ turn shutoff valves rated for 125 psi and 180 degrees F, long shank valve fittings for replacement of valves within box, 2" drain outlet fitting. Oatey no. 38981.

2.12 GREASE INTERCEPTOR

A. Manufacturers: Schier Products or pre-approved equal.

B. GI-1: Schier Products Model No. GB-2 indoor polyethylene grease interceptor, 3” inlet and outlet, built in flow control with minimum 6” extension and composite cover. 35 GPM flow rate and 20 gallon liquid capacity.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Coordinate location and setting of plumbing specialties with adjacent construction. Install in accordance with manufacturers recommendations.

B. Set floor drains, roof drains and cleanouts level and plumb adjusted to finished floor elevation, roof elevation or finished wall location. Locate where serviceable. Allow minimum of 18" clearance around cleanouts for rodding. Lubricate threaded cleanout plugs with graphite and oil, Teflon tape or waterproof grease. Install trap primer connections where indicated. Provide deep seal traps on floor drains.

C. Install water hammer arrestors where indicated and at quick closing valve installations. This shall include but not be limited to all types of flush valves, sensor operated faucets, and hose bibbs.

D. Install lab faucet vacuum breakers with Loctite 242 “blue” on threads.

E. Install backflow preventers in accordance with Wisconsin Department of Safety and Professional Services requirements maintaining minimum clearance distances for servicing and testing. Provide indirect waste piping with air gap installation from relief opening to above hub drain or floor drain.

F. Where backflow preventers requiring Wisconsin Department of Safety and Professional Services registration are installed, provide initial registration, testing and report filing required by Wisconsin Department of Safety and Professional Services. List the name and address of the building that the backflow preventer installations occur in.

G. Mount wall hydrants recessed in exterior wall construction with valve plug extended beyond interior side of building insulation. Slope to drain to exterior. Install so discharge is 18” min. above finished grade. Set wall box in grout or caulk and fill exterior wall penetration with insulation.

H. Install safing at floor drains above grade. Extend 12" beyond drains in all directions. Cover entire floor in showers and extend 6" up in walls above curbs and to a height of 6' (3" wide each direction) in corners. Install on concrete floor that is smooth and free of debris. Seal all joints and connect to drain body clamp. Safing is subject to standing water leak test. Install safing at all built-up shower installations. (Note: spray-on and brush applied liquid safing is not acceptable).

I. Flash vent penetrations through roof. Turn down top of lead flashing into vent pipe. Tighten drawband of membrane boot to vent pipe. Adhere base flashing to deck or membrane. Provide waterproof patch around penetration on existing roofs.

J. Install washing machine boxes in wall construction, secured to structure, directly behind proposed washing machine location. Provide water hammer arrestors in supply piping. Mount box a min. of 36” above floor.

K. Mount downspout nozzles 18” above ground.

END OF SECTION

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SECTION 22 05 23

GENERAL DUTY VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.01 SCOPE

A. This section includes valve specifications for all Plumbing systems except where indicated under Related Work. Included are the following topics:

PART 1 - GENERAL
- Scope
- Related Work
- Reference
- Quality Assurance
- Submittals
- Design Criteria

PART 2 - PRODUCTS
- Water System Valves
  - Ball Valves
  - Swing Check Valves
  - Spring Loaded Check Valves
  - Stop & Waste Valves
  - Balance Valves
  - Drain Valves
- Waste System Valves
  - Gate Valves
  - Ball Valves
  - Spring Loaded Check Valves
- Natural Gas Systems
  - Shut-off Valves
  - Gas Pressure Regulators
- Compressed Air Systems
  - Shut-off Valves
- Specialty Valves and Valve Accessories
  - Safety Relief Valves

PART 3 - EXECUTION
- General
- Shut-off Valves
- Balancing Valves
- Drain Valves
- Spring Loaded Check Valves
- Pressure Reducing Valves
- Safety Relief Valves
- Gas Pressure Regulators
- Compressed Air Valves

1.02 RELATED WORK

Section 22 05 14 Plumbing Specialties

Section 22 30 00 Plumbing Equipment

1.03 REFERENCE

A. Applicable provisions of Division 00 and 01 govern work under this section.

1.04 QUALITY ASSURANCE

A. Substitutions: Refer to Division 00 and 01.

1.05 SUBMITTALS

A. Schedule of all valves indicating type of service, dimensions, materials of construction, and pressure/temperature ratings for all valves to be used on the project. Temperature ratings specified are for continuous operation.

1.06 DESIGN CRITERIA

ANSI Z21.22 Relief Valves and Automatic Gas Shutoff Devices for Hot Water Supply Systems
ASSE 1003 Water Pressure Reducing Valves for Domestic Water Supply Systems

A. Where valve types (ball, butterfly, etc.) are specified for individual plumbing services (i.e. domestic water, gas, etc.), each valve type shall be of the same manufacturer unless prior written approval is obtained from the Owner.

B. Valves to be line size unless specifically noted otherwise.

C. Valves shall be manufactured in the United States of America, (USA).

PART 2 - PRODUCTS

2.01 WATER SYSTEM VALVES:

A. All water system valves to be rated at not less than 125 water working pressure at 240 degrees F unless noted otherwise.

B. Ball valves:
3" and smaller: Two piece bronze body; full port sweat ends, chrome plated bronze ball; blowout-proof stem; 600 psig WOG. Provide valve stem extensions for valves installed in all piping with insulation. Apollo, Hammond, Milwaukee, Nibco.

C. Spring loaded check valves:
2" and smaller: Bronze body, sweat or threaded ends, bronze trim, stainless steel spring, stainless steel center guide pin, Class 125, teflon seat unless only bronze available. ConBraCo 61 series, Mueller 203BP, Nibco S480Y, Val-Matic S1400 series.
1. 2-1/2" and larger: Cast or ductile iron body, wafer or globe type, bronze trim, bronze or EPDM seat, stainless steel spring, stainless steel stem if stem is required, Class 125. APCO 300 or 600 series, Centerline CLC with full body option, Hammond IR9354, Milwaukee 1800 series, Mueller Steam 101AP or 105AP, Nibco W910 or F910, Val-Matic 1400 or 1800 or 8000 series.

D. STOP & WASTE VALVES:
1” and smaller, Bronze body, sweat or threaded ends, 400 psi WOG, stainless steel ball and stem, full port ball valve, with threaded drain cap. Apollo, Grinnell, Hammond, Milwaukee or Nibco manufacturer.

E. Balance valves:
Furnish and install as shown on plans with manufacturer recommendations B&G Model CB or “RF” calibrated balance valves. “RF” Models for flow rates less than 1 GPM. Valves are to be designed to allow installing contractor to pre-set balance schedule.
All valves 1/2” to 3” pipe size to consist of Lead Free Brass body/SS ball construction with glass and carbon filled TFE seat rings. Valves are to have differential pressure read-out ports across valve seat area. Read-out ports to be fitted with internal EPT inserts/check valves. Valve bodies are to have 1/4”NPT tapped drain/purge port. Valves are to have memory stop feature to allow valve to be closed for service and then reopened to set point without disturbing balance position. All valves are to have calibrated nameplates to assure specific valve settings. Valves shall be designed for positive shut-off.

F. Drain valves:
3/4 inch ball valve with integral threaded hose adapter, sweat or threaded inlet connections, with threaded cap and chain on hose threads.

2.02 WASTE SYSTEM VALVES

A. Gate valves:

1. 2" and Smaller: Bronze body, bronze trim, threaded ends, solid wedge, rising stem, union bonnet, malleable iron hand wheel, suitable for 300 psi WOG. Crane 431UB, Hammond IB629, Lunkenheimer 3151, Milwaukee 1151(M), Nibco T134, Powell 2714, Stockham B120.
2. 2-1/2" and Larger: Iron body, bronze trim, bolted bonnet, O.S.& Y., solid wedge, flanged, suitable for 200 psi WOG. Crane 465-1/2, Grinnell 6020A, Hammond IR1140, Lunkenheimer 1430, Milwaukee F2885, Nibco F617-O, Powell 1793, Stockham G623.

B. Ball valves:
1. 3" and Smaller: Two piece bronze body; sweat or threaded ends, chrome plated bronze ball; blowout-proof stem; 400 psig WOG. Apollo 70-200, Hammond 8511, Milwaukee BA150, Nibco S585-70.

C. Spring loaded check valves:
1. 2" and Smaller: Bronze body, sweat or threaded ends, bronze trim, stainless steel spring, stainless steel center guide pin, Class 125, teflon seat unless only bronze available. ConBraCo 61 series, Mueller 203BP, Nibco S480Y, Val-Matic S1400 series.
2. 2-1/2" and Larger: Cast or ductile iron body, wafer or globe type, bronze trim, bronze or EPDM seat, stainless steel spring, stainless steel stem if stem is required, Class 125. APCO 300 or 600 series, Centerline CLC with full body option, Hammond IR9354, Milwaukee 1800 series, Mueller Steam 101AP or 105AP, Nibco W910 or F910, Val-Matic 1400 or 1800 or 8000 series.

2.06 NATURAL GAS SYSTEMS

A. Shut-off valves:
1. 4" and Smaller: Ball or eccentric plug valve, bronze or cast iron body, 2" and under threaded ends, 2-1/2" and over flanged ends, chrome plated bronze ball, bronze or nickel plated cast iron plug, TFE or Hycar seats and seals, lever handle, 175 psi W.O.G., U.L listed for use as natural gas shut-off. Apollo 80-100, DeZurik 425.

B. Gas pressure regulators:
2" and smaller: Cast iron body, aluminum spring and diaphragm, Nitrile diaphragm, threaded ends, 150 psi W.O.G., -20 degrees F to 150 degrees F.

2.07 COMPRESSED AIR SYSTEMS

A. Shut-off valves:
3" and Smaller: Two or three piece bronze body; threaded ends, chrome plated bronze ball; glass filled teflon seat; teflon packing and threaded packing nut; blowout-proof stem; 600 psig WOG. Apollo 70-100, Milwaukee BA100, Nibco T585-70 or T-590-Y, Watts B-6000.

2.08 SPECIALTY VALVES AND VALVE ACCESSORIES

A. Gauge valves:
Use 1/4" ball valves. Needle valves and gauge cocks will not be accepted.

B. Safety relief valves:
Bronze body, temperature and pressure actuated, stainless steel stem and spring, thermostat with non-metallic coating, test lever, suitable for 125 psig water working pressure at 240 degrees F, sized for full BTUH input and operating pressure of equipment, with valve capacity on metal label. For equipment less than or equal to 200,000 BTUH input, provide AGA, UL or ASME listed and labeled valve. Provide ASME listed and labeled valve for larger equipment. Bell & Gossett, A. W. Cash, Conbraco, Watts, Wilkins. Temperature and pressure relief valve shall be sized per AGA rating for BTUH input, Re: Wisconsin Department of Safety and Professional Services 382.40(5)(d).

PART 3 - EXECUTION

3.01 GENERAL

A. Properly align piping before installation of valves. Install and test valves in strict accordance with valve manufacturer's installation recommendations. Do not support weight of piping system on valve ends.

B. Mount valves in locations which allow access for operation, servicing and replacement.

C. Provide valve handle extensions for all valves installed in insulated piping.

D. Install all valves with the stem in the upright or horizontal position. If possible, install butterfly valves with the stem in the horizontal position. Valves installed with the stems down will not be accepted.

E. Prior to flushing of piping systems, place all valves in the full-open position.

3.02 SHUT-OFF VALVES

A. Install shut-off valves at each piece of equipment, at each branch take-off from mains for isolation or repair and elsewhere as indicated.

3.03 BALANCING VALVES

A. Install where indicated on the drawings and details for balancing of flow in pumped hot water recirculation piping systems. Upon project completion, adjust each valve and set position stop. Balance system to minimum flow in return piping branches needed to maintain even supply water temperature throughout building. Provide balancing report indicating final GPM at each balancing valve.

3.04 DRAIN VALVES

A. Provide drain valves for complete drainage of all systems. Locations of drain valves include low points of piping systems, downstream of riser isolation valves, equipment locations specified or detailed, other locations required for drainage of systems and elsewhere as indicated.

3.05 SPRING LOADED CHECK VALVES

A. Install a spring loaded check valve in each circulating pump discharge line, each clearwater sump pump discharge line and elsewhere as indicated.

3.07 SAFETY RELIEF VALVES

A. Install relief valves on all pressure vessels and elsewhere as indicated. Inlet and outlet piping connecting to valves must be the same size as valve connections or larger. Pipe discharge to drain where indicated or to floor.

3.08 GAS PRESSURE REGULATORS

A. When the gas pressure regulator is equipped with a vent connection, run a connection size vent to outside air in accordance with codes. Use a larger size vent when required by the manufacturer's installation instructions.

3.09 COMPRESSED AIR VALVES

A. Install shut-off valves at each piece of equipment, base of drip legs and elsewhere as indicated. Install safety exhaust shut-off valves at terminal equipment designed for frequent removal. Install pressure reducing valves at filter stations and elsewhere as indicated. Mount in readily accessible location for gauge and maintenance access.

END OF SECTION

SECTION 22 05 29

HANGERS AND SUPPORTS FOR PLUMBING PIPING & EQUIPMENT

PART 1 - GENERAL

1.01 SCOPE

A. This section includes specifications for supports of all plumbing equipment and materials as well as piping system anchors. Included are the following topics:

PART 1 - GENERAL
- Scope
- Related Work
- Reference
- Reference Standards
- Quality Assurance
- Description
- Shop Drawings
- Design Criteria

PART 2 - PRODUCTS
- Manufacturers
- Structural Supports
- Pipe Hangers and Supports
- Pipe Hanger Rods
- Beam Clamps
- Corrosive Atmosphere Coatings

PART 3 - EXECUTION
- Installation
- Hanger and Support Spacing

1.02 RELATED WORK

Section 03 10 00	Concrete Formwork
Section 03 30 00	Cast in Place Concrete for Equipment Pads
Section 22 07 00	Plumbing Insulation for Insulation Protection at Support Devices

1.03 REFERENCE

A. Applicable provisions of Division 00 and 01 shall govern work under this section.

1.04 REFERENCE STANDARDS

MSS SP-58
MSS SP-69

1.05 QUALITY ASSURANCE

A. Refer to Division 00 and 01, Approved Equals and Substitutions.

1.06 DESCRIPTION

A. Provide all supporting devices as required for the installation of mechanical equipment and materials. All supports and installation procedures are to conform to the latest requirements of the ANSI Code for building piping.

B. Do not hang any mechanical item directly from a metal deck or run piping so its rests on the bottom chord of any truss or joist.

C. Fasteners depending on soft lead for holding power or requiring powder actuation will not be accepted.

D. Support apparatus and material under all conditions of operation, variations in installed and operating weight of equipment and piping, to prevent excess stress, and allow for proper expansion and contraction and vibration control.

E. Protect insulation at all hanger points; see Related Work above.

F. For piping hung from open-web steel joists, the following is required:
   1. All hung equipment shall be supported within 3” of the structural joist panel points or this contractor shall provide joist stiffeners as indicated on the structural plans.
   2. For 6” diameter or larger pipes, or combinations of pipes with a load equal to or greater than a 6” diameter.
      a. If the pipe runs parallel to joists, locate the pipe midway between and support equally off of two joists. Locate supports at joist panel points at maximum spacing of 8’-0” on center.
      b. If the pipe runs perpendicular to joists, provide supports at 10’ to 12’ on center maximum spacing.

G. Wood Trusses: Contractor shall coordinate with, and receive written approval from truss supplier for the location, weight and fastening methods to be used to hang or attach mechanical, plumbing, and electrical systems prior to truss fabrication. Manufacturer shall consider loss of section in design. If loads cannot be placed at panel points, or the trusses properly field reinforced, truss supplier shall increase bottom chord size as required. Respective subcontractors shall hire a registered P.E. to design connections and hanger supports.

H. Wood I-joists: Attach piping systems to wood I-joists following guidelines, recommendations and details provided by the I-joist manufacturer and/or the American Plywood Association (APA, www.apaIjoists.org).

1.07 SHOP DRAWINGS

A. Schedule of all hanger and support devices indicating attachment methods and type of device for each pipe size and type of service.

1.08 DESIGN CRITERIA

A. Materials and application of pipe hangers and supports shall be in accordance with MSS Standard Practice SP-58 and SP-69 unless noted otherwise.

B. Piping connected to pumps, compressors, or other rotating or reciprocating equipment is to have vibration isolation supports for a minimum distance of one hundred pipe diameters or three supports away from the equipment, whichever is greater. Vibration of piping systems shall not be permitted. Adjust extent of vibration isolators as necessary. Standard pipe hangers/supports as specified in this section are required beyond the 100 pipe diameter/3 support distance.

C. Conform to Specification Section 05 05 30, “Post Installed Anchors in Concrete and Masonry (CMU)” for connections of hangers and supports to the structure.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. B-Line, Grinnell, Pate, Piping Technology, Roof Products & Systems or approved equal.

2.02 STRUCTURAL SUPPORTS

A. Provide all supporting steel required for the installation of mechanical equipment and materials, including angles, channels, beams, etc. to suspended or floor supported tanks and equipment. All of this steel may not be specifically indicated on the drawings.

2.03 PIPE HANGERS AND SUPPORTS

A. Hangers for Pipe Sizes 1/2" through 2":
Carbon steel, adjustable swivel ring. B-Line B3170NF, Grinnell 69 or 70. Carbon steel, adjustable clevis, standard. B-Line B3100, Grinnell 260.

B. Hangers for Pipe Sizes 2" and Larger:
Carbon steel, adjustable clevis, standard. B-Line B3100, Grinnell 260.

C. Multiple or Trapeze Hangers:
Steel channels with welded spacers and hanger rods.

D. Wall Support:
Carbon steel welded bracket with hanger. B-Line 3068 Series, Grinnell 194 Series.
1. Perforated, epoxy painted finish, 16-12 gauge, min., steel channels securely anchored to wall structure, with interlocking, split-type, bolt secured, galvanized pipe/tubing clamps. B-Line type S channel with B-2000 series clamps, Grinnell type PS 200 H with PS 1200 clamps. When copper piping is being supported, provide flexible elastomeric/thermoplastic isolation cushion material to completely encircle the piping and avoid contact with the channel or clamp, equal to B-Line B1999 Vibra Cushion or provide manufacturers clamp and cushion assemblies, B-Line BVT series, Grinnell PS 1400 series.

E. Vertical Support:
Carbon steel riser clamp. B-Line B3373, Grinnell 261 for above floor use. Grinnell 40 with bolts and concrete anchors for attachment to underside of concrete floor deck.

F. Floor Support:
Carbon steel pipe saddle, stand and bolted floor flange. B-Line B3088T/B3093.

G. Copper Pipe Supports:
All supports, fasteners, clamps, etc. directly connected to copper piping shall be copper plated or polyvinylchloride coated. Where steel channels are used, provide isolation collar between supports/clamps/fasteners and copper piping.

2.04 PIPE HANGER RODS

A. Steel Hanger Rods:
Threaded both ends, threaded one end, or continuous threaded, complete with adjusting and lock nuts.

B. Size rods for individual hangers and trapeze support as indicated in the following schedule.

C. Total weight of equipment, including valves, fittings, pipe, pipe content, and insulation, are not to exceed the limits indicated.

Maximum Load (Lbs.) (650°F Maximum Temperature)	Rod Diameter (Inches)
610	3/8
1130	1/2
1810	5/8
2710	3/4
3770	7/8
4960	1
8000	1-1/4

2.05 BEAM CLAMPS

A. MSS SP-69 Types 19 & 23 malleable black iron clamp for attachment to beam flange to 0.62 inches thick with a retaining ring and threaded rod of 3/8, 1/2, and 5/8 inch diameter. Furnish with a hardened steel cup point set screw. B-Line B3036L/B3034, Grinnell 86/92.

B. MSS SP-69 Type 28 or Type 29 forged steel jaw type clamp with a tie rod to lock clamp in place, suitable for rod sizes to 1-1/2 inch diameter. B-Line B3054, Grinnell 228.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Size, apply and install supports and anchors in compliance with manufacturers recommendations.

B. Install supports to provide for free expansion of the piping system. Support all piping from the structure using concrete inserts, beam clamps, ceiling plates, wall brackets, or floor stands. Fasten ceiling plates and wall brackets securely to the structure and test to demonstrate the adequacy of the fastening.

C. Coordinate hanger and support installation to properly group piping of all trades.

D. Where piping can be conveniently grouped to allow the use of trapeze type supports, use standard structural shapes or continuous insert channels for the supporting steel. Where continuous insert channels are used, pipe supporting devices made specifically for use with the channels may be substituted for the specified supporting devices provided that similar types are used and all data is submitted for prior approval.

E. Size and install hangers and supports, except for riser clamps, for installation on the exterior of piping insulation.

F. Perform welding in accordance with standards of the American Welding Society.

3.02 HANGER AND SUPPORT SPACING

A. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.

B. Place a hanger within 12 inches of each horizontal elbow, valve, strainer, or similar piping specialty item.

C. Use hangers with 1-1/2 inch minimum vertical adjustment.

D. Where several pipes can be installed in parallel and at the same elevation, provide multiple or trapeze hangers.

E. Support riser piping independently of connected horizontal piping.

F. Adjust hangers to obtain the slope specified in the piping section of these specifications. Space hangers for pipe as follows:

Pipe Material	Pipe Size	Maximum Horizontal Spacing	Maximum Vertical Spacing
Cast Iron	2” and Larger	5’-0”	15’-0”
Copper	1/2" through 3/4"	5’-0”	10’-0”
Copper	1” through 1-1/4”	6’-0”	10’-0”
Copper	1-1/2” through 2-1/2”	8’-0”	10’-0”
Ductile Iron	All	10’-0”	20’-0”
Steel	1/2" through 1-1/4”	7’-0”	15’-0”
Steel	1-1/2” through 6”	10’-0”	15’-0”
Plastic	Drain and vent	4’-0”	10’-0”
Plastic	1” or Less	2’-8”	4’-0”
Plastic	1-1/4” and Over	4’-0”	6’-0”

END OF SECTION

SECTION 22 07 00

PLUMBING INSULATION

PART 1 - GENERAL

1.01 SCOPE

A. This section includes insulation specifications for plumbing piping and equipment. Included are the following topics:

PART 1 - GENERAL
- Scope
- Related Work
- Reference Standards
- Quality Assurance
- Description
- Definitions
- Shop Drawings
- Operation and Maintenance Data

PART 2 - PRODUCTS
- Materials
- Insulation & Jackets
- Accessories

PART 3 - EXECUTION
- Installation
- Piping, Valve and Fitting Insulation

1.02 RELATED WORK

Section 22 05 00	Common Work Results for Plumbing
Section 22 11 00	Facility Water Distribution
Section 22 13 00	Facility Sanitary Sewerage
Section 22 14 00	Facility Storm Drainage
Section 22 15 13	General Service Compressed-Air Piping
Section 22 05 29	Hangers and Supports for Plumbing Piping and Equipment
Section 22 30 00	Plumbing Equipment

1.03 REFERENCE

A. Applicable provisions of Division 1 govern work under this section.

1.04 REFERENCE STANDARDS

ASTM B209	Aluminum and Aluminum Alloy Sheet and Plate
ASTM C165	Test Method for Compressive Properties of Thermal Insulations
ASTM C177	Heat Flux and Thermal Transmission Properties
ASTM C195	Mineral Fiber Thermal Insulation Cement
ASTM C240	Cellular Glass Insulation Block
ASTM C302	Density of Preformed Pipe Insulation
ASTM C303	Density of Preformed Block Insulation
ASTM C449	Mineral Fiber Hydraulic Setting Thermal Insulation Cement
ASTM C518	Heat Flux and Thermal Transmission Properties
ASTM C533	Calcium Silicate Block and Pipe Thermal Insulation
ASTM C534	Preformed Flexible Elastomeric Thermal Insulation
ASTM C547	Mineral Fiber Preformed Pipe Insulation
ASTM C552	Cellular Glass Block and Pipe Thermal Insulation
ASTM C553	Mineral Fiber Blanket and Felt Insulation
ASTM C578	Preformed, Block Type Cellular Polystyrene Thermal Insulation
ASTM C591	Preformed Rigid Cellular Polyurethane Thermal Insulation
ASTM C610	Expanded Perlite Block and Thermal Pipe Insulation

ASTM C612	Mineral Fiber Block and Board Thermal Insulation
ASTM C921	Properties of Jacketing Materials for Thermal Insulation
ASTM C1136	Flexible Low Permeance Vapor Retarders for Thermal Insulation
ASTM E84	Surface Burning Characteristics of Building Materials
MICA	National Commercial & Industrial Insulation Standards
NFPA 225	Surface Burning Characteristics of Building Materials
UL 723	Surface Burning Characteristics of Building Materials

1.05 QUALITY ASSURANCE

A. Substitution of Materials: Refer to Section GC - General Conditions of the Contract, Equals and Substitutions.

B. Label all insulating products delivered to the construction site with the manufacturer's name and description of materials.

1.06 DESCRIPTION

A. Furnish and install all insulating materials and accessories as specified or as required for a complete installation. The following types of insulation are specified in this section:
- Pipe Insulation
- Equipment Insulation

B. Install all insulation in accordance with the latest edition of MICA (Midwest Insulation Contractors Association) Standard and manufacturer's installation instructions. Exceptions to these standards will only be accepted where specifically modified in these specifications, or where prior written approval has been obtained from the DFD Project Representative.

1.07 DEFINITIONS

A. Concealed: shafts, furred spaces, space above finished ceilings, utility tunnels and crawl spaces. All other areas, including walk-through tunnels, shall be considered as exposed.

1.08 SHOP DRAWINGS

A. Submit a schedule of all insulating materials to be used on the project, including adhesives, fastening methods, fitting materials along with material safety data sheets and intended use of each material. Include manufacturer's technical data sheets indicating density, thermal characteristics, jacket type, and manufacturer's installation instructions.

1.09 OPERATION AND MAINTENANCE DATA

A. All operations and maintenance data shall comply with the submission and content requirements specified under section GENERAL REQUIREMENTS.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Materials or accessories containing asbestos will not be accepted.

B. Use composite insulation systems (insulation, jackets, sealants, mastics, and adhesives) that have a flame spread rating of 25 or less and smoke developed rating of 50 or less, with the following exceptions:

C. Insulation which is not located in an air plenum may have a flame spread rating not over 25 and a smoke developed rating no higher than 150.

2.02 INSULATION AND JACKETS

A. Manufacturers: Armstrong, Certainteed Manson, Childers, Dow, Extol, Halstead, H.B. Fuller, Imcoa, Knauf, Owens-Corning, Pittsburgh Corning, Rubatex, Johns-Mansville, or approved equal.

B. Insulating materials shall be fire retardant, moisture and mildew resistant, and vermin proof. Insulation shall be suitable to receive jackets, adhesives and coatings as indicated.

C. RIGID FIBERGLASS INSULATION:
1. Minimum nominal density of 3 lbs. per cu. ft., and thermal conductivity of not more than

0.23 at 75 degrees F, minimum compressive strength of 25 PSF at 10% deformation, rated for service to 450 degrees F.

2. White kraft reinforced foil vapor barrier all service jacket, factory applied to insulation with a self-sealing pressure sensitive adhesive lap, maximum permeance of .02 perms and minimum beach puncture resistance of 50 units.

D. SEMI-RIGID FIBERGLASS INSULATION:
   1. Minimum nominal density of 3 lbs. per cu. ft., thermal conductivity of not more than 0.28 at 75 degrees F, minimum compressive strength of 125 PSF at 10% deformation, rated for service to 450 degrees F. Insulation fibers perpendicular to jacket and scored for wrapping cylindrical surfaces.
   2. White kraft reinforced foil vapor barrier all service jacket, factory applied to insulation with a maximum permeance of .02 perms and minimum beach puncture resistance of 50 units.

E. CELLULAR GLASS INSULATION:
   1. Rigid closed cell, minimum nominal density of 8.5 lbs. per cu. ft., thermal conductivity of not more than 0.36 at 50 degrees F, minimum compressive strength of 100 psi, maximum water vapor transmission of 0.0 perm inch, maximum water absorption of .2% by volume, rated for service range of -450 degrees F to 900 degrees F.

F. PVC FITTING COVERS AND JACKETS:
   1. White PVC film, gloss finish one side, semi-gloss other side, FS LP-535D, Composition A, Type II, Grade GU. Ultraviolet inhibited indoor/outdoor grade to be used where exposed to high humidity, ultraviolet radiation, in kitchens or food processing areas or installed outdoors. Jacket thickness to be .02 inch (20 mil).

G. METAL JACKETS:
   1. .016 inch thick aluminum or .010 inch thick stainless steel with safety edge.

2.03 INSULATION INSERTS AND PIPE SHIELDS

A. Manufacturers: B-Line, Pipe Shields, Value Engineered Products

B. Construct inserts with calcium silicate, minimum 140 psi compressive strength. Piping 12” and larger, supplement with high density 600 psi structural calcium silicate insert. Provide galvanized steel shield. Insert and shield to be minimum 180 degree coverage on bottom of supported piping and full 360 degree coverage on clamped piping. On roller mounted piping and piping designed to slide on support, provide additional load distribution steel plate.

C. Where contractor proposes shop/site fabricated inserts and shields, submit schedule of materials, thicknesses, gauges and lengths for each pipe size to demonstrate equivalency to pre-engineered pre-manufactured product described above. On low temperature systems, extruded polystyrene may be substituted for calcium silicate provided insert and shield length and gauge are increased to compensate for lower insulation compressive strength.

D. Precompressed 20# density molded fiberglass blocks, Hamfab or equal, of same thickness as adjacent insulation may be substituted for calcium silicate inserts with one 1”x 6” block for piping through 2-1/2” and three 1” x 6” blocks for piping through 4”. Submit shield schedule to demonstrate equivalency to pre-engineered/pre-manufactured product described above.

E. Wood blocks will not be accepted.

2.04 ACCESSORIES

A. All products shall be compatible with surfaces and materials on which they are applied, and be suitable for use at operating temperatures of the systems to which they are applied.

B. Adhesives, sealants, and protective finishes shall be as recommended by insulation manufacturer for applications specified.

C. Insulation bands to be 3/4 inch wide, constructed of aluminum or stainless steel. Minimum thickness to be .015 inch for aluminum and .010 inch for stainless steel.

D. Tack fasteners to be stainless steel ring grooved shank tacks.

E. Staples to be clinch style.

F. Insulating cement to be ANSI/ASTM C195, hydraulic setting mineral wool.

G. Finishing cement to be ASTM C449.

H. Fibrous glass or canvas fabric reinforcing shall have a minimum untreated weight of 6 oz./sq. yd.

I. Bedding compounds to be non-shrinking and permanently flexible.

J. Vapor barrier coatings to be non-flammable, fire resistant, polymeric resin.

K. Fungicidal water base coating (Foster 40-20 or equal) to be compatible with vapor barrier coating.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install insulation, jackets and accessories in accordance with manufacturer's instructions and under ambient temperatures and conditions recommended by manufacturer. Surfaces to be insulated must be clean and dry.

B. Do not insulate systems or equipment which are specified to be pressure tested or inspected, until testing, inspection and any necessary repairs have been successfully completed.

C. Install insulation with smooth and even surfaces. Poorly fitted joints or use of filler in voids will not be accepted. Cover and seal exposed fiberglass insulation when insulation is terminated, no raw fiberglass insulation is allowed. Provide neat and coated terminations at all nameplates, uninsulated fittings, or at other locations where insulation terminates. Install with longitudinal joints facing wall or ceiling.

D. Install fabric reinforcing without wrinkles. Overlap seams a minimum of 2 inches.

E. Use full-length material (as delivered from manufacturer) wherever possible. Scrap piecing of insulation or pieces cut undersize and stretched to fit will not be accepted.

F. Insulation shall be continuous through sleeves and openings. Vapor barriers shall be maintained continuous through all penetrations.

G. Provide a complete vapor barrier for insulation on the following systems:
- Cold water
- Storm Water

3.02 PIPING, VALVE, AND FITTING INSULATION

A. General:
1. Install insulation with butt joints and longitudinal seams closed tightly. Provide minimum 2" lap on jacket seams and 2" tape on butt joints, firmly cemented with lap adhesive. Additionally secure with staples along seams and butt joints. Coat staples with vapor barrier mastic on systems requiring vapor barrier.
2. Water supply piping insulation shall be continuous throughout the building and installed adjacent to and within building walls to a point directly behind the fixture that is being supplied.
3. Install insulation continuous through pipe hangers and supports with hangers and supports on the exterior of insulation. Where a vapor barrier is not required, hangers and supports may be attached directly to piping with insulation completely covering hanger or support and jacket sealed at support rod penetration. Where riser clamps are required to be attached directly to piping requiring vapor barrier, extend insulation and vapor barrier jacketing/coating around riser clamp.

B. Insulation Inserts and Pipe Shields:
Provide insulation inserts and pipe shields at all hanger and support locations. Inserts may be omitted on 3/4" and smaller copper piping provided 12" long 22 gauge pipe shields are used.

C. Fittings and Valves:
Fittings, valves, unions, flanges, couplings and specialties may be insulated with factory molded or built up insulation of the same thickness as adjoining insulation. Cover insulation with fabric reinforcing and mastic or where temperatures do not exceed 150 degrees, PVC fitting covers. Secure PVC fitting covers with tack fasteners and 1-1/2" band of mastic over ends, throat, seams or penetrations. On systems requiring vapor barrier, use vapor barrier mastic.

D. Elastomeric and Polyolefin:
Where practical, slip insulation on piping during pipe installation when pipe ends are open. Miter cut fittings allowing sufficient length to prevent stretching. Completely seal seams and joints for vapor tight installation. For elastomeric insulation, apply full bed of adhesive to both surfaces. For polyeolefin, seal factory preglued seams with roller and field seams and joints with full bed of hot melt polyolefin glue to both surfaces.

E. Pipe Insulation Schedule:
Provide insulation on new and existing remodeled piping as indicated in the following schedule:

Service	Insulation Types	Insulation Thickness By Pipe Size				
		1" & Smaller	1-1/4" to 2"	2-1/2" to 3"	4" to 6"	8" & Larger
Hot Water Supply	Rigid Glass Fiber	1"	1"	1-1/2"	1-1/2"	1-1/2"
Hot Water Circulating	Rigid Glass Fiber	1"	1"	1-1/2"		
Cold Water	Rigid Glass Fiber	1/2"	1/2"	1"	1"	1"
All Horizontal Storm Piping & 4'-0" of Vertical Piping Thereafter, & Roof Drain Bodies	Rigid Glass Fiber	1/2"	1/2"	1/2"	1/2"	1/2"

*** = Elastomeric & Phenolic types are acceptable**

I. The following piping and fittings are not to be insulated:
1. Chrome plated exposed supplies and stops (except where specifically noted).
2. Water hammer arrestors.
3. Piping unions and flanges for systems not requiring a vapor barrier.

END OF SECTION

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SECTION 22 10 13

FACILITY FUEL PIPING

PART 1 - GENERAL

1.01 SCOPE

A. This section contains specifications for fuel pipe and fuel pipe fittings for this project. Included are the following topics:

PART 1 - GENERAL
- Scope
- Related Work
- Reference
- Reference Standards
- Shop Drawings
- Quality Assurance
- Delivery, Storage, and Handling
- Design Criteria
- Welder Qualifications
- Natural Gas Service

PART 2 - PRODUCTS
- Natural Gas
- Vents and Relief Valves
- Unions and Flanges

PART 3 - EXECUTION
- Preparation
- Erection
- Welded Pipe Joints
- Threaded Pipe Joints
- Natural Gas
- Vents and Relief Valves
- Unions and Flanges
- Piping System Leak Tests
- Piping System Test Report

1.02 RELATED WORK

Section 22 05 14	Plumbing Specialties
Section 22 05 23	General Duty Valves for Plumbing Piping
Section 22 05 29	Hangers and Supports for Plumbing Piping and Equipment
Section 22 07 00	Plumbing Insulation.

1.03 REFERENCE

A. Applicable provisions of Division 00 and 01 govern work under this section.

1.04 REFERENCE STANDARDS

ANSI B16.3	Malleable Iron Threaded Fittings
ANSI B31.9	Pipe Material Requirements
ASTM A234	Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures
ASTM A53	Pipe, Steel, Black and Hot-Dipped, Zinc Coated Welded and Seamless

1.05 SHOP DRAWINGS

A. Refer to Division 00 and 01.

B. Contractor shall submit schedule indicating the ASTM specification number of the pipe being proposed along with its type and grade and sufficient information to indicate the type and rating of fittings for each service.

C. TYPE E OR S STEEL PIPE:

Mill certification papers, also known as material test reports, for the pipe furnished for this project, in English. Heat numbers on these papers to match the heat numbers stencilled on the pipe. Chemical analysis indicated on the mill certification papers to meet or exceed the requirements of the referenced ASTM specification.

1.06 QUALITY ASSURANCE

A. Order all Type E and Type S steel pipe with heat numbers rolled, stamped, or stenciled to each length or each bundle, depending on the size of the pipe, and in accordance with the appropriate ASTM specification.

B. Any installed material not meeting the specification requirements must be replaced with material that meets these specifications without additional cost to the Owner.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Promptly inspect shipments to insure that the material is undamaged and complies with specifications.

B. Cover pipe to eliminate rust and corrosion while allowing sufficient ventilation to avoid condensation. Do not store materials directly on grade. Protect pipe, tube, and fitting ends so they are not damaged. Where end caps are provided or specified, take precautions so the caps remain in place.

C. Offsite storage agreements will not relieve the contractor from using proper storage techniques.

D. Storage and protection methods must allow inspection to verify products.

1.08 DESIGN CRITERIA

A. Use only new material, free of defects, rust and scale, and meeting the latest revision of ASTM specifications as listed in this specification.

B. Construct all piping for the highest pressures and temperatures in the respective system in accordance with ANSI B31, but not less than 125 psig unless specifically indicated otherwise.

C. Non-metallic piping will be acceptable only for the services indicated. It will not be acceptable in occupied spaces and ventilation plenum spaces, including plenum ceilings.

D. Where weld fittings or mechanical grooved fittings are used, use only long radius elbows having a centerline radius of 1.5 pipe diameters.

E. Where ASTM A53 grade A pipe is specified, ASTM A53 grade B pipe may be substituted at Contractor's option. Where the grade or type is not specified, Contractor may choose from those commercially available.

1.09 WELDER QUALIFICATIONS

A. Before any metallic welding is performed, Contractor to submit his Standard Welding Procedure Specification together with the Procedure Qualification Record as required by Section IX of the ASME Boiler and Pressure Vessel Code and/or the National Certified Pipe Welding Bureau.

B. Before any polyethylene fusion welding is performed, Contractor to submit certification that the welders to be used on this project have successfully demonstrated proper welding procedures in accordance with the Code of Federal Regulations, Title 49, Part 192, Section 192.285.

C. The Architect / Engineering or the Owner reserves the right to test the work of any welder employed on the project, at the Contractor's expense. If the work of the welder is found to be unsatisfactory, the welder shall be prevented from doing further welding on the project.

1.10 NATURAL GAS SERVICE

A. All charges for the gas service as shown on the plans, including the connection from the main in the street or other location to the gas meter, shall be paid by this Contractor, including setting of gas meter(s) and all work performed by the gas company.

PART 2 – PRODUCTS

2.01 NATURAL GAS

A. 2" and Smaller: ASTM A53, type E or S, standard weight (schedule 40) black steel pipe with ASTM A197/ANSI B16.3 class 150 black malleable iron threaded fittings or ASTM A234 grade WPB/ANSI B16.9 standard weight, seamless, carbon steel weld fittings.

B. 2-1/2" and Larger: ASTM A53, type E or S, standard weight black steel pipe with ASTM A234 grade WPB/ANSI B16.9 standard weight, seamless, carbon steel weld fittings.

2.02 VENTS AND RELIEF VALVES

A. Use pipe and pipe fittings as specified for the system to which the relief valve or vent is connected.

2.03 UNIONS AND FLANGES

A. 2" and Smaller: ASTM A197/ANSI B16.3 malleable iron unions with brass seats. Use black malleable iron on black steel piping and galvanized malleable iron on galvanized steel piping. Use unions of a pressure class equal to or higher than that specified for the fittings of the respective piping service but not less than 250 psi.

B. 2-1/2" and Larger: ASTM A181 or A105, grade 1 hot forged steel flanges of threaded, welding and of a pressure class compatible with that specified for valves, piping specialties and fittings of the respective piping service. Flanges smaller than 2-1/2" may be used as needed for connecting to equipment and piping specialties. Use raised face flanges ANSI B16.5 for mating with other raised face flanges on equipment with flat ring or full face gaskets. Use ANSI B16.1 flat face flanges with full face gaskets for mating with other flat face flanges on equipment.

PART 3 – EXECUTION

3.01 PREPARATION:

A. Remove all foreign material from interior and exterior of pipe and fittings.

3.02 ERECTION

A. Install all piping parallel to building walls and ceilings and at heights which do not obstruct any portion of a window, doorway, stairway, or passageway. Where interferences develop in the field, offset or reroute piping as required to clear such interferences. In all cases, consult drawings for exact location of pipe spaces, ceiling heights, door and window openings, or other architectural details before installing piping.

B. Provide anchors, expansion joints, swing joints and/or expansion loops so that piping may expand and contract without damage to itself, equipment, or building.

C. Mitered ells, notched tees, and orange peel reducers are not acceptable. On threaded piping, bushings are not acceptable.

D. "Weldolets" and "Threadolets" may be used for branch takeoffs up to one-half (1/2) the diameter of the main.

E. Do not route piping through transformer vaults or above transformers, panelboards, or switchboards, including the required service space for this equipment, unless the piping is serving this equipment.

F. Install all valves, and piping specialties, including items furnished by others, as specified and/or detailed. Make connections to all equipment installed by others where that equipment requires the piping services indicated in this section.

3.03 WELDED PIPE JOINTS

A. All gas piping within plenum ceiling spaces shall be welded.

B. Make all welded joints by fusion welding in accordance with ASME Codes, ANSI B31, and State Codes where applicable.

C. Electrodes shall be Lincoln, or approved equal, with coating and diameter as recommended by the manufacturer for the type and thickness of work being done.

3.04 THREADED PIPE JOINTS

A. Use a Teflon based thread lubricant or Teflon tape when making joints; no hard setting pipe thread cement or caulking will be allowed.

3.05 NATURAL GAS

A. Pitch horizontal piping down 1" in 60 feet in the direction of flow. Install a 4" minimum depth dirt leg at the bottom of each vertical run and at each appliance. When installing mains and branches, cap gas tight each tee or pipe end which will not be immediately extended. All branch connections to the main shall be from the top or side of the main. Teflon tape is acceptable for use on natural gas lines.

B. Do not install gas pipe in a ventilation air plenum.

C. If an above ground vent terminates in an area subject to snow accumulation, terminate the line at least five feet above grade.

D. Install a shut off valve at each appliance. Provide a valved connection at the main for equipment and appliances furnished by others.

E. Piping through a roof shall be run through an approved roof penetration with flashing and counter flashing.

F. Each gas pressure reducing valve vent and relief valve vent shall be run separately to a point outside of the building, terminated with a screened vent cap, and located according to gas utility regulations.

G. Clean all welded piping before all regulators and control valves. Test by placing target cloth over piping and blow with compressed air. Clean piping until target cloth is clean and free of debris.

3.08 VENTS AND RELIEF VALVES

A. Install vent and relief valve discharge lines as indicated on the drawings, as detailed, and as specified for each specific valve or piping specialty item. In no event is a termination to occur less than six feet above a roof line.

3.09 UNIONS AND FLANGES

A. Install a union or flange, as required, at each automatic control valve and at each piping specialty or piece of equipment which may require removal for maintenance, repair, or replacement. Where a valve is located at a piece of equipment, locate the flange or union connection on the equipment side of the valve. Concealed unions or flanges are not acceptable.

3.10 PIPING SYSTEM LEAK TESTS

A. Verify that the piping system being tested is fully connected to all components and that all equipment is properly installed, wired, and ready for operation. If required for the additional pressure load under test, provide temporary restraints at expansion joints or isolate them during the test. Verify that hangers can withstand any additional weight load that may be imposed by the test.

B. Provide all piping, fittings, blind flanges, and equipment to perform the testing.

C. Conduct pressure test with test medium of air or water unless specifically indicated. Minimum test time is indicated in the table below; additional time may be necessary to conduct an examination for leakage. Each test must be witnessed by the Division's Representative. If leaks are found, repair the area with new materials and repeat the test; caulking will not be acceptable.

D. Do not insulate pipe until it has been successfully tested.

E. For hydrostatic tests, use clean water and remove all air from the piping being tested by means of air vents or loosening of flanges/unions. Measure and record test pressure at the high point in the system.

F. For air tests, gradually increase the pressure to not more than one half of the test pressure; then increase the pressure in steps of approximately one-tenth of the test pressure until the required test pressure is reached. Examine all joints and connections with a soap bubble solution or equivalent method. The piping system exclusive of possible localized instances at pump or valve packing shall show no evidence of leaking. After testing is complete, slowly release the pressure in a safe manner.

G. Measure natural gas system test pressure with a water manometer or an equivalent device calibrated in increments not greater than 0.1 inch water column. System will not be approved until it can be demonstrated that there is no measurable loss of test pressure during the test period.

H. Conduct fuel oil system test so as not to impose a pressure of more than 10 psig on the tank. Instead of a pressure test, suction lines may be tested under a vacuum of not less than 20 inches of mercury maintained for at least one hour.

System	Pressure	Medium	Duration
Natural Gas	100 psig	Air	24 Hour

I. All pressure tests are to be documented.

J. On piping that cannot be tested because of connection to an active line, provide temporary blind flanges and hydrostatically test new section of piping. After completion of test, remove temporary flanges and make final connections to piping. Die penetrate test pass weld or x-ray the piping that was not hydrostatically tested up to the active system.

END OF SECTION

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SECTION 22 11 00

FACILITY WATER DISTRIBUTION

PART 1 – GENERAL

1.01 SCOPE

A. This section contains specifications for plumbing pipe and pipe fittings for this project. Included are the following topics:

PART 1 - GENERAL
- Scope
- Related Work
- Reference
- Reference Standards
- Shop Drawings
- Quality Assurance
- Delivery, Storage, and Handling
- Design Criteria

PART 2 - PRODUCTS
- Domestic Water
- Dielectric Unions and Flanges
- Unions and Flanges
- Mechanical Grooved Pipe Connections

PART 3 - EXECUTION
- General
- Preparation
- Erection
- Copper Pipe Joints
- Threaded Pipe Joints
- Mechanical Joint Pipe Connections
- Push-On Gasketed Pipe Connections
- Mechanical Grooved Pipe Connections
- Domestic Water
- Dielectric Unions and Flanges
- Unions and Flanges
- Piping System Leak Tests

1.02 RELATED WORK

Section 22 05 14 Plumbing Specialties
Section 22 05 29 Hangers and Supports for Plumbing Piping and Equipment

1.03 REFERENCE

A. Applicable provisions of Division 00 and 01 govern work under this section.

1.04 REFERENCE STANDARDS

ANSI B16.22	Wrought Copper and Wrought Copper Alloy Solder Joint Pressure Fittings
ANSI B16.29	Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings – DWV
ANSI B16.3	Malleable Iron Threaded Fittings
ANSI B16.4	Cast Iron Threaded Fittings
ANSI B16.5	Pipe Flanges and Flanged Fittings
ASTM A105	Forgings, Carbon Steel, for Piping Components
ASTM A126	Gray Cast Iron Castings for Valves, Flanges, and Pipe Fittings
ASTM A234	Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures
ASTM A53	Pipe, Steel, Black and Hot-Dipped, Zinc Coated Welded and Seamless
ASTM A536	Ductile Iron Castings

ASTM B280	Seamless Copper Tube for Air Conditioning and Refrigeration Field Service
ASTM B32	Solder Metal
ASTM B813	Liquid and Paste Fluxes for Soldering Applications of Copper and Copper Alloy Tube
ASTM B88	Seamless Copper Water Tube
ASTM D1785	Poly Vinyl Chloride (PVC) Plastic Pipe
ASTM D2241	Poly Vinyl Chloride (PVC) Pressure-Rated Pipe (SDR Series)
ASTM D2464	Threaded Poly Vinyl Chloride (PVC) Plastic Pipe Fittings, Schedule 80
ASTM D2466	Poly Vinyl Chloride (PVC) Plastic Pipe Fittings, Schedule 40
ASTM D2513	Thermoplastic Gas Pressure Pipe, Tubing, and Fittings
ASTM D2564	Solvent Cements for Poly Vinyl Chloride (PVC) Plastic Pipe and Fittings
ASTM D2657	Heat Fusion Joining of Polyolefin Pipe and Fittings
ASTM D2774	Recommended Practice for Underground Installation of Thermoplastic Pressure Piping
ASTM D2855	Making Solvent Cemented Joints with Poly Vinyl Chloride (PVC) Pipe and Fittings
ASTM D3139	Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals
ASTM D3222	Unmodified Poly Vinylidene Fluoride (PVDF) Molding Extrusion and Coating Materials
ASTM D4101	Propylene Plastic Injection and Extrusion Materials
ASTM F1476	Performance of Gasketed Mechanical Couplings for Use in Piping Applications
ASTM F437	Threaded Chlorinated Poly Vinyl Chloride (CPVC) Plastic Pipe Fittings, Schedule 80
ASTM F438	Socket Type Chlorinated Poly Vinyl Chloride (CPVC) Plastic Pipe Fittings, Schedule 40
ASTM F441	Chlorinated Poly Vinyl Chloride (CPVC Plastic Pipe, Schedules 40 and 80
ASTM F493	Solvent Cements for Chlorinated Poly Vinyl Chloride (CPVC) Plastic Pipe and Fittings
ASTM F656	Primers for Use in Solvent Cement Joints of Poly Vinyl Chloride (PVC) Plastic Pipe and Fittings
AWS A5.8	Brazing Filler Metal
AWWA C104	Cement Mortar Lining for Ductile Iron Pipe and Fittings for Water
AWWA C105	Polyethylene Encasement for Ductile Iron Piping for Water
AWWA C110	Ductile Iron and Gray Iron Fittings, 3 In. Through 48 In., for Water and Other Liquids
AWWA C111	Rubber Gasket Joints for Ductile Iron and Gray Iron Pressure Pipe and Fittings
AWWA C151	Ductile Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds for Water or Other Liquids
AWWA C153	Ductile Iron Compact Fittings, 3 In. Through 48 In., for Water and Other Liquids
AWWA C600	Installation of Ductile Iron Water Mains and Their Appurtenances
AWWA C606	Grooved and Shouldered Joints
AWWA C651	Disinfecting Water Mains
AWWA C900	Polyvinyl Chloride (PVC) Pressure Pipe, 4 In. Through 12 In., for Water Distribution
CGA G-4.1	Equipment Cleaned for Oxygen Service
CGA G-4.4	Industrial Practices for Gaseous Oxygen Transmission and Distribution Piping Systems
CGA G-6.1	Standard for Low Pressure Carbon Dioxide Systems at Consumer Sites
CGA G-8.1	Standard for Nitrous Oxide Systems at Consumer Sites
CGA P-2.1	Standards for Medical-Surgical Vacuum Systems in Health Care Facilities
NFPA 50	Bulk Oxygen Systems at Consumers Sites
NFPA 54	National Fuel Gas Code
NFPA 99	Health Care Facilities

1.05 SHOP DRAWINGS

A. Schedule from the contractor indicating the ASTM, AWWA or CISPI specification number of the pipe being proposed along with its type and grade if known at the time of submittal, and sufficient information to indicate the type and rating of fittings for each service.

B. Statement from manufacturer on his letterhead that pipe furnished meets the ASTM, AWWA or CISPI specification contained in this section.

C. Grooved joint couplings and fittings shall be shown on product submittals, and shall be specifically identified with the applicable style or series designation.

1.06 QUALITY ASSURANCE

A. Order all copper, cast iron, steel, PVC and polyethylene pipe with each length marked with the name or trademark of the manufacturer and type of pipe; with each shipping unit marked with the purchase order number, metal or alloy designation, temper, size, and name of supplier. All piping shall be manufactured in the United States of America (USA).

B. All grooved joint couplings, fittings, valves, and specialties shall be the products of a single manufacturer. Grooving tools shall be of the same manufacturer as the grooved components.

C. All castings used for coupling housings, fittings, valve bodies, etc., shall be date stamped for quality assurance and traceability.

D. Any installed material not meeting the specification requirements must be replaced with material that meets these specifications without additional cost to the Owner.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Promptly inspect shipments to insure that the material is undamaged and complies with specifications.

B. Cover pipe to prevent corrosion or deterioration while allowing sufficient ventilation to avoid condensation. Do not store materials directly on grade. Protect pipe, tube, and fitting ends so they are not damaged. Where end caps are provided or specified, take precautions so the caps remain in place. Protect fittings, flanges, and unions by storage inside or by durable, waterproof, above ground packaging.

C. Offsite storage agreements will not relieve the contractor from using proper storage techniques.

D. Storage and protection methods must allow inspection to verify products.

1.08 DESIGN CRITERIA

A. Use only new material, free of defects, rust and scale, and meeting the latest revision of ASTM, AWWA or CISPI specifications as listed in this specification.

B. Construct all piping for the highest pressures and temperatures in the respective system.

C. Where weld fittings or mechanical grooved fittings are used, use only long radius elbows having a centerline radius of 1.5 pipe diameters.

D. Where ASTM A53 type F pipe is specified, grade A type E or S, or grade B type E or S may be substituted at Contractor's option. Where the grade or type is not specified, Contractor may choose from those commercially available.

E. Where ASTM B88, type L H (drawn) temper copper tubing is specified, ASTM B88, type K H (drawn) temper copper tubing may be substituted at Contractor's option.

PART 2 – PRODUCTS

2.01 DOMESTIC WATER

A. Above Ground:
   1. Type L copper water tube, H (drawn) temper, ASTM B88; wrought copper pressure fittings, ANSI B16.22; lead free (<.2%) solder, ASTM B32; flux, ASTM B813; copper phosphorous brazing alloy, AWS A5.8 BCuP.
      a. Copper mechanical grooved fittings and couplings on roll grooved pipe may be used in lieu of soldered fittings.
   2. Ductile iron pipe, thickness Class 53, AWWA C151/C115; with standard thickness cement mortar lining, AWWA C104; ductile iron mechanical grooved cement mortar lined fittings and couplings on cut grooved pipe, Class 350 12" and below, Class 250 above 12", AWWA C606; ductile iron or gray iron flanged cement mortar lined fittings, Class 250, AWWA C110; rubber gasket joints with non-toxic gasket lubricant, AWWA C111.

B. Below Ground 2-1/2" and Smaller:
Type K copper water tube, O (annealed) temper, ASTM B88; with cast copper pressure fittings, ANSI B16.18; wrought copper pressure fittings, ANSI B16.22; lead free (<.2%) solder, ASTM B32; flux, ASTM B813; or cast copper flared pressure fittings, ANSI B16.26.

2.02 DIELECTRIC UNIONS AND FLANGES

A. Watts Regulator Company, Lochinvar, Wilkins or EPCO Sales, Inc., dielectric unions 2" and smaller; dielectric flanges 2" and larger; with iron female pipe thread to copper solder joint or brass female pipe thread end connections, non-asbestos gaskets, having a pressure rating of not less than 175 psig at 180 degrees.

B. Victaulic Series 47, dielectric waterway fittings to 8”, threaded or grooved ends, electroplated steel or ductile iron casing, with inert thermoplastic lining having a pressure rating to 300 psig at 230 degrees F.

2.03 UNIONS AND FLANGES

A. Unions, flanges and gasket materials to have a pressure rating of not less than 150 psig at 180 degrees. Gasket material for flanges and flanged fittings shall be Teflon type. Treated paper gaskets are not acceptable.

B. 2" and Smaller Steel:
1. ASTM A197/ANSI B16.3 malleable iron unions with brass seats. Use black malleable iron on black steel piping and galvanized malleable iron on galvanized steel piping.
2. 2" and Smaller Copper:
ANSI B16.18 cast bronze union coupling or ANSI B15.24 Class 150 cast bronze flanges.

C. 2-1/2" and Larger Steel:
ASTM A181 or A105, grade 1 hot forged steel flanges of threaded, welding neck, or slip-on pattern on black steel and threaded only on galvanized steel. Use raised face flanges ANSI B16.5 for mating with other raised face flanges or equipment with flat ring or full face gaskets. Use ANSI B16.1 flat face flanges with full face Teflon gaskets for mating with other flat face flanges on equipment. Gaskets shall be teflon type.

D. 2-1/2" and Larger Copper:
ANSI B15.24 Class 150 cast bronze flanges with full face teflon gaskets.

2.04 MECHANICAL GROOVED PIPE CONNECTIONS

A. Mechanical grooved pipe couplings and fittings, ASTM F1476, as manufactured by Victaulic may be used with cut or roll groove galvanized steel pipe, roll groove stainless steel, cut groove ductile iron pipe or roll groove copper pipe where noted. Mechanical grooved components and assemblies to be rated for minimum 250 psi working pressure.

B. All mechanical grooved pipe material including gaskets, couplings, fittings, flange adapters, and tools to be from the same manufacturer.

C. Couplings consist of two ductile iron ASTM A536 housings with painted finish. Reducing couplings are not acceptable.
1. Steel Pipe:
a. Rigid Type: Housing shall be cast with offsetting angle pattern bolt pads to provide rigidity and system support and hanging in accordance with ANSI B31.1 and B31.9.
1) 2” through 6”: Installation Ready, for direct stab installation without field disassembly. Victaulic Style 107.
2) Victaulic Zero Flex Style 07
b. Flexible Type: For use in locations where vibration attenuation and stress relief are required. Three flexible couplings may be used in lieu of a flexible connector. The couplings shall be placed in close proximity to the source of the vibration. Victaulic Style 77.
2. Copper Tube: Housings shall be cast with offsetting angle pattern bolt pads to provide rigidity, manufactured to copper tube dimensions. (Flaring of tube or fitting ends to accommodate alternate sized couplings is not allowed). Victaulic Style 606.

3. Ductile Iron (AWWA) Pipe: Victaulic Style 31.
    a. For transition between IPS steel and AWWA ductile iron pipe sizes, with housings cast with offsetting angle pattern bolt pads to provide rigidity. Victaulic Style 307.

D. Fittings used on galvanized steel pipe to be ductile iron A536, with galvanized finish, ASTM A153. Fittings used on ductile iron pipe to be cement mortar lined ductile iron with coal tar coating, ASTM A536; conforming to requirements of AWWA C110/C153 and AWWA C606. Fittings used on copper tube to be copper tube dimensioned wrought copper ANSI B16.22 or cast bronze ASNI B16.18. Fittings used on stainless steel shall be ASTM A403 or factory fabricated ASTM A312.

E. Gaskets to be EPDM, ASTM D2000. Gaskets for hot water systems and dry pipe systems to be flush seal design. Heat treated carbon track bolts and nuts, ASTM A183, with zinc electroplated finish ASTM B633, or stainless steel ASTM F593.
    1. Gaskets used on potable water systems shall be UL classified in accordance with ANSI/NSF-61 for potable water service.

F. Flange adapters to be ductile iron, ASTM A536; except at lug type butterfly valves where standard threaded flanges shall be used. Victaulic Style 741 (steel pipe), 341 (AWWA ductile iron pipe) or 641 (copper tubing).

G. Credit for the inherent flexibility of mechanical grooved pipe connections when used for expansion joints or flexible connectors may be allowed upon specific application by the Contractor and in accordance with the coupling manufacturer's recommendations. Three flexible couplings at first three connection points both upstream and downstream of pumps may be used in lieu of flexible connectors. Request for expansion joints shall be made in writing and shall include service, location, line size, proposed application and supporting calculations for the intended service.

PART 3 – EXECUTION

3.01 GENERAL

A. Install pipe and fittings in accordance with reference standards, manufacturer's recommendations and recognized industry practices.

3.02 PREPARATION

A. Cut pipe ends square. Ream ends of piping to remove burrs. Clean scale and dirt from interior and exterior of each section of pipe and fitting prior to assembly.

3.03 ERECTION

A. Install all piping parallel to building walls and ceilings and at heights which do not obstruct any portion of a window, doorway, stairway, or passageway. Where interferences develop in the field, offset or reroute piping as required clearing such interferences. Coordinate locations of plumbing piping with piping, ductwork, conduit and equipment of other trades to allow sufficient clearances. In all cases, consult drawings for exact location of pipe spaces, ceiling heights, door and window openings, or other architectural details before installing piping. All piping shall be concealed in areas with ceilings.

B. Where copper or steel piping is embedded in masonry or concrete, provide protective sleeve covering of elastomeric pipe insulation.

C. Install underground warning tape 6"-12" below finished grade above all exterior below ground piping. Where existing underground warning tape is encountered, repair and replace.

D. Maintain piping in clean condition internally during construction.

E. Provide clearance for installation of insulation, access to valves and piping specialties.

F. Provide anchors, expansion joints, swing joints and/or expansion loops so that piping may expand and contract without damage to itself, equipment, or building.
    1. For water systems, use adequate numbers of Victaulic Style 77 flexible couplings in header piping to accommodate thermal growth and contraction, and for the elimination of expansion loops. (In accordance with Victaulic instructions and as approved by the

Engineer). Where expansion loops are required, use Victaulic Style 77 couplings on the loops.

G. Do not route piping through transformer vaults or above transformers, panelboards, or switchboards, including the required service space for this equipment, unless the piping is serving this equipment

H. Install all valves and piping specialties, including items furnished by others, as specified and/or detailed. Provide access to valves and specialties for maintenance. Make connections to all equipment, fixtures and systems installed by others where same requires the piping services indicated in this section.

3.04 COPPER PIPE JOINTS

A. Remove all slivers and burrs remaining from the cutting operation by reaming and filing both pipe surfaces. Clean fitting and tube with metal brush, emery cloth or sandpaper. Remove residue from the cleaning operation, apply flux and assemble joint to socket stop. Apply flame to fitting until solder melts when placed at joint. Remove flame and feed solder into joint until full penetration of cup and ring of solder appears. Wipe excess solder and flux from joint.

B. Grooved joints for copper tubing shall be made at copper tube dimensions. (Flaring of tube ends to accommodate alternate sized couplings is not permitted).

3.05 THREADED PIPE JOINTS

A. Use a thread lubricant or teflon tape when making joints; no hard setting pipe thread cement or caulking will be allowed.

3.06 MECHANICAL JOINT PIPE CONNECTIONS

A. Comply with AWWA C600/C605 installation requirements. Clean pipe end and socket. Clean and lubricate pipe end, socket and gasket with soapy water or gasket lubricant. Place gland and gasket, properly oriented, on pipe end. Insert pipe end fully into socket and press gasket evenly into recess keeping joint straight. Press gland evenly against gasket, insert bolts and hand tighten nuts. Make joint deflection prior to tightening bolts. Evenly tighten bolts in sequence to recommended torque.

3.07 PUSH-ON GASKETED PIPE CONNECTIONS

A. Clean pipe end, bell, gasket seat and gasket of dirt or debris. Coat end of pipe and gasket with gasket lubricant. Insure pipe is supported off the ground so lubricant does not pick up dirt. Push spigot end into gasket bell with levered pipe joining tool recommended by pipe manufacturer. Large diameter exterior mains may be joined by pushing end of pipe section with backhoe against wood blocking over pipe end. Insert to fully seated position or to reference mark on pipe.

3.08 MECHANICAL GROOVED PIPE CONNECTIONS

A. Use pipe factory grooved in accordance with the coupling manufacturer's specifications or field grooved pipe in accordance with the same specifications using specially designed tools specially designed for the application. Lubricate pipe and coupling gasket, align pipe, and secure joint in accordance with the coupling manufacturer's specifications.

B. The grooved coupling manufacturer’s factory trained representative shall provide onsite training for Contractor’s field personnel in the use of grooving tools and installation of grooved joint products. The representative shall periodically visit the jobsite and review contractor is following best recommended practices in grooved product installation. (A distributor’s representative is not considered qualified to conduct the training or jobsite visit(s)).

3.09 DOMESTIC WATER

A. Maintain piping system in clean condition during installation. Remove dirt and debris from assembly of piping as work progresses. Cap open pipe ends where left unattended or subject to contamination.

B. Install exterior water piping below predicted frost level in accordance with Wisconsin Department of Safety and Professional Services, ChapterSPS382, SPS Table 382.30-6, but in

no case less than 6' bury depth to top of pipe. Maintain minimum of 8' horizontal distance between 2-1/2" and larger water piping and sanitary sewer piping. Maintain minimum of 30" horizontal and 12" vertical distance, water on top, between 2" and smaller water piping and sanitary sewer piping. Where water piping crosses a sanitary sewer, provide minimum 18" vertical clearance and waterproof PVC water pipe sleeve (reference sanitary sewer materials) sealed at both ends for distance of 10' from sewer in both directions.

C. Provide thrust restraints for 3" and larger exterior water piping joints, hydrants, caps, plugs, fittings and bends of 22-1/2 degrees or more. Field apply continuous anti-corrosion coating to rodded restraint components. Protect mechanical joints, nuts and bolts from concrete cover. Cover with 8 mil sheet or tube polyethylene material sleeve.

D. Install interior water piping with drain valves where indicated and at low points of system to allow complete drainage. Install shutoff valves where indicated and at the base of risers to allow isolation of portions of system for repair. Do not install water piping within exterior walls.

E. Prior to use, isolate and fill system with potable water. Allow to stand 24 hours. Flush each outlet proceeding from the service entrance to the furthest outlet for minimum of 1 minute and until water appears clear. Fill system with a solution of water and chlorine containing at least 50 parts per million of chlorine and allow to stand for 24 hours. Alternately a solution containing at least 200 parts per million of chlorine may be used and allowed to stand for 3 hours. Flush system with potable water until chlorine concentration is no higher than source water level.

F. Wait 24 hours after final flushing. Take samples of water for lab testing. The number and location of samples shall be representative of the system size and configuration and are subject to approval by Engineer. Test shall show the absence of coliform bacteria. If test fails, repeat disinfection and testing procedures until no coliform bacteria are detected. Submit test report indicating date and time of test along with test results. If water system is filled, chlorinated, and tested prior to substantial completion, and the water system is not used, provisions shall be made to either periodically flush or drain the lines and re-chlorinate the system to assure potability at the time of building occupancy.

3.10 DIELECTRIC UNIONS AND FLANGES

A. Install dielectric unions, waterway fittings, or flanges at each point where a copper-to-steel pipe connection is required in domestic water systems.

3.11 UNIONS AND FLANGES

A. Install a union or flange at each connection to each piece of equipment and at other items which may require removal for maintenance, repair, or replacement. Where a valve is located at a piece of equipment, locate the flange or union connection on the equipment side of the valve. Concealed unions or flanges are not acceptable.

B. Union and flanges for disconnect and servicing area not required in installations using grooved mechanical joint couplings. (The couplings shall serve as unions and disconnect points).

3.12 PIPING SYSTEM LEAK TESTS

A. Isolate or remove components from system which are not rated for test pressure. Perform final testing for medical and lab gas with all system components in place. Test piping in sections or entire system as required by sequence of construction. Do not insulate or conceal pipe until it has been successfully tested.

B. If required for the additional pressure load under test, provide temporary restraints at fittings or expansion joints. Backfill underground water mains prior to testing with the exception of thrust restrained valves which may be exposed to isolate potential leaks.

C. For hydrostatic tests, use clean water and remove all air from the piping being tested by means of air vents or loosening of flanges/unions. Measure and record test pressure at the high point in the system.

D. For air or nitrogen tests, gradually increase the pressure to not more than one half of the test pressure; then increase the pressure in steps of approximately one-tenth of the test pressure until the required test pressure is reached. Examine all joints and connections with a soap

bubble solution or equivalent method. System will not be approved until it can be demonstrated that there is no measurable loss of test pressure during the test period.

E. Inspect system for leaks. Where leaks occur, repair the area with new materials and repeat the test; caulking will not be acceptable.

F. Entire test must be witnessed by the Division's representative. All pressure tests are to be documented.

System	Test Medium	Initial Test Pressure Duration	Final Test Pressure Duration
Below Ground Domestic Water*	Water	N/A	200 psig 2 Hour
Above Ground Domestic Water	Water	N/A	100 psig 8 Hour
Above Ground Non-Potable Water	Water	N/A	100 psig 8 Hour
Below Ground Non-Potable Water	Water	N/A	100 psig 8 Hour

*Leakage on exterior mains 3" and larger may not exceed leakage calculated as follows:

$$\text{GPH Allowable Leakage} = \frac{(\text{Feet of Pipe})\,(\text{Inches Dia. of Pipe})\,(\text{Test Pressure})^5}{133{,}200}$$

END OF SECTION

SECTION 22 13 00

FACILITY SANITARY SEWERAGE

PART 1 – GENERAL

1.01 SCOPE

A. This section contains specifications for plumbing pipe and pipe fittings for this project. Included are the following topics:

PART 1 - GENERAL
- Scope
- Related Work
- Reference
- Reference Standards
- Shop Drawings
- Quality Assurance
- Delivery, Storage, and Handling
- Design Criteria

PART 2 - PRODUCTS
- Sanitary Waste and Vent

PART 3 - EXECUTION
- General
- Preparation
- Erection
- Copper Pipe Joints
- Threaded Pipe Joints
- Solvent Welded Pipe Joints
- Mechanical Hubless Pipe Connections
- Push-On Gasketed Pipe Connections
- Sanitary Waste and Vent
- Piping System Leak Tests

1.02 RELATED WORK

Section 22 05 14	Plumbing Specialties
Section 22 05 29	Hangers and Supports for Plumbing Piping and Equipment

1.03 REFERENCE

A. Applicable provisions of Division 00 and 01 govern work under this section.

1.04 REFERENCE STANDARDS

ANSI B16.22	Wrought Copper and Wrought Copper Alloy Solder Joint Pressure Fittings
ANSI B16.29	Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV
ANSI B16.3	Malleable Iron Threaded Fittings
ANSI B16.4	Cast Iron Threaded Fittings
ANSI B16.5	Pipe Flanges and Flanged Fittings
ASTM A105	Forgings, Carbon Steel, for Piping Components
ASTM A126	Gray Cast Iron Castings for Valves, Flanges, and Pipe Fittings
ASTM A234	Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures
ASTM A53	Pipe, Steel, Black and Hot-Dipped, Zinc Coated Welded and Seamless
ASTM A74	Cast Iron Soil Pipe and Fittings
ASTM A861	High Silicon Iron Pipe and Fittings
ASTM A888	Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications
ASTM B280	Seamless Copper Tube for Air Conditioning and Refrigeration Field Service
ASTM B306	Copper Drainage Tube (DWV)

ASTM B32	Solder Metal
ASTM B813	Liquid and Paste Fluxes for Soldering Applications of Copper and Copper Alloy Tube
ASTM B88	Seamless Copper Water Tube
ASTM C564	Rubber Gaskets for Cast Iron Soil Pipe and Fittings
ASTM C76	Reinforced Concrete Culvert, Storm Drain and Sanitary Pipe
ASTM D1785	Poly Vinyl Chloride (PVC) Plastic Pipe
ASTM D2241	Poly Vinyl Chloride (PVC) Pressure-Rated Pipe (SDR Series)
ASTM D2466	Poly Vinyl Chloride (PVC) Plastic Pipe Fittings, Schedule 40
ASTM D2564	Solvent Cements for Poly Vinyl Chloride (PVC) Plastic Pipe and Fittings
ASTM D2665	Poly Vinyl Chloride (PVC) Plastic Drain, Waste and Vent Pipe and Fittings
ASTM D2729	Poly Vinyl Chloride (PVC) Sewer Pipe and Fittings
ASTM D2774	Recommended Practice for Underground Installation of Thermoplastic Pressure Piping
ASTM D2855	Making Solvent Cemented Joints with Poly Vinyl Chloride (PVC) Pipe and Fittings
ASTM D3034	Type PSM Poly Vinyl Chloride (PVC) Sewer Pipe and Fittings
ASTM D3139	Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals
ASTM D3212	Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
ASTM D3222	Unmodified Poly Vinylidene Fluoride (PVDF) Molding Extrusion and Coating Materials
ASTM D3311	Drain, Waste and Vent (DWV) Plastic Fitting Patterns
ASTM F2618	Standard Specification for Chlorinated Poly (Vinyl Chloride) (CPVC) Pipe and Fittings for Chemical Waste Drainage Systems.
AWS A5.8	Brazing Filler Metal
CISPI 310	Couplings For Use In Connection With Hubless Cast Iron Soil Pipe And Fittings for Sanitary And Storm Drain, Waste And Vent Piping Applications

1.05 SHOP DRAWINGS

A. Schedule from the contractor indicating the ASTM, or CISPI specification number of the pipe being proposed along with its type and grade if known at the time of submittal, and sufficient information to indicate the type and rating of fittings for each service.

B. Statement from manufacturer on his letterhead that pipe furnished meets the ASTM, or CISPI specification contained in this section.

1.06 QUALITY ASSURANCE

A. Order all copper, cast iron, steel, PVC and polyethylene pipe with each length marked with the name or trademark of the manufacturer and type of pipe; with each shipping unit marked with the purchase order number, metal or alloy designation, temper, size, and name of supplier.

B. Any installed material not meeting the specification requirements must be replaced with material that meets these specifications without additional cost to the Owner.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Promptly inspect shipments to insure that the material is undamaged and complies with specifications.

B. Cover pipe to prevent corrosion or deterioration while allowing sufficient ventilation to avoid condensation. Do not store materials directly on grade. Protect pipe, tube, and fitting ends so they are not damaged. Where end caps are provided or specified, take precautions so the caps remain in place. Protect fittings, flanges, and unions by storage inside or by durable, waterproof, above ground packaging.

C. Offsite storage agreements will not relieve the contractor from using proper storage techniques.

D. Storage and protection methods must allow inspection to verify products.

1.08 DESIGN CRITERIA

A. Use only new material, free of defects, rust and scale, and meeting the latest revision of ASTM, or CISPI specifications as listed in this specification.

B. All cast iron pipe and fittings shall be of domestic manufacture.

C. Construct all piping for the highest pressures and temperatures in the respective system.

D. Non-metallic piping will be acceptable only for the services indicated. It will not be acceptable in ventilation plenum spaces, including plenum ceilings. Plumbing Contractor shall confirm plenum locations with HVAC Contractor.

E. Where weld fittings or mechanical grooved fittings are used, use only long radius elbows having a centerline radius of 1.5 pipe diameters.

F. Where ASTM A53 type F pipe is specified, grade A type E or S, or grade B type E or S may be substituted at Contractor's option. Where the grade or type is not specified, Contractor may choose from those commercially available.

G. Where ASTM B88, type L H (drawn) temper copper tubing is specified, ASTM B88, type K H (drawn) temper copper tubing may be substituted at Contractor's option.

PART 2 – PRODUCTS

2.01 SANITARY WASTE AND VENT

A. Interior Above Ground:
   1. Hubless cast iron soil pipe and fittings, ASTM A888; CISPI Standard 301, ASTM A74, with heavy duty no hub couplings, ASTM C1540. Provide heavy duty, shielded stainless steel bands and tightening devices with ASTM Standard C564 rubber sleeve, ANACO/HUSKY SD 4000. Pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute and be listed by NSF International, and manufactured by AB&I, Charlotte, or Tyler.
   2. Type M copper water tube, H (drawn) temper, ASTM B88; with cast copper drainage fittings (DWV), ANSI B16.23; wrought copper drainage fittings (DWV), ANSI B16.29; lead free (<.2%) solder, ASTM B32; flux, ASTM B813; copper phosphorous brazing alloy, AWS A5.8 BCuP.
   3. PVC plastic pipe, Schedule 40, Class 12454-B (PVC 1120), ASTM D1785; PVC plastic drain, waste and vent pipe and fittings, ASTM D2665; socket fitting patterns, ASTM D3311; primer, ASTM F656; solvent cement, ASTM D2564. Solvent cement and primer shall be compliant with California South Coast Air Quality Management District (SCAQMD) Rule 1168 and Ozone Transport Commission (OTC) regulations for Volatile Organic Compound emissions levels. Solvent cement and primer shall be compliant with California South Coast Air Quality Management District (SCAQMD) Rule 1168 and Ozone Transport Commission (OTC) regulations for Volatile Organic Compound emissions levels. **PVC pipe and fittings shall not be permitted in plenum spaces**.

B. Interior Below Ground:
   1. 15” and Smaller: Cast iron soil pipe and fittings, hub and spigot, service weight, ASTM A74; with neoprene rubber compression gaskets, ASTM C564 and CISPI HSN 85.
   2. 16” and Smaller: PVC plastic pipe, Schedule 40, Class 12454-B (PVC 1120), ASTM D1785; PVC plastic drain, waste and vent pipe and fittings, ASTM D2665; socket fitting patterns, ASTM D3311; primer, ASTM F656; solvent cement, ASTM D2564. Solvent cement and primer shall be compliant with California South Coast Air Quality Management District (SCAQMD) Rule 1168 and Ozone Transport Commission (OTC) regulations for Volatile Organic Compound emissions levels.

C. Exterior Below Ground 10" and Smaller:
   1. Non-reinforced concrete sewer, storm drain and culvert pipe, Class III, ASTM C14; rubber gasket joints, ASTM C443; bell and spigot ends with opposing shoulder or confined O-ring seal configuration, ASTM C302.

D. Exterior Below Ground:

1. 15” and Smaller: Cast iron soil pipe and fittings, ASTM A74; with neoprene rubber compression gaskets, ASTM C564 and CISPI HSN 85.
2. 16” and Smaller: PVC plastic pipe, Schedule 40, Class 12454-B (PVC 1120), ASTM D1785; PVC plastic drain, waste and vent pipe and fittings, ASTM D2665; socket fitting patterns, ASTM D3311; primer, ASTM F656; solvent cement, ASTM D2564.
3. 15” and Smaller: Type PSM PVC sewer pipe and socket fittings, SDR 35, Class 12454-B (PVC 1120), ASTM D3034; primer, ASTM F656; solvent cement, ASTM 2564; or integral bell and flexible elastomeric seal, ASTM D3212.

PART 3 – EXECUTION

3.01 GENERAL

A. Install pipe and fittings in accordance with reference standards, manufacturer’s recommendations and recognized industry practices.

3.02 PREPARATION

A. Cut pipe ends square. Ream ends of piping to remove burrs. Clean scale and dirt from interior and exterior of each section of pipe and fitting prior to assembly.

3.03 ERECTION

A. Install all piping parallel to building walls and ceilings and at heights which do not obstruct any portion of a window, doorway, stairway, or passageway. Where interferences develop in the field, offset or reroute piping as required clearing such interferences. Coordinate locations of plumbing piping with piping, ductwork, conduit and equipment of other trades to allow sufficient clearances. In all cases, consult drawings for exact location of pipe spaces, ceiling heights, door and window openings, or other architectural details before installing piping.

B. Where copper or steel piping is embedded in masonry or concrete, provide protective sleeve covering of elastomeric pipe insulation.

C. Install underground warning tape 6"-12" below finished grade above all exterior below ground piping. Where existing underground warning tape is encountered, repair and replace.

D. Maintain piping in clean condition internally during construction.

E. Provide clearance for installation of insulation, access to valves and piping specialties.

F. Provide anchors, expansion joints, swing joints and/or expansion loops so that piping may expand and contract without damage to itself, equipment, or building.

G. Do not route piping through transformer vaults or above transformers, panel boards, or switchboards, including the required service space for this equipment, unless the piping is serving this equipment

H. Install all valves and piping specialties, including items furnished by others, as specified and/or detailed. Provide access to valves and specialties for maintenance. Make connections to all equipment, fixtures and systems installed by others where same requires the piping services indicated in this section.

3.04 COPPER PIPE JOINTS

A. Remove all slivers and burrs remaining from the cutting operation by reaming and filing both pipe surfaces. Clean fitting and tube with metal brush, emery cloth or sandpaper. Remove residue from the cleaning operation, apply flux and assemble joint to socket stop. Apply flame to fitting until solder melts when placed at joint. Remove flame and feed solder into joint until full penetration of cup and ring of solder appears. Wipe excess solder and flux from joint.

3.05 THREADED PIPE JOINTS

A. Use a thread lubricant or Teflon tape when making joints; no hard setting pipe thread cement or caulking will be allowed.

3.06 SOLVENT WELDED PIPE JOINTS

A. Install in accordance with ASTM D2855 "Making Solvent Cemented Joints With PVC Pipe and Fittings". Saw cut piping square and smooth. Tube cutters may be used if they are fitted with

wheels designed for use with PVC/CPVC pipe that do not leave a raised bead on pipe exterior. Support and restrain pipe during cutting to prevent nicks and scratches. Bevel ends 10-15 degrees and deburr interior. Remove dust, drips, moisture, grease and other superfluous materials from pipe interior and exterior. Check dry fit of pipe and fittings. Reject materials which are out of round or do not fit within close tolerance. Use heavy body solvent cement for large diameter fittings.

B. Maintain pipe, fittings, primer and cement between 40 and 100 degrees during application and curing. Apply primer and solvent using separate daubers (3" and smaller piping only) or clean natural bristle brushes about 1/2 the size of the pipe diameter. Apply primer to the fitting socket and pipe surface with a scrubbing motion. Check for penetration and reapply as needed to dissolve surface to a depth of 4-5 thousandths. Apply solvent cement to the fitting socket and pipe in an amount greater than needed to fill any gap. While both surfaces are wet, insert pipe into socket fitting with a quarter turn to the bottom of the socket. Solvent cement application and insertion must be completed in less than 1 minute. Minimum of 2 installers is required on piping 4" and larger. Hold joint for 30 seconds or until set. Reference manufacturer's recommendations for initial set time before handling and for full curing time before pressure testing. Cold weather solvent/cement may be utilized only under unusual circumstances and when specifically approved by the Architect/Engineer.

3.07 MECHANICAL HUBLESS PIPE CONNECTIONS

A. Place the gasket on the end of one pipe or fitting and the clamp assembly on the end of the other pipe or fitting. Firmly seat the pipe or fitting ends against the integrally molded shoulder inside the neoprene gasket. Slide the clamp assembly into position over the gasket. Tighten fasteners to manufacturers recommended torque.

3.08 PUSH-ON GASKETED PIPE CONNECTIONS

A. Clean pipe end, bell, gasket seat and gasket of dirt or debris. Coat end of pipe and gasket with gasket lubricant. Insure pipe is supported off the ground so lubricant does not pick up dirt. Push spigot end into gasket bell with levered pipe joining tool recommended by pipe manufacturer. Large diameter exterior mains may be joined by pushing end of pipe section with backhoe against wood blocking over pipe end. Insert to fully seated position or to reference mark on pipe.

3.09 SANITARY WASTE AND VENT

A. Verify invert elevations and building elevations prior to installation. Coordinate invert elevations with Site Utility Contractor prior to installation. Install exterior piping pitched to drain at indicated elevations and slope. Install interior piping pitched to drain at minimum slope of 1/4" per foot for 2" and smaller piping and 1/8" per foot for piping 3" and larger.

B. Install exterior piping below predicted frost level and not less than 5' bury depth to top of pipe wherever possible. Where piping is located above predicted frost level, provide frost protection in accordance Wisconsin Department of Professional Services, Chapter SPS382, SPS82.30(11)(c).

C. Flush piping inlets (floor drains, hub drains, mop basins, fixtures, etc.) with high flow of water at completion of project to demonstrate full flow capacity. Remove blockages and make necessary repairs where flow is found to be impeded.

3.10 PIPING SYSTEM LEAK TESTS

A. Isolate or remove components from system which are not rated for test pressure. Test piping in sections or entire system as required by sequence of construction. Do not insulate or conceal pipe until it has been successfully tested.

B. If required for the additional pressure load under test, provide temporary restraints at fittings or expansion joints. Backfill underground water mains prior to testing with the exception of thrust restrained valves which may be exposed to isolate potential leaks.

C. For hydrostatic tests, use clean water and remove all air from the piping being tested by means of air vents or loosening of flanges/unions. Measure and record test pressure at the high point in the system.

D. For air or nitrogen tests, gradually increase the pressure to not more than one half of the test pressure; then increase the pressure in steps of approximately one-tenth of the test pressure until the required test pressure is reached. Examine all joints and connections with a soap bubble solution or equivalent method. System will not be approved until it can be demonstrated that there is no measurable loss of test pressure during the test period.

E. Inspect system for leaks. Where leaks occur, repair the area with new materials and repeat the test; caulking will not be acceptable.

F. Entire test must be witnessed by the local authority having jurisdiction. All pressure tests are to be documented.

System	Test Medium	Initial Test Pressure Duration	Final Test Pressure Duration
Sanitary Waste & Vent	Water	N/A	10' Water 2 Hour

END OF SECTION

SECTION 22 14 00

FACILITY STORM DRAINAGE

PART 1 - GENERAL

1.01 SCOPE

A. This section contains specifications for plumbing pipe and pipe fittings for this project. Included are the following topics:

PART 1 - GENERAL
- Scope
- Related Work
- Reference
- Reference Standards
- Shop Drawings
- Quality Assurance
- Delivery, Storage, and Handling
- Design Criteria
- Welder Qualifications

PART 2 - PRODUCTS
- Storm and Clear Water Waste

PART 3 - EXECUTION
- General
- Preparation
- Erection
- Copper Pipe Joints
- Threaded Pipe Joints
- Solvent Welded Pipe Joints
- Mechanical Hubless Pipe Connections
- Push-On Gasketed Pipe Connections
- Storm and Clearwater Waste
- Piping System Leak Tests

1.02 RELATED WORK

Section 22 05 14 Plumbing Specialties
Section 22 05 29 Hangers and Supports for Plumbing Piping and Equipment

1.03 REFERENCE

A. Applicable provisions of Division 00 and 01 govern work under this section.

1.04 REFERENCE STANDARDS

ANSI B16.22	Wrought Copper and Wrought Copper Alloy Solder Joint Pressure Fittings
ANSI B16.29	Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV
ANSI B16.3	Malleable Iron Threaded Fittings
ANSI B16.4	Cast Iron Threaded Fittings
ANSI B16.5	Pipe Flanges and Flanged Fittings
ASTM A105	Forgings, Carbon Steel, for Piping Components
ASTM A126	Gray Cast Iron Castings for Valves, Flanges, and Pipe Fittings
ASTM A234	Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures
ASTM A74	Cast Iron Soil Pipe and Fittings
ASTM A861	High Silicon Iron Pipe and Fittings
ASTM A888	Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications
ASTM B306	Copper Drainage Tube (DWV)
ASTM B32	Solder Metal

ASTM B813	Liquid and Paste Fluxes for Soldering Applications of Copper and Copper Alloy Tube
ASTM B88	Seamless Copper Water Tube
ASTM C443	Joints for Circular Concrete Pipe Sewer and Culvert Pipe Using Rubber Gaskets
ASTM C564	Rubber Gaskets for Cast Iron Soil Pipe and Fittings
ASTM C76	Reinforced Concrete Culvert, Storm Drain and Sanitary Pipe
ASTM D1785	Poly Vinyl Chloride (PVC) Plastic Pipe
ASTM D2241	Poly Vinyl Chloride (PVC) Pressure-Rated Pipe (SDR Series)
ASTM D2321	Underground Installation of Flexible Thermoplastic Sewer Pipe
ASTM D2464	Threaded Poly Vinyl Chloride (PVC) Plastic Pipe Fittings, Schedule 80
ASTM D2466	Poly Vinyl Chloride (PVC) Plastic Pipe Fittings, Schedule 40
ASTM D2513	Thermoplastic Gas Pressure Pipe, Tubing, and Fittings
ASTM D2564	Solvent Cements for Poly Vinyl Chloride (PVC) Plastic Pipe and Fittings
ASTM D2657	Heat Fusion Joining of Polyolefin Pipe and Fittings
ASTM D2665	Poly Vinyl Chloride (PVC) Plastic Drain, Waste and Vent Pipe and Fittings
ASTM D2729	Poly Vinyl Chloride (PVC) Sewer Pipe and Fittings
ASTM D2774	Recommended Practice for Underground Installation of Thermoplastic Pressure Piping
ASTM D2855	Making Solvent Cemented Joints with Poly Vinyl Chloride (PVC) Pipe and Fittings
ASTM D3034	Type PSM Poly Vinyl Chloride (PVC) Sewer Pipe and Fittings
ASTM D3139	Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals
ASTM D3212	Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
ASTM D3311	Drain, Waste and Vent (DWV) Plastic Fitting Patterns
ASTM D4101	Propylene Plastic Injection and Extrusion Materials
ASTM F405	Corrugated Polyethylene (PE) Tubing and Fittings
ASTM F437	Threaded Chlorinated Poly Vinyl Chloride (CPVC) Plastic Pipe Fittings, Schedule 80
ASTM F438	Socket Type Chlorinated Poly Vinyl Chloride (CPVC) Plastic Pipe Fittings, Schedule 40
ASTM F441	Chlorinated Poly Vinyl Chloride (CPVC Plastic Pipe, Schedules 40 and 80
ASTM F656	Primers for Use in Solvent Cement Joints of Poly Vinyl Chloride (PVC) Plastic Pipe and Fittings
CISPI 310	Couplings For Use In Connection With Hubless Cast Iron Soil Pipe And Fittings For Sanitary And Storm Drain, Waste And Vent Piping Applications
STM A53	Pipe, Steel, Black and Hot-Dipped, Zinc Coated Welded and Seamless

1.05 SHOP DRAWINGS

A. Schedule from the contractor indicating the ASTM, AWWA or CISPI specification number of the pipe being proposed along with its type and grade if known at the time of submittal, and sufficient information to indicate the type and rating of fittings for each service.

B. Statement from manufacturer on his letterhead that pipe furnished meets the ASTM, AWWA or CISPI specification contained in this section.

1.06 QUALITY ASSURANCE

A. Order all copper, cast iron, steel, PVC and polyethylene pipe with each length marked with the name or trademark of the manufacturer and type of pipe; with each shipping unit marked with the purchase order number, metal or alloy designation, temper, size, and name of supplier.

B. Any installed material not meeting the specification requirements must be replaced with material that meets these specifications without additional cost to the Owner.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Promptly inspect shipments to insure that the material is undamaged and complies with specifications.

B. Cover pipe to prevent corrosion or deterioration while allowing sufficient ventilation to avoid condensation. Do not store materials directly on grade. Protect pipe, tube, and fitting ends so they are not damaged. Where end caps are provided or specified, take precautions so the caps

remain in place. Protect fittings, flanges, and unions by storage inside or by durable, waterproof, above ground packaging.

C. Offsite storage agreements will not relieve the contractor from using proper storage techniques.

D. Storage and protection methods must allow inspection to verify products.

1.08 DESIGN CRITERIA

A. Use only new material, free of defects, rust and scale, and meeting the latest revision of ASTM, AWWA or CISPI specifications as listed in this specification.

B. All cast iron pipe and fittings shall be of domestic manufacturer.

C. Construct all piping for the highest pressures and temperatures in the respective system.

D. Non-metallic piping will be acceptable only for the services indicated. It will not be acceptable in ventilation plenum spaces, including plenum ceilings. Plumbing Contractor shall confirm plenum locations with HVAC Contractor.

E. Where weld fittings or mechanical grooved fittings are used, use only long radius elbows having a centerline radius of 1.5 pipe diameters.

F. Where ASTM A53 type F pipe is specified, grade A type E or S, or grade B type E or S may be substituted at Contractor's option. Where the grade or type is not specified, Contractor may choose from those commercially available.

G. Where ASTM B88, type L H (drawn) temper copper tubing is specified, ASTM B88, type K H (drawn) temper copper tubing may be substituted at Contractor's option.

1.09 WELDER QUALIFICATIONS

A. Before any polyethylene fusion welding is performed, Contractor to submit certification that the welders to be used on this project have successfully demonstrated proper welding procedures in accordance with the Code of Federal Regulations, Title 49, Part 192, Section 192.285.

B. The Architect or Engineer reserves the right to test the work of any welder employed on the project, at the State's expense. If the work of the welder is found to be unsatisfactory, the welder shall be prevented from doing further welding on the project and all defective welds replaced.

PART 2 – PRODUCTS

2.01 STORM AND CLEARWATER WASTE

A. INTERIOR ABOVE GROUND:

1. Hubless cast iron soil pipe and fittings, ASTM A888; CISPI Standard 301, ASTM A74, with heavy duty no hub couplings, ASTM C1540. Provide heavy duty, shielded stainless steel bands and tightening devices with ASTM Standard C564 rubber sleeve, ANACO/HUSKY SD 4000. Pipe and fittings shall be marked with the collective trademark of Cast Iron Soil Pipe Institute and be listed by NSF International, and be manufactured by AB&I, Charlotte or Tyler.
2. Type M copper water tube, H (drawn) temper, ASTM B88; with cast copper drainage fittings (DWV), ANSI B16.23; wrought copper drainage fittings (DWV), ANSI B16.29; lead free (<.2%) solder, ASTM B32; flux, ASTM B813; copper phosphorous brazing alloy, AWS A5.8 BCuP. Mechanically formed brazed tee connections may be used in lieu of specified tee fittings for clearwater waste vent branch takeoffs up to one-half (1/2) the diameter of the main.
3. Copper drainage tube (DWV), ASTM B306; with cast copper drainage fittings (DWV), ANSI B16.23; wrought copper drainage fittings (DWV), ANSI B16.29; lead free (<.2%) solder, ASTM B32; flux, ASTM B813; copper phosphorous brazing alloy, AWS A5.8 BCuP. Mechanically formed brazed tee connections may be used in lieu of specified tee fittings for clearwater waste vent branch takeoffs up to one-half (1/2) the diameter of the main.
4. PVC plastic pipe, Schedule 40, Class 12454-B (PVC 1120), ASTM D1785; PVC plastic drain, waste and vent pipe and fittings, ASTM D2665; fitting patterns, ASTM D3311;

primer, ASTM F656; solvent cement, ASTM D2564. Solvent cement and primer shall be compliant with California South Coast Air Quality Management District (SCAQMD) Rule 1168 and Ozone Transport Commission (OTC) regulations for Volatile Organic Compound emissions levels. **PVC pipe and fittings shall not be permitted in plenum spaces or when receiving Clearwater waste in excess of 130°F.**

B. PRESSURIZED INTERIOR ABOVE GROUND:
   1. Type L copper water tube, H (drawn) temper, ASTM B88; with cast copper drainage fittings (DWV), ANSI B16.23; wrought copper drainage fittings (DWV), ANSI B16.29; lead free (<.2%) solder, ASTM B32; flux, ASTM B813.

C. INTERIOR BELOW GROUND:
   1. 15" and Smaller: Cast iron soil pipe and fittings, hub and spigot, service weight, ASTM A74; with neoprene rubber compression gaskets, ASTM C564 and CISPI HSN 85.
   2. 16” and Smaller: PVC plastic pipe, Schedule 40, Class 12454-B (PVC 1120), ASTM D1785; PVC plastic drain, waste and vent pipe and fittings, ASTM D2665; fitting patterns, ASTM D3311; primer, ASTM F656; solvent cement, ASTM D2564. Solvent cement and primer shall be compliant with California South Coast Air Quality Management District (SCAQMD) Rule 1168 and Ozone Transport Commission (OTC) regulations for Volatile Organic Compound emissions levels. Solvent cement and primer shall be compliant with California South Coast Air Quality Management District (SCAQMD) Rule 1168 and Ozone Transport Commission (OTC) regulations for Volatile Organic Compound emissions levels.

D. EXTERIOR BELOW GROUND 10" AND SMALLER:
   1. Non-reinforced concrete sewer, storm drain and culvert pipe, Class III, ASTM C14; rubber gasket joints, ASTM C443; bell and spigot or tongue and groove ends.

E. EXTERIOR BELOW GROUND:
   1. 15" and Smaller: Cast iron soil pipe and fittings, hub and spigot, service weight, ASTM A74; with neoprene compression rubber gaskets, ASTM C564 and CISPI HSN 85.
   2. 16” and Smaller: PVC plastic pipe, Schedule 40, Class 12454-B (PVC 1120), ASTM D1785; PVC plastic drain, waste and vent pipe and fittings, ASTM D2665; fitting patterns, ASTM D3311; primer, ASTM F656; solvent cement, ASTM 2564. Solvent cement and primer shall be compliant with California South Coast Air Quality Management District (SCAQMD) Rule 1168 and Ozone Transport Commission (OTC) regulations for Volatile Organic Compound emissions levels.
   3. 15" and Smaller: Type PSM PVC sewer pipe and fittings, SDR 35, Class 12454-B (PVC 1120), ASTM D3034; primer, ASTM F656; solvent cement, ASTM 2564; or integral bell and flexible elastomeric seal, ASTM D3212.

PART 3 – EXECUTION

3.01 GENERAL

A. Install pipe and fittings in accordance with reference standards, manufacturer’s recommendations and recognized industry practices.

3.02 PREPARATION

A. Cut pipe ends square. Ream ends of piping to remove burrs. Clean scale and dirt from interior and exterior of each section of pipe and fitting prior to assembly.

3.03 ERECTION

A. Install all piping parallel to building walls and ceilings and at heights which do not obstruct any portion of a window, doorway, stairway, or passageway. Where interferences develop in the field, offset or reroute piping as required clearing such interferences. Coordinate locations of plumbing piping with piping, ductwork, conduit and equipment of other trades to allow sufficient clearances. In all cases, consult drawings for exact location of pipe spaces, ceiling heights, door and window openings, or other architectural details before installing piping.

B. Where copper or steel piping is embedded in masonry or concrete, provide protective sleeve covering of elastomeric pipe insulation.

C. Install underground warning tape 6"-12" below finished grade above all exterior below ground piping. Where existing underground warning tape is encountered, repair and replace.

D. Maintain piping in clean condition internally during construction.

E. Provide clearance for installation of insulation, access to valves and piping specialties.

F. Provide anchors, expansion joints, swing joints and/or expansion loops so that piping may expand and contract without damage to itself, equipment, or building.

G. Do not route piping through transformer vaults or above transformers, panel boards, or switchboards, including the required service space for this equipment, unless the piping is serving this equipment

H. Install all valves and piping specialties, including items furnished by others, as specified and/or detailed. Provide access to valves and specialties for maintenance. Make connections to all equipment, fixtures and systems installed by others where same requires the piping services indicated in this section.

3.04 COPPER PIPE JOINTS

A. Remove all slivers and burrs remaining from the cutting operation by reaming and filing both pipe surfaces. Clean fitting and tube with metal brush, emery cloth or sandpaper. Remove residue from the cleaning operation, apply flux and assemble joint to socket stop. Apply flame to fitting until solder melts when placed at joint. Remove flame and feed solder into joint until full penetration of cup and ring of solder appears. Wipe excess solder and flux from joint.

3.05 THREADED PIPE JOINTS

A. Use a thread lubricant or Teflon tape when making joints; no hard setting pipe thread cement or caulking will be allowed.

3.06 SOLVENT WELDED PIPE JOINTS

A. Install in accordance with ASTM D2855 "Making Solvent Cemented Joints With PVC Pipe and Fittings". Saw cut piping square and smooth. Tube cutters may be used if they are fitted with wheels designed for use with PVC/CPVC pipe that do not leave a raised bead on pipe exterior. Support and restrain pipe during cutting to prevent nicks and scratches. Bevel ends 10-15 degrees and deburr interior. Remove dust, drips, moisture, grease and other superfluous materials from pipe interior and exterior. Check dry fit of pipe and fittings. Reject materials which are out of round or do not fit within close tolerance. Use heavy body solvent cement for large diameter fittings.

B. Maintain pipe, fittings, primer and cement between 40 and 100 degrees during application and curing. Apply primer and solvent using separate daubers (3" and smaller piping only) or clean natural bristle brushes about 1/2 the size of the pipe diameter. Apply primer to the fitting socket and pipe surface with a scrubbing motion. Check for penetration and reapply as needed to dissolve surface to a depth of 4-5 thousandths. Apply solvent cement to the fitting socket and pipe in an amount greater than needed to fill any gap. While both surfaces are wet, insert pipe into socket fitting with a quarter turn to the bottom of the socket. Solvent cement application and insertion must be completed in less than 1 minute. Minimum of 2 installers is required on piping 4" and larger. Hold joint for 30 seconds or until set. Reference manufacturer’s recommendations for initial set time before handling and for full curing time before pressure testing. Cold weather solvent/cement may be utilized only under unusual circumstances and when specifically approved by the Architect/Engineer.

C. Solvent cement and primer shall be compliant with California South Coast Air Quality Management District (SCAQMD) Rule 1168 and Ozone Transport Commission (OTC) regulations for Volatile Organic Compound emissions levels.

3.07 MECHANICAL HUBLESS PIPE CONNECTIONS

A. Place the gasket on the end of one pipe or fitting and the clamp assembly on the end of the other pipe or fitting. Firmly seat the pipe or fitting ends against the integrally molded shoulder inside the neoprene gasket. Slide the clamp assembly into position over the gasket. Tighten fasteners to manufacturers recommended torque.

3.08 PUSH ON GASKETED PIPE CONNECTIONS

A. Clean pipe end, bell, gasket seat and gasket of dirt or debris. Coat end of pipe and gasket with gasket lubricant. Insure pipe is supported off the ground so lubricant does not pick up dirt. Push spigot end into gasket bell with levered pipe joining tool recommended by pipe manufacturer. Large diameter exterior mains may be joined by pushing end of pipe section with backhoe against wood blocking over pipe end. Insert to fully seated position or to reference mark on pipe.

3.09 STORM PIPING

A. Verify invert elevations and building elevations prior to installation. Coordinate invert elevations with Site Utility Contractor prior to installation. Install exterior piping pitched to drain at indicated elevations and slope. Install interior piping pitched to drain at minimum slope of 1/8" per foot. For piping 3" and larger, and ¼" per foot for piping 2" and smaller.

B. Install exterior piping below predicted frost level and not less than 5' bury depth to top of pipe wherever possible. Where piping is located above predicted frost level, provide frost protection in accordance with Wisconsin Department of Safety and Professional Services SPS 382.30(11)(c).

3.10 PIPING SYSTEM LEAK TESTS

A. Isolate or remove components from system which are not rated for test pressure. Test piping in sections or entire system as required by sequence of construction. Do not insulate or conceal pipe until it has been successfully tested.

B. If required for the additional pressure load under test, provide temporary restraints at fittings or expansion joints. Backfill underground water mains prior to testing with the exception of thrust restrained valves which may be exposed to isolate potential leaks.

C. For hydrostatic tests, use clean water and remove all air from the piping being tested by means of air vents or loosening of flanges/unions. Measure and record test pressure at the high point in the system.

D. For air or nitrogen tests, gradually increase the pressure to not more than one half of the test pressure; then increase the pressure in steps of approximately one-tenth of the test pressure until the required test pressure is reached. Examine all joints and connections with a soap bubble solution or equivalent method. System will not be approved until it can be demonstrated that there is no measurable loss of test pressure during the test period.

E. Inspect system for leaks. Where leaks occur, repair the area with new materials and repeat the test; caulking will not be acceptable.

F. Entire test must be witnessed by the local authority having jurisdiction. All pressure tests are to be documented.

System	Test Medium	Initial Test Pressure Duration	Final Test Pressure Duration
Storm Piping	Water	N/A	10' Water 2 Hour
Pressurized Storm/Clear Water Waste	Water	N/A	100 psig 2 Hour

END OF SECTION

SECTION 22 15 13

GENERAL SERVICE COMPRESSED AIR PIPING

PART 1 - GENERAL

1.01 SCOPE

A. This section contains specifications for plumbing pipe and pipe fittings for this project. Included are the following topics:

PART 1 - GENERAL
- Scope
- Related Work
- Reference
- Reference Standards
- Shop Drawings
- Quality Assurance
- Delivery, Storage, and Handling
- Design Criteria
- Welder Qualifications

PART 2 - PRODUCTS
- Compressed Air (Non Medical, Non Lab)

PART 3 - EXECUTION
- General
- Preparation
- Erection
- Copper Pipe Joints
- Welded Pipe Joints
- Threaded Pipe Joints
- Aluminum Pipe Joints
- Compressed Air
- Piping System Leak Tests

1.02 RELATED WORK

Section 22 05 14 Plumbing Specialties
Section 22 05 29 Hangers and Supports for Plumbing Piping and Equipment

1.03 REFERENCE

A. Applicable provisions of Division 00 and 01 govern work under this section.

1.04 REFERENCE STANDARDS

ANSI B16.3	Malleable Iron Threaded Fittings
ANSI B16.22	Wrought Copper and Wrought Copper Alloy Solder Joint Pressure Fittings
ANSI B16.29	Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV
ASTM A53	Pipe, Steel, Black and Hot-Dipped, Zinc Coated Welded and Seamless
ASTM A105	Forgings, Carbon Steel, for Piping Components
ASTM A126	Gray Cast Iron Castings for Valves, Flanges, and Pipe Fittings
ASTM A234	Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures
ASTM B32	Solder Metal
ASTM B88	Seamless Copper Water Tube
ASTM B280	Seamless Copper Tube for Air Conditioning and Refrigeration Field Service
ASTM B813	Liquid and Paste Fluxes for Soldering Applications of Copper and Copper Alloy Tube
ASTM B819	Seamless Copper Tube for Medical Gas Systems
ASTM D1785	Poly Vinyl Chloride (PVC) Plastic Pipe
ASTM D2464	Threaded Poly Vinyl Chloride (PVC) Plastic Pipe Fittings, Schedule 80

ASTM D2466	Poly Vinyl Chloride (PVC) Plastic Pipe Fittings, Schedule 40
ASTM D2564	Solvent Cements for Poly Vinyl Chloride (PVC) Plastic Pipe and Fittings
ASTM D2855	Making Solvent Cemented Joints with Poly Vinyl Chloride (PVC) Pipe and Fittings
ASTM F493	Solvent Cements for Chlorinated Poly Vinyl Chloride (CPVC) Plastic Pipe and Fittings
ASTM F656	Primers for Use in Solvent Cement Joints of Poly Vinyl Chloride (PVC) Plastic Pipe and Fittings
NFPA 99	Health Care Facilities

1.05 SHOP DRAWINGS

A. Schedule from the contractor indicating the ASTM specification number of the pipe being proposed along with its type and grade if known at the time of submittal, and sufficient information to indicate the type and rating of fittings for each service.

B. Statement from manufacturer on his letterhead that pipe furnished meets the ASTM, AWWA or CISPI specification contained in this section.

1.06 QUALITY ASSURANCE

A. Order all copper, steel, and PVC pipe with each length marked with the name or trademark of the manufacturer and type of pipe; with each shipping unit marked with the purchase order number, metal or alloy designation, temper, size, and name of supplier.

B. Any installed material not meeting the specification requirements must be replaced with material that meets these specifications without additional cost to the Owner.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Promptly inspect shipments to insure that the material is undamaged and complies with specifications.

B. Cover pipe to prevent corrosion or deterioration while allowing sufficient ventilation to avoid condensation. Do not store materials directly on grade. Protect pipe, tube, and fitting ends so they are not damaged. Where end caps are provided or specified, take precautions so the caps remain in place. Protect fittings, flanges, and unions by storage inside or by durable, waterproof, above ground packaging.

C. Offsite storage agreements will not relieve the contractor from using proper storage techniques.

D. Storage and protection methods must allow inspection to verify products.

1.08 DESIGN CRITERIA

A. Relocate existing compressor to other side of wall into metals shop. Core through wall up high above new shelving and back feed existing compressed air system.

B. Use only new material, free of defects, rust and scale, and meeting the latest revision of ASTM specifications as listed in this specification.

C. Construct all piping for the highest pressures and temperatures in the respective system.

D. Non-metallic piping will not be acceptable in ventilation plenum spaces, including plenum ceilings.

E. Where weld fittings or mechanical grooved fittings are used, use only long radius elbows having a centerline radius of 1.5 pipe diameters.

F. Where ASTM A53 type F pipe is specified, grade A type E or S, or grade B type E or S may be substituted at Contractor's option. Where the grade or type is not specified, Contractor may choose from those commercially available.

1.09 WELDER QUALIFICATIONS

A. Welding procedures, welders, and welding operators for all building service piping to be in accordance with certified welding procedures of the National Certified Pipe Welding Bureau and Section 927.5 of ASME B31.9 Building Services Piping or AWS 10.9 Qualification of Welding Procedures and Welders for Piping and Tubing. Before any metallic welding is performed,

Contractor to submit his Standard Welding Procedure Specification together with the Procedure Qualification Record as required by Section 927.6 of ASME B31.9 Building Services Piping.

B. Before any polyethylene fusion welding is performed, Contractor to submit certification that the welders to be used on this project have successfully demonstrated proper welding procedures in accordance with the Code of Federal Regulations, Title 49, Part 192, Section 192.285.

C. The Architect or Engineer reserves the right to test the work of any welder employed on the project, at the State's expense. If the work of the welder is found to be unsatisfactory, the welder shall be prevented from doing further welding on the project and all defective welds replaced.

PART 2 - PRODUCTS

2.01 COMPRESSED AIR (NON-MEDICAL, NON-LAB)

A. 2" and Smaller TOOL AIR:
Black steel pipe, Schedule 40, Type F, Grade A, ASTM A53; with black malleable iron threaded fittings, Class 150, ASTM A197/ANSI B16.3; seamless carbon steel weld fittings, standard weight, ASTM A234 grade WPB/ANSI B16.9.

PART 3 - EXECUTION

3.01 GENERAL

A. Install pipe and fittings in accordance with reference standards, manufacturer’s recommendations and recognized industry practices.

3.02 PREPARATION

A. Cut pipe ends square. Ream ends of piping to remove burrs. Clean scale and dirt from interior and exterior of each section of pipe and fitting prior to assembly.

3.03 ERECTION

A. Install all piping parallel to building walls and ceilings and at heights which do not obstruct any portion of a window, doorway, stairway, or passageway. Where interferences develop in the field, offset or reroute piping as required clearing such interferences. Coordinate locations of plumbing piping with piping, ductwork, conduit and equipment of other trades to allow sufficient clearances. In all cases, consult drawings for exact location of pipe spaces, ceiling heights, door and window openings, or other architectural details before installing piping.

B. Maintain piping in clean condition internally during construction.

C. Provide clearance for installation of insulation, access to valves and piping specialties.

D. Provide anchors, expansion joints, swing joints and/or expansion loops so that piping may expand and contract without damage to itself, equipment, or building.

E. Install all valves and piping specialties, including items furnished by others, as specified and/or detailed. Provide access to valves and specialties for maintenance. Make connections to all equipment, fixtures and systems installed by others where same requires the piping services indicated in this section.

3.04 COPPER PIPE JOINTS

A. Remove all slivers and burrs remaining from the cutting operation by reaming and filing both pipe surfaces. Clean fitting and tube with metal brush, emery cloth or sandpaper. Remove residue from the cleaning operation, apply flux and assemble joint to socket stop. Apply flame to fitting until solder melts when placed at joint. Remove flame and feed solder into joint until full penetration of cup and ring of solder appears. Wipe excess solder and flux from joint.

3.05 WELDED PIPE JOINTS

A. Make all welded joints by fusion welding in accordance with ASME Codes, ANSI B31, and State Codes where applicable. "Weldolets" and "Threadolets" may be used for branch takeoffs up to one-half (1/2) the diameter of the main.

3.06 THREADED PIPE JOINTS

A. Use a thread lubricant or Teflon tape when making joints; no hard setting pipe thread cement or caulking will be allowed.

3.07 COMPRESSED AIR

A. Install a 4" minimum depth dirt leg at the bottom of each vertical run and at each outlet connection with shutoff valve at bottom of dirt leg.

3.08 PIPING SYSTEM LEAK TESTS

A. Isolate or remove components from system which are not rated for test pressure. Perform final testing for medical and lab gas with all system components in place. Test piping in sections or entire system as required by sequence of construction. Do not insulate or conceal pipe until it has been successfully tested.

B. For air or nitrogen tests, gradually increase the pressure to not more than one half of the test pressure; then increase the pressure in steps of approximately one-tenth of the test pressure until the required test pressure is reached. Examine all joints and connections with a soap bubble solution or equivalent method. System will not be approved until it can be demonstrated that there is no measurable loss of test pressure during the test period.

C. Inspect system for leaks. Where leaks occur, repair the area with new materials and repeat the test; caulking will not be acceptable.

D. Entire test must be witnessed by the Owner's representative. All pressure tests are to be documented.

System	Test Medium	Initial Test		Final Test	
		Pressure	Duration	Pressure	Duration
Compressed Air	Air	N/A	N/A	150 psig	24 Hour

END OF SECTION

SECTION 22 30 00

PLUMBING EQUIPMENT

PART 1 - GENERAL

1.01 SCOPE

A. This section includes specifications for water heaters, water softeners, pumps and other equipment used for plumbing applications. Included are the following topics:

PART 1 - GENERAL
- Scope
- Related Documents
- Reference
- Quality Assurance
- Shop Drawings

PART 2 - PRODUCTS
- Water Heaters
- Sump Pumps
- Inline System Lubricated Centrifugal Pumps
- Expansion Tanks

PART 3 - EXECUTION
- Installation

1.02 RELATED DOCUMENTS

Division 26	Electrical
Section 22 05 13	Common Motor Requirements for Plumbing Equipment
Section 22 05 15	Piping Specialties
Section 22 05 23	General-Duty Valves for Plumbing Piping
Section 22 07 00	Plumbing Insulation

1.03 REFERENCE

A. Applicable provisions of Division 00 and 01 shall govern work under this section.

1.04 QUALITY ASSURANCE

A. Substitutions: Refer to Division 00 and 01.

B. Plumbing products requiring approval by the State of Wisconsin Department of Safety and Professional Services must be approved or have pending approval at the time of shop drawing submission.

C. Equipment descriptions establish equipment types, quality, material features, capacity, and physical weights and sizes. Proposed variations to specified equipment shall require preapproval with written detailed supporting data from the Plumbing Contractor a minimum of ten (10) days prior to the bid date for Architect / Engineer Review. If the product is acceptable, the Architect / Engineer will issue it in an Addendum. Proposed alternative equipment received directly from vendors will be rejected.
   1. Costs resulting from changes in gas or electrical loads shall be the responsibility of the Plumbing Contractor.
   2. Alternative equipment weights shall not exceed specified equipment weights.
   3. Alternative water heater flue and intake limitations must be considered and Plumbing Contractor shall be responsible for determining compatibility with building dimensions.
   4. Efficiencies of water heaters shall not be less than specified efficiencies.

1.05 SHOP DRAWINGS

A. Include data concerning dimensions, capacities, materials of construction, ratings, certifications, weights, pump curves with net positive suction head requirements, manufacturer's installation requirements, manufacturer's performance limitations, and appropriate identification.

PART 2 - PRODUCTS

2.01 DIRECT VENT SEALED COMBUSTION GAS FIRED WATER HEATERS

A. Manufacturers: A.O. Smith, Lochinvar or Bradford-White.

B. GWH-1**:** A.O. Smith Model BTH-250: Water heater shall have a rated storage capacity of not less than 100 gallons, a minimum gas input of 250,000 BTU/Hr., a minimum recovery of 320 GPH at 90°F temperature rise, and a thermal efficiency rating of 96%. It shall be design certified by CSA International (formerly AGA and CGA), for 180°F application. The tank shall be lined with high temperature enamel or stainless steel and shall have a bolted hand hole cleanout. Glass lined tanks shall have four extruded magnesium anode rods installed in separate head couplings. The heater shall be insulated with non-CFC foam. This water heater shall be equipped with an electronic ignition system, an ASME rated T&P relief valve and a premix closed combustion system for direct venting using either a 3" (76 mm), or 4" (102 mm), PVC, CPVC, or ABS vent pipe (115 VAC required). The water heater shall be factory assembled and tested. The water heater shall be approved for zero inch clearance to combustibles. A digital LCD display shall be integrated into the front and be an adjustable electronic thermostat to any temperature up to 180°F. A recycling Energy Cut Off (ECO), shuts off all gas in the event of an overheat condition. The entire installation shall be made in compliance with state and local codes and ordinances. Provided with a 5-year tank warranty.

C. Provide gas pressure regulator with vent limiting device.

2.02 SUMP PUMPS

A. Manufacturers: Weil, Zoeller, or approved equal.

B. SP-1: Elevator Sump Pump:

1. Weil Model 1412, 1-1/2" single seal submersible sump pump with cast iron impeller and 1/2 HP, 1750 RPM, 115/1/60 motor and 20' cord. 30 GPM @ 14 TDH.
2. Weil Model 8109 control panel with 3 floats.
3. Provide perforated 1/4" steel simplex cover.
4. Provide 24" diameter x 36" deep fiberglass sump basin.

2.03 INLINE SYSTEM LUBRICATED CENTRIFUGAL PUMPS

A. Manufacturers: Bell and Gossett, Grundfos, Taco.

B. Circulating Pumps: CP-1**:** Bell & Gossett, Model NBF-36, 3 speed pump 9 GPM @ 12' head, 1" connections.

C. Type: Horizontal single stage close coupled system lubricated in-line pumps, 125 psig maximum working pressure at operating temperature of 225°F. continuous. The manufacturer shall certify all pump ratings. All pumps to operate without excessive noise or vibration.

D. Casing: Bronze or stainless steel; flanged suction and discharge connection.

E. Impeller: Bronze, stainless steel or thermoplastic, keyed to the shaft, single suction enclosed type, hydraulically and dynamically balanced.

F. Bearings: System lubricated carbon sleeve bearings.

G. Shaft: Stainless steel or ceramic.

H. Seal: Stainless steel can isolating rotor and stator.

I. Motor: Provide pump with impedance protected motor sized for non-overloading over the entire pump curve. Furnish each pump and motor with a nameplate giving the manufacturer's name, serial number of pump, capacity in GPM and head in feet at design condition, horsepower, voltage, frequency, speed and full load current.

2.04 EXPANSION TANKS

A. Manufacturer: Amtrol, Bell and Gossett, Wessels.

B. ET-1**:** Wessels Model TXA-50. Vertical steel precharged hydro-pneumatic expansion tank, 125 psi ASME labeled construction, complete with replaceable flexible butyl rubber bladder,

system connection fitting, Schrader type air charge fitting, steel base ring stand, factory prime and enamel painted exterior finish, ASME relief valve. Materials exposed to water to be NSF or FDA approved for potable water service.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Install plumbing equipment where indicated in accordance with manufacturer's recommendations. Coordinate equipment location with piping, ductwork, conduit and equipment of other trades to allow sufficient clearances. Locate equipment and arrange plumbing piping to provide access space for servicing all components.

B. Set commercial water heaters on concrete housekeeping pads. Adjust and level equipment.

C. Set sumps on compacted granular backfill adjusting for plumb and level. Backfill in even layers around sump with granular backfill.

D. Connect equipment to water and drain piping using unions or flanges and isolation valves.

E. Pipe temperature and pressure relief valves to floor as indicated.

F. Extend water heater condensate tubes to hub drain.

G. Startup and test equipment adjusting operating and safety controls for proper operation.

H. Lubricate pumps before startup. Adjust pumps for rated flow. Clean and blow down strainers after 8 hours of operation.

I. Adjust compression tank pre-charge to scheduled minimum operating pressure prior to connecting to system.

END OF SECTION

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SECTION 22 42 00
COMMERCIAL PLUMBING FIXTURES

PART 1 - GENERAL

1.01 SCOPE

A. This section includes specifications for plumbing fixtures, faucets and trim.

PART 1 - GENERAL
- Scope
- Related Work
- Reference
- Quality Assurance
- Shop Drawings
- Design Criteria

PART 2 - PRODUCTS
- Plumbing Fixtures

PART 3 - EXECUTION
- Installation

1.02 RELATED WORK

Section 11400	Foodservice Equipment
Section 22 05 14	Plumbing Specialties
Section 22 05 29	Hangers and Supports for Plumbing Piping and Equipment
Section 22 11 00	Facility Water Distribution
Section 22 13 00	Facility Sanitary Sewerage
Section 22 14 00	Facility Storm Drainage
Section 22 15 13	General Service Compressed-Air Piping

1.03 REFERENCE

A. Applicable provisions of Division 00 of 01 shall govern work under this section.

1.04 QUALITY ASSURANCE

A. Substitution of Materials: Refer to Division 01, General Conditions, Equals and Substitutions.

B. Plumbing products requiring approval by the Wisconsin Department of Safety and Professional Services (SPS) must be approved or have pending approval at the time of shop drawing submission.

C. All fixtures shall be in conformance with Wisconsin Department of Safety and Professional Services Administrative Codes SPS 384.10 and SPS 384.20.

1.05 SHOP DRAWINGS

A. Include data concerning sizes, utility sizes, rough in-dimensions, capacities, materials of construction, ratings, weights, trim, finishes, Manufacturer's installation requirements, manufacturer's performance limitations, and appropriate identification.

1.06 DESIGN CRITERIA

ANSI A112.6.1M-88	Supports for Off-the Floor Plumbing Fixtures for Public Use.
ANSI A112.18.1-94	Finished and Rough Brass Plumbing Fixture Fittings.
ANSI A112.19.1-90	Enameled Cast Iron Plumbing Fixtures.
ANSI A112.19.2M-82	Vitreous China Plumbing Fixtures.
ANSI A112.19.5-79(R1990)	Trim for Water Closet Bowls, Tanks and Urinals.
ARI-1010-94	Drinking Fountains and Self-Contained Mechanically Refrigerated Drinking Water Coolers.
ASSE 1011-93	Hose Connection Vacuum Breakers.

ASSE 1014-90	Handheld Showers.
ASSE 1035-93	Laboratory Faucet Backflow Preventers

PART 2 – PRODUCTS

2.01 PLUMBING FIXTURES

A. Manufacturers: Fixture descriptions establish fixture type, quality, materials, features and size. Proposed variations to specified products or listed Manufacturers shall require preapproval with written detailed supporting data from the Plumbing Contractor a minimum of ten (10) days prior to bid date for Architect / Engineer review. If the product is acceptable, the Architect / Engineer will issue it in an Addendum. Proposed alternative fixture data received directly from Vendors will be rejected.

- **Water Closets**
  American Standard, Kohler
- **Urinals**
  American Standard, Kohler
- **Lavatories**
  American Standard, Kohler
- **Water Closet Seats**
  Bemis, Beneke, Church, Olsonite Sperzel
- **Faucets**
  Chicago Faucet, Kohler, Speakman, Symmons
- **Drains**
  Chicago Faucet, Engineered Brass Co., Kohler, McGuire
- **Stops and Supplies**
  Chicago Faucet Co., T&S Brass, McGuire. (Heavy Duty Type Only)
- **Flush Valves**
  Coyne & Delany, Sloan, Zurn
- **Traps**
  Kohler, McGuire, Dearborn, Engineered Brass Co. (17 gauge Min.)
- **Carriers and Supports**
  Josam, Smith, Wade, Watts Drainage, Zurn
- **Wash Fountains**
  Bradley
- **Sinks**
  Elkay, Just
- **Laundry Trays**
  Fiat, Mustee
- **Mop Basins**
  Fiat, Mustee, Acorn
- **Showers**
  Symmons, Powers
- **Electric Water Coolers**
  Elkay, Oasis, Sunroc
- **Emergency Eyewash Fountains and Showers**
  Acorn Safety, Guardian, Speakman

B. Water Closets

1. WC-1 - Wall hung back outlet white vitreous china siphon jet water closet with elongated bowl, 1-1/2" top spud, 2-5/8" passageway and 1.6 gallon flush. Flush valve handle 11-1/2” above rim.

• Fixture:	Kohler Kingston K-4325
• Flush Valve:	Sloan Royal 111-1.6
• Seat:	Bemis 1655-SS/C white solid plastic open front
• Carrier:	Josam commercial grade adjusted for 15” bowl height

2. WC-2 - Same as WC-1, barrier free adjusted for 16-1/2" bowl height. Operating handle of the flush valve to be ADA compliable for activation force and located to the wide side of the stall.
3. WC-3 - Floor mount bottom outlet white vitreous china siphon jet child height water closet bowl with 12-1/2" rim height and 1.6 gallon battery powered sensor flush valve.

• Fixture:	Kohler Primary K-4321
• Flush Valve:	Sloan G2 8111-1.6
• Seat:	Kohler K-4686 white solid plastic open front with scalloped handholds

C. Urinals
1. UR-1 - Wall mount white vitreous china washout urinal with 3/4" top inlet spud, 2" outlet, removable strainer and 0.125 gallon flush. Battery powered sensor flush valve.

• Fixture:	Kohler Bardon K-4991-ETSS
• Flush Valve:	Sloan G2 8186-0.5
• Carrier:	Smith commercial grade adjusted for 24" lip height

2. UR-2 - Same as UR-1, barrier free adjusted for 16" lip height.

D. Lavatories
1. L-1 - Wall mount white vitreous china lavatory drilled for concealed arm carrier with 4" on center faucet openings. Deck mounted 4" fixed centers, hot and cold metering faucet, 2.2 GPM spray, vandal proof push-tilt handles. Set at ADA height.

• Fixture:	Kohler Greenwich K-2032
• Faucet:	Chicago Faucet No. 802-336ABCP
• Drain:	McGuire 155WC perforated strainer and 1-1/4" offset tailpiece
• Trap:	McGuire B8902C 1-1/4"x1-1/2" 17 ga. cast brass trap and tubular wall bend. With C.O. plug
• Supplies & Stops:	McGuire H2165LK
• Carrier:	Smith floor mounted concealed arm adjusted for 34" height rim height

2. L-2 - Wall mount compact lavatory with 4" on center faucet openings and wall hanger bracket. Gooseneck hot and cold battery operated sensor faucet with user adjustable mixing valve, 1.5 GPM aerator and ceramic operating cartridges. Provide undercounter thermostatic mixing valve conforming to ASSE 1070. Set water temperature at 110 deg. maximum. Set at child height.

• Fixture:	Mansfield Model 1613-NS-4
• Faucet:	Chicago Faucet No. 116.870.AB.1
• Drain:	McGuire 155WC perforated strainer and 1-1/4" offset tailpiece
• Trap:	McGuire B8902C 1-1/4"x1-1/2" 17 ga. cast brass trap and tubular wall bend. With C.O. plug
• Supplies & Stops:	McGuire H2165LK
• Tempering Valve:	Watts USG-B

3. Insulate all lavatory supplies, stops and trap with pre-manufactured insulating kit.

E. Wash fountains
1. WF-1 - Floor mounted 4 station wash fountain with stainless steel access panel, floor and bowl anchor brackets, supply stops, strainers, check valves, thermostatic mixing valve, infrared sensors, solenoid valves, transformer and back splash.

• Fixture:	Bradley SN2004-B-STD-IRP-NSD-TMA-BS
• Trap:	2"x2" 17 ga. cast brass trap
• Stops:	Ball valves

F. Sinks

1. S-1 - Counter mounted 18 ga. type 302 stainless steel double compartment sink with 4 faucet openings 4" on center. Two handle faucet with wrist blades, 1.5 GPM integral cast swing spout, ceramic cartridge and side spray.

• Fixture:	Elkay LR-3322
• Faucet:	Chicago Faucet No. 1102-GN8AE35-317AB
• Drain:	Elkay LK-35
• Waste:	McGuire No. 113C16G17, Center outlet, 17 ga
• Trap:	McGuire 8912C
• Supplies & Stops:	McGuire H2165LK

2. S-2 - Counter mounted 18 ga type 302 stainless steel single compartment sink with 3 faucet openings 4" on center. Two handle faucet with wrist blades, gooseneck spout, 1.5 GPM aerator.

• Fixture:	Elkay LR-1919-3
• Faucet:	Chicago Faucet No. 786-GN2FCXKABCP
• Drain:	Elkay LK-35
• Trap:	McGuire 8912C
• Supplies & Stops:	McGuire H2165LK

3. S-3 - Counter mounted 18 ga type 302 stainless steel single compartment sink with 3 faucet openings 4" on center. Two handle faucet with wrist blades, gooseneck spout, 1.5 GPM aerator.

• Fixture:	Elkay PSR-1720-3
• Faucet:	Chicago Faucet No. 786-GN2FCXKABCP
• Drain:	Elkay LK-35
• Trap:	McGuire 8912C
• Supplies & Stops:	McGuire H2165LK

4. S-4 – Science lab station with integral bowl. See architectural drawings for left or right hand faucets locations. Cold water only, faucet shall have vacuum breaker. Provide two sided gas valve.

• Fixture:	By Others
• Faucet:	Chicago Faucet No. LWS2-A11-G
• Drain:	Elkay LK-35
• Trap:	McGuire 8912C
• Supplies & Stops:	McGuire H2165LK
• Gas Turret	Chicago Faucet No. LGB1-11A-25

5. S-5 – Science lab station with integral bowl. See architectural drawings for left or right hand faucets locations. Hot and cold water, faucet shall have vacuum breaker. Provide two sided gas valve.

• Fixture:	By Others
• Faucet:	Chicago Faucet No. LWM1-A11-E
• Drain:	Elkay LK-35
• Trap:	McGuire 8912C
• Supplies & Stops:	McGuire H2165LK
• Gas Turret	Chicago Faucet No. LGB1-11A-25

6. S-6 – 3 compartment sink with left and right drain boards. Provide 8” on center faucet openings over center bowl. Provide wall mounted pre-rinse assembly and add on faucet

• Fixture:	Advance Tabco model FC-3-1620-18RL
• Faucet:	Regency model 600FPRSFA12K
• Drain:	Included
• Trap:	McGuire 8912C
• Supplies & Stops:	McGuire H2165LK

G. Laundry Trays
   1. LT-1 - Wall and floor mounted molded polyester resin and stone single compartment laundry tray with wall bracket and painted steel legs. Secure to wall and floor. Hot and cold faucet, 6” swing spout, 2-3/8” lever handles, 1/4 turn ceramic cartridge.

• Fixture:	Fiat FL-1
• Faucet:	Chicago Faucet No. 891-E2XKCP
• Trap:	McGuire 8912C 1-1/2"x1-1/2" 17 ga. cast brass trap and tubular wall bend, with tailpiece
• Supplies & Stops:	McGuire H2165LK

H. Mop Basins
   1. MB-1 - Floor mounted molded polyester resin and stone mop basin, 24"x24"x10" H, with 3" drain, stainless steel strainer and vinyl bumper guards.

• Fixture:	Mustee 63M
• Faucet:	Chicago Faucet 782-IS with Watts 8BC vacuum breaker
• Hose:	Mustee 65.700
• Stops:	(Integral with faucet)
• Bumper Guards:	Mustee 63.401

I. Showers
   1. SH-1 - Pressure balanced shower valve with check stops, adjustable temperature limit stop, ASSE 1016 Listed. Brass balljoint showerhead with spray adjustment.

• Shower System:	Symmons Safetymix-1-100-X

   2. SH-2.-.Pressure balanced thermostat shower valve with check stops, adjustable temperature limit stop Lever handle operated. With lever operated diverter valve, brass ball joint with adjustable spray shower head and hand-held adjustable head with 30" slide bar, 60" hose, in-line vacuum breaker and supply elbow. ADA compliable.

• Shower System:	Symmons Safetymix-1-117-FS-B30-X

J. Electric Water Coolers
   1. EWC-1 - Dual level, wall mounted, barrier free and standard height electric water cooler with bottle filler station, stainless steel basin with self-closing front and side wall hanger and 1/4" tailpiece pushbar operators. Rated for 8.0GPH at 80 degree inlet water at 90 degree ambient temperature and 50 degree outlet water, 1/5 HP compressor, 370 watt, 120/60/1. Mount so upper unit spout is at 40" above floor.

• Fixture:	Elkay EZSTL8WSLK
• Trap:	1 1/4"x1 1/4" 17 ga. cast brass, with C.O. plug
• Supply Stops:	McGuire HST02

K. EMERGENCY EYE/FACE WASH AND SHOWER
   1. EEW/SH-1: Emergency eye/face and shower. Barrier-free with pull rod.

• Fixture:	Guardian GBF1909
• Mixing Valve:	Lawler 911E in recessed stainless steel cabinet with stainless steel door and lock

PART 3 – EXECUTION

3.01 INSTALLATION

A. Install plumbing fixtures in accordance with manufacturer’s instructions. Set level and plumb. Secure in place to counters, floors and walls providing solid bearing and secure mounting. Bolt fixture carriers to floor and wall. Secure rough-in fixture piping to prevent movement of exposed piping.

B. Install each fixture with trap easily removable for servicing and cleaning. Install fixture stops in readily accessible location for servicing.

C. Install barrier free fixtures in compliance with Wisconsin Department of Safety and Professional Services SPS 352 and SPS 369 and Federal ADA Accessibility Guidelines. Install barrier free

lavatory traps parallel and adjacent to wall and supplies and stops elevated to 27" above floor to avoid contact by wheelchair users.

D. Provide unions at water connections to drinking fountains and electric water coolers.

E. Each fixture shall have a stop valve installation to control the fixture. Stop valves shall be heavy duty type with brass stems and screwed or sweat inlet connections. Compression type inlets are not acceptable.

F. Cover pipe penetrations with escutcheons. Exposed traps, stops, piping and escutcheons to be chrome plated brass, same items in concealed locations may be of rough brass finish.

G. Set floor mounted water closets, floor mounted service sinks; counter mounted lavs and sinks; lav and sink faucets and drains with full setting bed of flexible non-staining plumber's putty. Cover exposed water closet bolts with bolt covers.

H. Set mop basins to floor and wall with grout or silicone sealant.

I. Seal openings between walls, floors and fixtures with mildew-resistant silicone sealant same color as fixture.

J. Test fixtures to demonstrate proper operation. Replace malfunctioning units or components. Adjust valves for intended water flow rate to fixtures without splashing, noise or overflow. Adjust self-closing lavatory faucets to 15 second cycle. Adjust shower valve temperature limit stops to 110 degree maximum outlet temperature.

K. Protect fixtures during construction. At completion clean plumbing fixtures and trim using manufacturer's recommended cleaning methods and materials.
   1. Select fixture carriers with dimensions compatible with wall construction chassis, etc.

M. Existing Fixtures: Where existing fixtures and fittings are indicated to be reused or relocated, this contractor is responsible for documenting condition prior to construction and for damages incurred during construction.

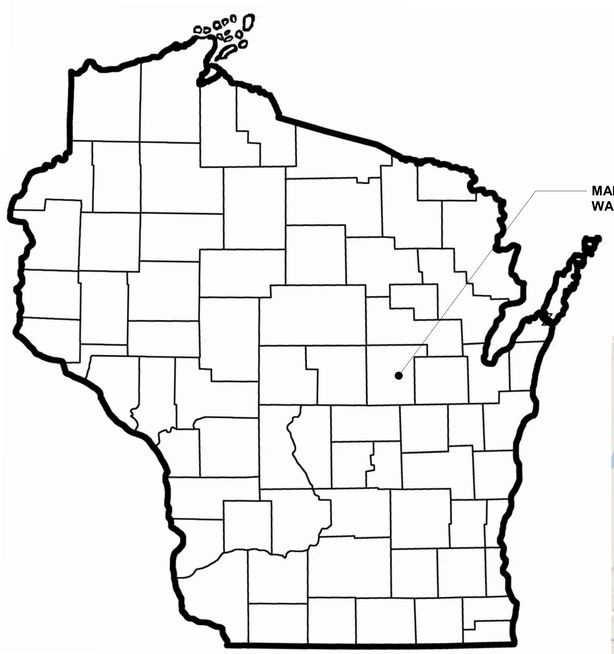
END OF SECTION

COVER SHEET FOR PART 1

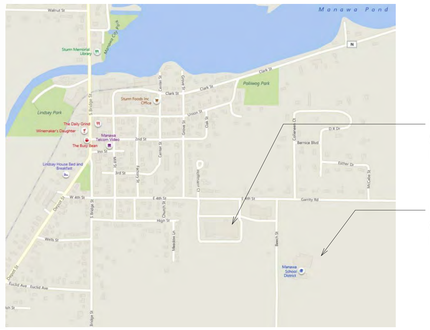
MANAWA ELEMENTARY SCHOOL - ALTERATIONS
MANAWA MIDDLE/HIGH SCHOOL - ADDITIONS & ALTERATIONS

PART 1 - MANAWA ELEMENTARY SCHOOL

800 BEECH STREET
MANAWA, WI 54949



STATE LOCATION MAP



LOCAL AREA MAP

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BIDDING AND CONSTRUCTION SET
27 JUNE 2019

Hoffman
Planning, Design & Construction, Inc.
800.236.2370 | hoffman.net

BIDDING AND CONSTRUCTION SET
PROJECT No. 18268

MANAWA

MANAWA ELEMENTARY SCHOOL - ALTERATIONS
MANAWA MIDDLE/HIGH SCHOOL - ADDITIONS & ALTERATIONS
PART 1 - MANAWA ELEMENTARY SCHOOL
800 BEECH STREET
MANAWA, WI 54949

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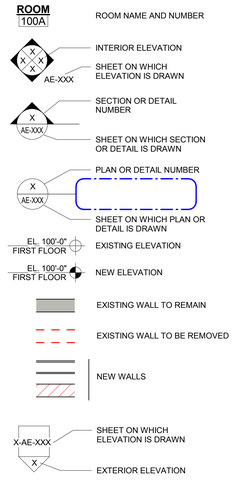
SHEET TITLE:
TITLE SHEET

SHEET NUMBER
1-GI-001

ABBREVIATIONS

AB	ANCHOR BOLT	ID	INSIDE DIAMETER
ACC	ACCESSIBLE	IF	INSIDE FACE
ACT	ACOUSTICAL CEILING TILE	INSUL	INSULATION
ADA	AMERICANS WITH DISABILITIES ACT	IS	INSIDE
ADJ	ADJACENT		
AFF	ABOVE FINISHED FLOOR	JAN	JANITOR
AHU	AIR HANDLING UNIT	JT	JOINT
ALT	ALTERNATE		
ALUM	ALUMINUM	L	ANGLE
		LAM	LAMINATE
B PL	BASE PLATE	LAV	LAVATORY
BF	BOTH FACES	LL	LIVE LOAD
BLDG	BUILDING	LP	LIGHT POLE
BLKG	BLOCKING	LPT	LOW POINT
BM	BENCH MARK	LT	LIGHT
BOT	BOTTOM	LVR	LOUVER
BRG	BEARING		
		MATL	MATERIAL
CB	CATCH BASIN	MAX	MAXIMUM
CJ	CONSTRUCTION JOINT	MECH	MECHANICAL
CJ	CONTROL JOINT	MFG	MANUFACTURER
CL	CENTER LINE	MH	MANHOLE
CLG	CEILING	MIN	MINIMUM
CLG HT	CEILING HEIGHT	MO	MASONRY OPENING
CLR	CLEAR	MTL	METAL
CMU	CONCRETE MASONRY UNIT		
CO	CLEANOUT	NIC	NOT IN CONTRACT
COL	COLUMN	NO	NUMBER
CONC	CONCRETE	NTS	NOT TO SCALE
CONT	CONTINUOUS		
CONTR	CONTRACTOR	OC	ON CENTER
CPT	CARPET	OD	OUTSIDE DIAMETER
CSMT	CASEMENT	OFD	OVERFLOW DRAIN
CSWK	CASEWORK	OPH	OPPOSITE HAND
CT	CERAMIC TILE	OPNG	OPENING
CTR	CENTER	OPT	OPTIONAL
		OS	OUTSIDE
DEMO	DEMOLITION		
DF	DRINKING FOUNTAIN	PART	PARTITION
DH	DOUBLE HUNG	PCC	PRECAST CONCRETE
DIA	DIAMETER	PL	PROPERTY LINE
DIM	DIMENSION	PLAM	PLASTIC LAMINATE
DL	DEAD LOAD	PLAS	PLASTER
DS	DOWNSPOUT	PT	PAINT
DT	DRAIN TILE		
		QT	QUARRY TILE
EJ	EXPANSION JOINT		
EL	ELEVATION	R	RADIUS
ELEV	ELEVATOR	R	RISER
EQ	EQUAL	RD	ROOF DRAIN
EQUIP	EQUIPMENT	REC	RECESSED
EWC	ELECTRIC WATER COOLER	REF	REFERENCE
EXC	EXCAVATE	RFG	ROOFING
EXIST	EXISTING	RO	ROUGH OPENING
EXP BT	EXPANSION BOLT		
		SCP	SCUPPER
FC BRK	FACE BRICK	SHTHG	SHEATHING
FCO	FLOOR CLEANOUT	SP	SURVEY POINT
FD	FLOOR DRAIN	SSTL	STAINLESS STEEL
FDTN	FOUNDATION	STL JST	STEEL JOIST
FE	FIRE EXTINGUISHER	SUSP	SUSPENDED
FEC	FIRE EXTINGUISHER CABINET		
FIN FLR	FINISH FLOOR	T or TR	TREAD
FO	FACE OF	TO	TOP OF
FTG	FOOTING	TYP	TYPICAL
GB	GRAB BAR	UL	UNDERWRITERS LABORATORY
GALV	GALVANIZED	UNEX	UNEXCAVATED
GSB	GYPSUM SHEATHING BOARD	UNO	UNLESS NOTED OTHERWISE
GYP BD	GYPSUM BOARD		
		VB	VINYL BASE
HB	HOSE BIB	VCT	VINYL COMPOSITE TILE
HC	HANDICAP	VTR	VENT THROUGH ROOF
HCP	HANDICAPPED		
HDR	HEADER	WC	WATER CLOSET
HDW	HARDWARE	W/O	WITH OUT
HM	HOLLOW METAL	WP	WORK POINT
HPT	HIGH POINT	WWF	WELDED WIRE FABRIC

DRAWING SYMBOLS LEGEND:



GENERAL NOTES:

1. ALL WORK OF ALL TRADES SHALL BE COMPLETED IN ACCORDANCE WITH ALL GOVERNING CODES AND ORDINANCES. IF ANY CONTRACTOR OBSERVES THAT ANY OF THE CONTRACT DOCUMENTS ARE AT VARIANCE WITH APPLICABLE LAWS, STATUTES, BUILDING CODES, OR ORDINANCES, THEY SHALL PROMPTLY NOTIFY HOFFMAN.
2. EACH CONTRACTOR SHALL VERIFY ALL CONDITIONS AND DIMENSIONS AT THE SITE; NEITHER THE OWNER NOR HOFFMAN ASSUMES RESPONSIBILITY FOR CONDITIONS OR DIMENSIONS SHOWN AS EXISTING.
3. NOTIFY HOFFMAN IMMEDIATELY IF ANY HAZARDOUS MATERIALS ARE ENCOUNTERED DURING DEMOLITION, REMODELING, OR EXCAVATION, AND STOP WORK IN THE IMMEDIATE AREA UNTIL A COURSE OF ACTION IS DETERMINED. DO NOT ABATE.
4. CONTRACTOR IS RESPONSIBLE FOR REVIEWING ALL CONTRACT DOCUMENTS FOR WORK PERTAINING TO THEIR SCOPE, INCLUDING CODE AND REFERENCE SHEETS. KEYNOTE LIST ON INDIVIDUAL SHEETS MAY NOT INCLUDE ALL KEYNOTES ON THAT SHEET.
5. PLAN NOTES ARE GLOBAL; INDIVIDUAL PLAN NOTES MAY NOT BE PRESENT ON EVERY PLAN SHEET.
6. NEITHER HOFFMAN NOR THE OWNER ARE RESPONSIBLE FOR ERRORS IN SCALING DUE TO PRINTING, REPRODUCTION, OR ELECTRONIC FILE CREATION. SCALE AT YOUR OWN RISK.

CONSULTANTS:

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STEVENS POINT, WI 54481
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APPLETON, WI 54913-7889
920-734-9867

AUDIO VISUAL:
ARROW AV GROUP
1209 FULLVIEW DRIVE
APPLETON, WI 54913
920-730-4888

FIRE DETECTION & ALARM:
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414-790-0232

PLUMBING:
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255 NORTH 21st STREET
MILWAUKEE, WI 53223
414-475-5554

MECHANICAL:
MEAD & HUNT
10700 WEST RESEARCH DRIVE, SUITE 155
WAUWATOSA, WI 53226
414-790-0232

ELECTRICAL:
MEAD & HUNT
10700 WEST RESEARCH DRIVE, SUITE 155
WAUWATOSA, WI 53226
414-790-0232

TELECOMMUNICATION:
MEAD & HUNT
10700 WEST RESEARCH DRIVE, SUITE 155
WAUWATOSA, WI 53226
414-790-0232

PART 1 SHEET INDEX

MANAWA ELEMENTARY SCHOOL
800 BEECH ST.,
MANAWA, WI 54949

WISCONSIN DSPS TRANSACTION ID 3234629

GENERAL

1-GI-001	TITLE SHEET
1-GI-002	SHEET INDEX, SYMBOLS, GENERAL NOTES, CONSULTANTS LIST

LIFE SAFETY

1-GI-101	CODE PLAN

ARCHITECTURAL

1-AD-101	DEMOLITION PLAN - AREA A
1-AD-102	DEMOLITION PLAN - AREA B
1-AD-103	DEMOLITION PLAN - AREA C
1-AD-203	DEMOLITION CEILING PLAN - AREA A
1-AE-101	FLOOR PLAN - AREA A
1-AE-102	FLOOR PLAN - AREA B
1-AE-103	FLOOR PLAN - AREA C
1-AE-401	TOILET ROOM STANDARDS
1-AE-402	ENLARGED PLAN - AREA C
1-AE-501	WALL SECTIONS, WALL TYPES, WALL DETAILS
1-AE-601	DOOR SCHEDULE, DOOR & FRAME TYPES, DOOR DETAILS
1-AE-701	CASEWORK / INTERIOR ELEVATIONS
1-AF-103	REFLECTED CEILING PLAN - AREA C, CEILING DETAILS
1-AF-601	ROOM FINISH SCHEDULE
1-AF-801	FLOOR PATTERN PLAN - AREA A
1-AF-802	FLOOR PATTERN PLAN - AREA B
1-AF-803	FLOOR PATTERN PLAN - AREA C

PLUMBING

1-PD-101	PLUMBING DEMOLITION PLAN
1-PL-101	PLUMBING NEW WORK PLANS

HVAC

1-MS-001	NOTES, SYMBOLS AND ABBREVIATIONS
1-MH-101	FIRST FLOOR MECHANICAL PLANS - AREA A
1-MH-102	FIRST FLOOR MECHANICAL PLANS - AREA C
1-MS-501	HVAC DETAILS & SCHEDULES

ELECTRICAL AND FIRE ALARM & DETECTION

1-EE-001	ELECTRICAL & FIRE ALARM NOTES, SYMBOLS & ABBREVIATIONS
1-EPD-101	FIRST FLOOR POWER & FIRE ALARM DEMOLITION PLAN - AREA A
1-EPD-102	FIRST FLOOR POWER & FIRE ALARM DEMOLITION PLAN - AREA B
1-EPD-103	FIRST FLOOR POWER & FIRE ALARM DEMOLITION PLAN - AREA C
1-ELD-101	FIRST FLOOR LIGHTING DEMOLITION PLAN - AREA A
1-ELD-102	FIRST FLOOR LIGHTING DEMOLITION PLAN - AREA B
1-ELD-103	FIRST FLOOR LIGHTING DEMOLITION PLAN - AREA C
1-EP-101	FIRST FLOOR POWER & FIRE ALARM PLAN - AREA A
1-EP-102	FIRST FLOOR POWER & FIRE ALARM PLAN - AREA B
1-EP-103	FIRST FLOOR POWER & FIRE ALARM PLAN - AREA C
1-EL-101	FIRST FLOOR LIGHTING PLAN - AREA A
1-EL-102	FIRST FLOOR LIGHTING PLAN - AREA B
1-EL-103	FIRST FLOOR LIGHTING PLAN - AREA C
1-EE-401	ENLARGED PLANS
1-EE-402	ENLARGED PLANS
1-EE-601	SCHEDULES
1-EE-901	ONE-LINE DIAGRAM
1-TE-001	TECH SYSTEMS NOTES, SYMBOLS & ABBREVIATIONS
1-TD-103	FIRST FLOOR COMM DEMOLITION PLAN - AREA C
1-TA-103	FIRST FLOOR COMM PLAN - AREA C
1-TE-401	ENLARGED PLANS, ELEVATIONS & SECTIONS

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CONSULTANT

MANAWA ELEMENTARY SCHOOL - ALTERATIONS
MANAWA MIDDLE/HIGH SCHOOL - ADDITIONS & ALTERATIONS
PART 1 - MANAWA ELEMENTARY SCHOOL
800 BEECH STREET
MANAWA, WI 54949

MARK	DATE

ISSUED: PRELIMINARY

PROJECT 18268

CAD DWG

DRAWN BY: Author

CHECKED BY: Checker

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SHEET TITLE:
SHEET INDEX, SYMBOLS, GEN. NOTES, CONSULTANTS

SHEET NUMBER:
1-GI-002

1 CODE PLAN
SCALE 1/16" = 1'-0"
AS REFERENCED BY:

PRELIMINARY
NOT FOR CONSTRUCTION

WALL PRIORITY LEGEND

PRIORITY	#	PLAN GRAPHIC	PARTITION TYPE
HIGHEST	1	4FW 4FW	4 HOUR - FIRE WALL
	2	3FW 3FW	3 HOUR - FIRE WALL
	3	2FW 2FW	2 HOUR - FIRE WALL
	4	4FB 4FB	4 HOUR - FIRE BARRIER
	5	3FB 3FB	3 HOUR - FIRE BARRIER
	6	2FB 2FB	2 HOUR - FIRE BARRIER
MEDIUM	7	1FB 1FB	1 HOUR - FIRE BARRIER
	8	1FP 1FP	1 HOUR - FIRE PARTITION
	9	1SB 1SB	1 HOUR - SMOKE BARRIER
	10	1BW 1BW	1 HOUR - BEARING WALL
	11	5FP 5FP	1/2 HOUR - FIRE PARTITION
	12	0SP 0SP	0 HOUR - SMOKE PARTITION (WALL TO LIMIT THE TRANSFER OF SMOKE (DOORS AND GLAZING FOR BORROWED LIGHTS ARE NOT RATED)
LOWEST	13		NON-RATED

NOTE: PARTITIONS WITH A HIGHER PRIORITY # TAKE PRECEDENCE OVER PARTITIONS WITH A LOWER PRIORITY # - SEE AE-501 FOR DETAILS

CODE SHEET KEY

- 72" / 56" / 378 — PROVIDED WIDTH / REQUIRED WIDTH / OCCUPANT LOAD
- FIRE EXTINGUISHER
- FIRE EXTINGUISHER TYPE "K"
- EXIT LIGHT
- AREA OF LEVEL 2 ALTERATION
- EGRESS PATH

BUILDING DATA SUMMARY

APPLICABLE CODES:

BUILDING ACCESSIBILITY AND LIFE SAFETY:
- 2015 IBC - International Building Code
- 2015 IEBC - Existing Building Code
- Wisconsin SPS 362
- 2015 IECC - International Energy Conservation Code
- 2009 ICC/ANSI A117.1 - American National Standards Institute

BUILDING AREA:

Existing First Floor: 81,786 sf
First Floor Alterations: 1,372 SQ. FT.
Level 2 Alterations: <50%

BUILDING OCCUPANCIES / TYPE (IBC CH. 3&5):

Primary Occupancy:
- E Education

Secondary Occupancy:
- E / A-2) Cafeteria / Commons (per IBC 303.1.3)
- E/ A-3) Gymnasium (per IBC 303.1.3)
- B Administrative Offices
- S-2 Storage / Mechanical

Accessory Occupancy:
- S-1 Storage

TYPE OF CONSTRUCTION (IBC CH. 6 & 7):
- All existing construction is Construction Type IIB
- All alterations shall be Construction Type IIB

MEANS OF EGRESS / OCCUPANT LOAD (IBC CH. 10):
- Egress paths and occupant load unchanged.

PLUMBING CALCULATIONS (IBC CH. 29):
- Occupant load and fixture counts unchanged

ACCESSIBILITY (IBC CH. 11, IEBC CH. 5&6):
- The new construction and all Level 2 zones meet all accessibility requirements per IBC Chapter 11 and ANSI A117.1 (2009 Edition)

SPRINKLER SYSTEM / FIRE SAFETY:
- Existing building not sprinklered

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CONSULTANT:

MANAWA

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MANAWA MIDDLE/HIGH SCHOOL - ADDITIONS & ALTERATIONS
PART 1 - MANAWA ELEMENTARY SCHOOL
800 BEECH STREET
MANAWA, WI 54949

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PROJECT NO:	18268
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SHEET TITLE: CODE PLAN

SHEET NUMBER: 1-GI-101

1 FIRST FLOOR DEMOLITION PLAN - AREA A

SCALE 1/8" = 1'-0"
AS REFERENCED BY:

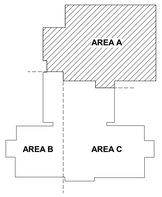
PRELIMINARY
NOT FOR CONSTRUCTION

GENERAL DEMOLITION NOTES

1. DEMOLOTION NOTES ON THIS SHEET APPLY TO THE MIDDLE SCHOOL / HIGH SCHOOL PROJECT ONLY.
2. NOT ALL NOTES ARE APPLICABLE TO THIS SHEET.
3. REFERENCE SECTION 02 41 00 FOR ITEMS TO BE REMOVED AND SALVAGED FOR OWNER RE-USE.
4. SEE SHEET XXX FOR CEILING DEMOLITION PLANS.
5. COORDINATE ALL DEMOLITION WORK WITH NEW CONSTRUCTION. REFER TO AE SHEETS THIS SET.
6. REFERENCE MECHANICAL, PLUMBING, ELECTRICAL DEMOLITION PLANS FOR ADDITIONAL INFORMATION.
7. IN AREAS SCHEDULED TO RECIEVE NEW FLOORING, REMOVE ALL FLOORING, SETTING BEDS, MASTICS, ADHESIVES AND PREPARE FLOOR TO RECEIVE NEW FINISHES. REFER TO SECTION 09 XX XX - FOR ADDITIONAL INFORMATION.

DEMOLITION NOTES KEY

NO.	DESCRIPTION
8	02 41 00 C2 - SAWCUT AND REMOVE PORTLAND CEMENT PAVING
9	02 41 00 F5 - REMOVE SUSPENDED CEILING
19	02 41 00 F1 - REMOVE FLOORING AND ADHESIVE
24	02 41 00 P1 - REMOVE FIXTURE - PLUMBING TO DISCONNECT & CAP
30	02 41 00 B2 - REMOVE MASONRY WALL
31	02 41 00 G2A - REMOVE FURNISHINGS AND STORE FOR REINSTALLATION
32	02 41 00 F2 - REMOVE BASE
33	02 41 00 D1A - REMOVE AND STORE DOOR
34	02 41 00 G1A - REMOVE AND STORE EXISTING CASEWORK
36	02 41 00 - REMOVE LOCKER BASE



KEY PLAN

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CONSULTANT:

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SHEET TITLE:
DEMOLITION PLAN - AREA A

SHEET NUMBER:
1-AD-101

1 FIRST FLOOR DEMOLITION PLAN - AREA B

SCALE 1/8" = 1'-0"
AS REFERENCED BY:

PRELIMINARY
NOT FOR CONSTRUCTION

GENERAL DEMOLITION NOTES

1. DEMOLOTION NOTES ON THIS SHEET APPLY TO THE MIDDLE SCHOOL / HIGH SCHOOL PROJECT ONLY.
2. NOT ALL NOTES ARE APPLICABLE TO THIS SHEET.
3. REFERENCE SECTION 02 41 00 FOR ITEMS TO BE REMOVED AND SALVAGED FOR OWNER RE-USE.
4. SEE SHEET XXX FOR CEILING DEMOLITION PLANS.
5. COORDINATE ALL DEMOLITION WORK WITH NEW CONSTRUCTION. REFER TO AE SHEETS THIS SET.
6. REFERENCE MECHANICAL, PLUMBING, ELECTRICAL DEMOLITION PLANS FOR ADDITIONAL INFORMATION.
7. IN AREAS SCHEDULED TO RECIEVE NEW FLOORING, REMOVE ALL FLOORING, SETTING BEDS, MASTICS, ADHESIVES AND PREPARE FLOOR TO RECEIVE NEW FINISHES. REFER TO SECTION 09 XX XX - FOR ADDITIONAL INFORMATION.

(#) DEMOLITION NOTES KEY

NO.	DESCRIPTION
8	02 41 00 C2 - SAWCUT AND REMOVE PORTLAND CEMENT PAVING
9	02 41 00 F5 - REMOVE SUSPENDED CEILING
19	02 41 00 F1 - REMOVE FLOORING AND ADHESIVE
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31	02 41 00 G2A - REMOVE FURNISHINGS AND STORE FOR REINSTALLATION
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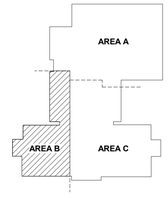
33	02 41 00 D1A - REMOVE AND STORE DOOR
34	02 41 00 G1A - REMOVE AND STORE EXISTING CASEWORK
36	02 41 00 - REMOVE LOCKER BASE



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SHEET TITLE:
DEMOLITION PLAN - AREA B

SHEET NUMBER:
1-AD-102

1 FIRST FLOOR DEMOLITION PLAN - AREA C

SCALE 1/8" = 1'-0"
AS REFERENCED BY:

FOR BIDS
NOT FOR CONSTRUCTION

GENERAL DEMOLITION NOTES

1. DEMOLOTION NOTES ON THIS SHEET APPLY TO THE MIDDLE SCHOOL / HIGH SCHOOL PROJECT ONLY.
2. NOT ALL NOTES ARE APPLICABLE TO THIS SHEET.
3. REFERENCE SECTION 02 41 00 FOR ITEMS TO BE REMOVED AND SALVAGED FOR OWNER RE-USE.
4. SEE SHEET XXX FOR CEILING DEMOLITION PLANS.
5. COORDINATE ALL DEMOLITION WORK WITH NEW CONSTRUCTION. REFER TO AE SHEETS THIS SET.
6. REFERENCE MECHANICAL, PLUMBING, ELECTRICAL DEMOLITION PLANS FOR ADDITIONAL INFORMATION.
7. IN AREAS SCHEDULED TO RECIEVE NEW FLOORING, REMOVE ALL FLOORING, SETTING BEDS, MASTICS, ADHESIVES AND PREPARE FLOOR TO RECEIVE NEW FINISHES. REFER TO SECTION 09 XX XX - FOR ADDITIONAL INFORMATION.

(#) DEMOLITION NOTES KEY

NO.	DESCRIPTION
8	02 41 00 C2 - SAWCUT AND REMOVE PORTLAND CEMENT PAVING
9	02 41 00 F5 - REMOVE SUSPENDED CEILING
19	02 41 00 F1 - REMOVE FLOORING AND ADHESIVE
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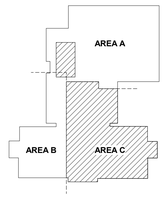
32	02 41 00 F2 - REMOVE BASE
33	02 41 00 D1A - REMOVE AND STORE DOOR
34	02 41 00 G1A - REMOVE AND STORE EXISTING CASEWORK
36	02 41 00 - REMOVE LOCKER BASE



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SHEET TITLE:

DEMOLITION PLAN - AREA C

SHEET NUMBER:

1-AD-103

1 CEILING DEMOLITON PLAN - AREA C

SCALE 1/8" = 1'-0"
AS REFERENCED BY:

2 PARTIAL CEILING DEMOLITON PLAN - AREA A

SCALE 1/8" = 1'-0"
AS REFERENCED BY:

PRELIMINARY
NOT FOR CONSTRUCTION

GENERAL DEMOLITION NOTES

1. DEMOLOTION NOTES ON THIS SHEET APPLY TO THE MIDDLE SCHOOL / HIGH SCHOOL PROJECT ONLY.
2. NOT ALL NOTES ARE APPLICABLE TO THIS SHEET.
3. REFERENCE SECTION 02 41 00 FOR ITEMS TO BE REMOVED AND SALVAGED FOR OWNER RE-USE.
4. SEE SHEET XXX FOR CEILING DEMOLITION PLANS.
5. COORDINATE ALL DEMOLITION WORK WITH NEW CONSTRUCTION. REFER TO AE SHEETS THIS SET.
6. REFERENCE MECHANICAL, PLUMBING, ELECTRICAL DEMOLITION PLANS FOR ADDITIONAL INFORMATION.
7. IN AREAS SCHEDULED TO RECIEVE NEW FLOORING. REMOVE ALL FLOORING, SETTING BEDS, MASTICS, ADHESIVES AND PREPARE FLOOR TO RECEIVE NEW FINISHES. REFER TO SECTION 09 XX XX - FOR ADDITIONAL INFORMATION.

(#) DEMOLITION NOTES KEY

NO.	DESCRIPTION
8	02 41 00 C2 - SAWCUT AND REMOVE PORTLAND CEMENT PAVING
9	02 41 00 F5 - REMOVE SUSPENDED CEILING
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33	02 41 00 D1A - REMOVE AND STORE DOOR
34	02 41 00 G1A - REMOVE AND STORE EXISTING CASEWORK
36	02 41 00 - REMOVE LOCKER BASE

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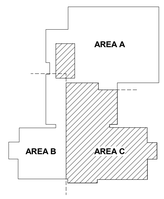

KEY PLAN

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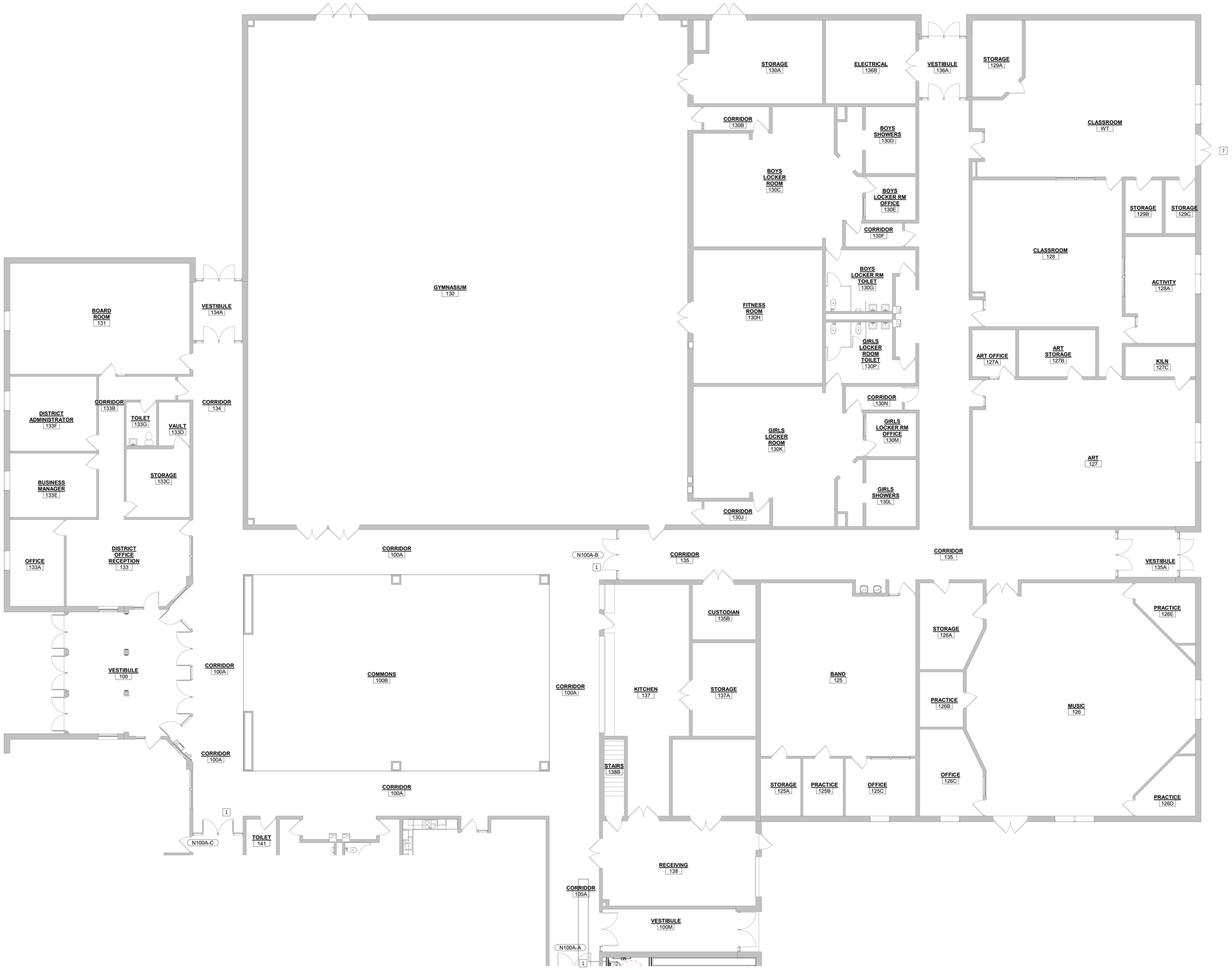
SHEET TITLE:
DEMOLITION CEILING PLANS

SHEET NUMBER:
1-AD-203



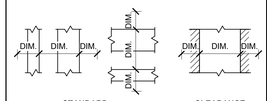
1 FIRST FLOOR PLAN - AREA A

SCALE 1/8" = 1'-0"
AS REFERENCED BY:

FOR BIDS
NOT FOR CONSTRUCTION

WALL DIMENSION KEY

NOTE:
ALL WALLS ARE DIMENSIONED TO FACE OF STUD OR FACE OF MASONRY. CLEARANCE DIMENSIONS ARE FROM FACE OF STUDS OR FACE OF MASONRY.



STANDARD DIMENSIONING | CLEARANCE DIMENSIONING

WALL TYPE NOTES

1. 09 21 16 - IDENTIFY ALL RATED WALLS WITH A FIRE RATED LABEL / STENCIL 8" ABOVE THE CEILING AT 10'-0" O.C. MAX WITH 1 1/2" LETTERS BRIGHTLY INDICATED ON A CONTRASTING BACKGROUND. MINIMUM 1 LABEL / STENCIL PER ROOM / WALL RUN.
2. ALL OPENINGS IN RATED WALLS SHALL PROVIDE OPENING PROTECTION AS REQUIRED BY CODE.
3. SEE CODE PLANS FOR LOCATION OF WALLS/ROOMS REQUIRED TO BE RATED.
4. FOR ALL UL DESIGN NUMBERS REFER TO THE FIRE RESISTANCE DIRECTORY: UNDERWRITERS LABORATORIES, LATEST EDITION AND/OR SHEET GI-501
5. SEE PROJECT MANUAL, 09 21 16 GYPSUM BOARD ASSEMBLIES, FOR BOARD MATERIALS AT SPECIFIC LOCATION THAT ARE REQUIRED TO BE DIFFERENT THAN THIS KEY NOTED MATERIAL.
6. ANY / ALL WALL TYPES SHOWING SOUND ATTENUATION BLANKET INSULATION SHALL BE CONSIDERED AS AN "ACOUSTICAL WALL".

FLOOR PLAN LEGEND

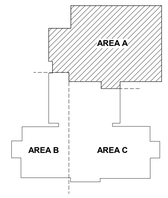
- X — DENOTES WINDOW TYPE. SEE SHEET AE-603
- NIC — DENOTES ITEM NOT IN CONTRACT - BY OWNER
- XXXX — DENOTES WALL TYPE - SEE SHEET AE-501 FOR EXTERIOR AND AE-502 FOR INTERIOR WALLS

PLAN NOTES KEY

NO.	DESCRIPTION
1	SEE DOOR & FRAME SCHEDULE FOR WORK AT EACH LEAF
2	04 20 00 A - CONCRETE MASONRY UNITS - TOOTH IN NEW CMU INTO EXISTING COURSING
3	EXTEND WALL TO MIN. 4" ABOVE CEILING HT.
5	03 30 00 D - NEW CONCRETE SLAB AT AREA OF REMOVED SLAB. MATCH EXISTING THICKNESS. SLOPE TO DRAIN. REFER TO PLUMBING PLANS.
6	03 30 00 D - PATCH CONCRETE SLAB AT AREA OF REMOVED CMU WALL.
7	09 91 13 A - PAINT - PAINT DOORS - SEE ROOM FINISH SCHEDULE
8	04 20 00 A2 - PATCH/REPAIR AREA OF REMOVED WALL WITH NEW BULLNOSE CMU
9	04 20 00 A CONCRETE MASONRY UNITS AND 05 12 00 STEEL LINTEL - SEE LINTEL SCHEDULE
10	12 35 30 - RE-INSTALL REMOVED CASEWORK
11	22 30 00 - RE-INSTALL REMOVED PLUMBING FIXTURES

KEYNOTE LEGEND

KEY NO.	KEYNOTE TEXT



KEY PLAN

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CONSULTANT:

MANAWA

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SHEET TITLE:
FIRST FLOOR PLAN - AREA A

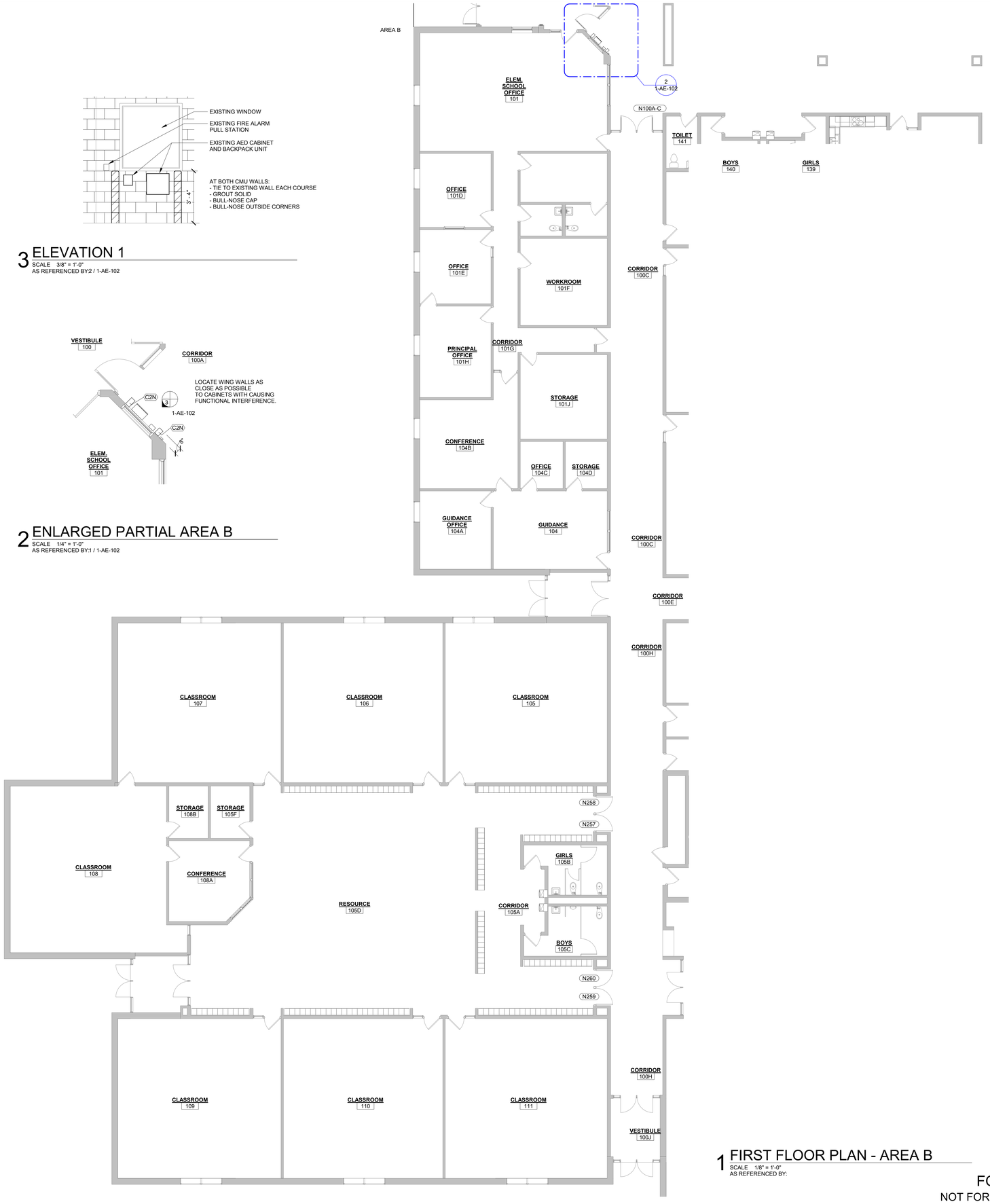
SHEET NUMBER:
1-AE-101

3 ELEVATION 1

SCALE 3/8" = 1'-0"
AS REFERENCED BY:2 / 1-AE-102

2 ENLARGED PARTIAL AREA B

SCALE 1/4" = 1'-0"
AS REFERENCED BY:1 / 1-AE-102



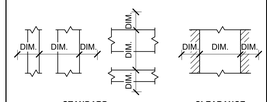
1 FIRST FLOOR PLAN - AREA B

SCALE 1/8" = 1'-0"
AS REFERENCED BY:

FOR BIDS
NOT FOR CONSTRUCTION

WALL DIMENSION KEY

NOTE:
ALL WALLS ARE DIMENSIONED TO FACE OF STUD OR FACE OF MASONRY. CLEARANCE DIMENSIONS ARE FROM FACE OF STUDS OR FACE OF MASONRY.



WALL TYPE NOTES

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FLOOR PLAN LEGEND

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NIC	DENOTES ITEM NOT IN CONTRACT - BY OWNER
XXXX	DENOTES WALL TYPE - SEE SHEET AE-501 FOR EXTERIOR AND AE-502 FOR INTERIOR WALLS

PLAN NOTES KEY

NO.	DESCRIPTION
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2	04 20 00 A - CONCRETE MASONRY UNITS - TOOTH IN NEW CMU INTO EXISTING COURSING
3	EXTEND WALL TO MIN. 4" ABOVE CEILING HT.
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6	03 30 00 D - PATCH CONCRETE SLAB AT AREA OF REMOVED CMU WALL.
7	09 91 13 A - PAINT - PAINT DOORS - SEE ROOM FINISH SCHEDULE
8	04 20 00 A2 - PATCH/REPAIR AREA OF REMOVED WALL WITH NEW BULLNOSE CMU
9	04 20 00 A CONCRETE MASONRY UNITS AND 05 12 00 STEEL LINTEL - SEE LINTEL SCHEDULE
10	12 35 30 - RE-INSTALL REMOVED CASEWORK
11	22 30 00 - RE-INSTALL REMOVED PLUMBING FIXTURES

KEYNOTE LEGEND

KEY NO.	KEYNOTE TEXT

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CONSULTANT:

MANAWA

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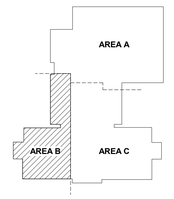
MANAWA MIDDLE/HIGH SCHOOL - ADDITIONS & ALTERATIONS
PART 1 - MANAWA ELEMENTARY SCHOOL
800 BEECH STREET
MANAWA, WI 54949



KEY PLAN

TRUE NORTH
PLAN NORTH

MARK	DATE
ISSUED: PRELIMINARY	
PROJECT NO: 18268	
CAD DWG FILE:	
DRAWN BY: Author	
CHECKED BY: Checker	

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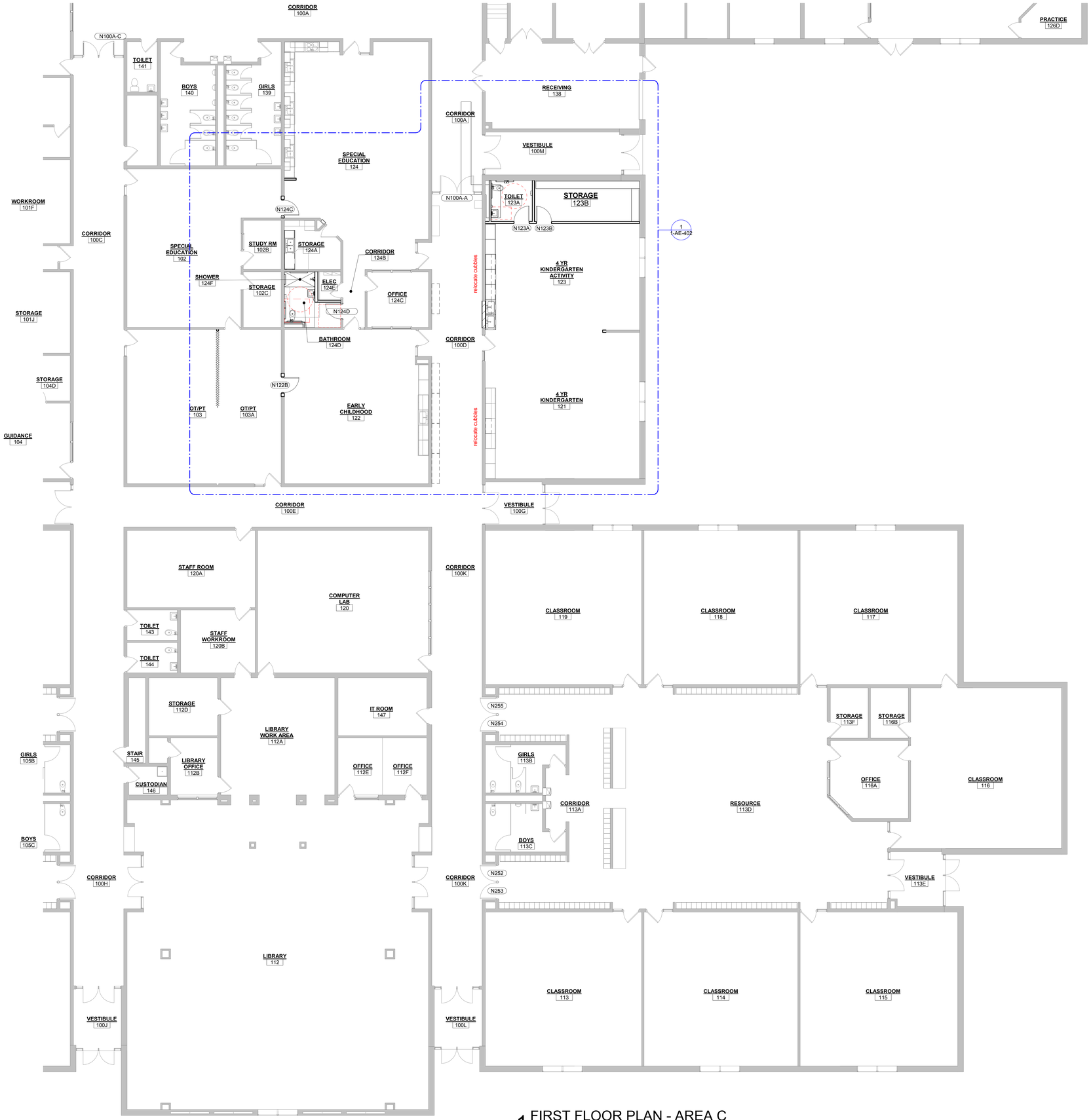
SHEET TITLE:
FIRST FLOOR PLAN - AREA B

SHEET NUMBER:
1-AE-102



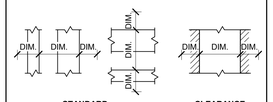
1 FIRST FLOOR PLAN - AREA C

SCALE 1/8" = 1'-0"
AS REFERENCED BY:

FOR BIDS
NOT FOR CONSTRUCTION

WALL DIMENSION KEY

NOTE:
ALL WALLS ARE DIMENSIONED TO FACE OF STUD OR FACE OF MASONRY. CLEARANCE DIMENSIONS ARE FROM FACE OF STUDS OR FACE OF MASONRY.



STANDARD DIMENSIONING | CLEARANCE DIMENSIONING

WALL TYPE NOTES

1. 09 21 16 - IDENTIFY ALL RATED WALLS WITH A FIRE RATED LABEL / STENCIL 8" ABOVE THE CEILING AT 10'-0" O.C. MAX WITH 1 1/2" LETTERS BRIGHTLY INDICATED ON A CONTRASTING BACKGROUND. MINIMUM 1 LABEL / STENCIL PER ROOM / WALL RUN.
2. ALL OPENINGS IN RATED WALLS SHALL PROVIDE OPENING PROTECTION AS REQUIRED BY CODE.
3. SEE CODE PLANS FOR LOCATION OF WALLS/ROOMS REQUIRED TO BE RATED.
4. FOR ALL UL DESIGN NUMBERS REFER TO THE FIRE RESISTANCE DIRECTORY: UNDERWRITERS LABORATORIES, LATEST EDITION AND/OR SHEET GI-501
5. SEE PROJECT MANUAL, 09 21 16 GYPSUM BOARD ASSEMBLIES, FOR BOARD MATERIALS AT SPECIFIC LOCATION THAT ARE REQUIRED TO BE DIFFERENT THAN THIS KEY NOTED MATERIAL.
6. ANY / ALL WALL TYPES SHOWING SOUND ATTENUATION BLANKET INSULATION SHALL BE CONSIDERED AS AN "ACOUSTICAL WALL".

FLOOR PLAN LEGEND

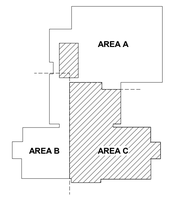
- X — DENOTES WINDOW TYPE. SEE SHEET AE-603
- NIC — DENOTES ITEM NOT IN CONTRACT - BY OWNER
- XXXX — DENOTES WALL TYPE - SEE SHEET AE-501 FOR EXTERIOR AND AE-502 FOR INTERIOR WALLS

PLAN NOTES KEY

NO.	DESCRIPTION
1	SEE DOOR & FRAME SCHEDULE FOR WORK AT EACH LEAF
2	04 20 00 A - CONCRETE MASONRY UNITS - TOOTH IN NEW CMU INTO EXISTING COURSING
3	EXTEND WALL TO MIN. 4" ABOVE CEILING HT.
5	03 30 00 D - NEW CONCRETE SLAB AT AREA OF REMOVED SLAB. MATCH EXISTING THICKNESS. SLOPE TO DRAIN. REFER TO PLUMBING PLANS.
6	03 30 00 D - PATCH CONCRETE SLAB AT AREA OF REMOVED CMU WALL
7	09 91 13 A - PAINT - PAINT DOORS - SEE ROOM FINISH SCHEDULE
8	04 20 00 A2 - PATCH/REPAIR AREA OF REMOVED WALL WITH NEW BULLNOSE CMU
9	04 20 00 A CONCRETE MASONRY UNITS AND 05 12 00 STEEL LINTEL - SEE LINTEL SCHEDULE
10	12 35 30 - RE-INSTALL REMOVED CASEWORK
11	22 30 00 - RE-INSTALL REMOVED PLUMBING FIXTURES

KEYNOTE LEGEND

KEY NO.	KEYNOTE TEXT



KEY PLAN

TRUE NORTH | PLAN NORTH

Hoffman
Planning, Design & Construction, Inc.
800.236.2370 | hoffman.net

CONSULTANT:

MANAWA

MANAWA ELEMENTARY SCHOOL - ALTERATIONS
MANAWA MIDDLE/HIGH SCHOOL - ADDITIONS & ALTERATIONS
PART 1 - MANAWA ELEMENTARY SCHOOL
800 BEECH STREET
MANAWA, WI 54949

MARK	DATE

ISSUED: PRELIMINARY
PROJECT NO: 18268
CAD DWG FILE:
DRAWN BY: Author
CHECKED BY: Checker

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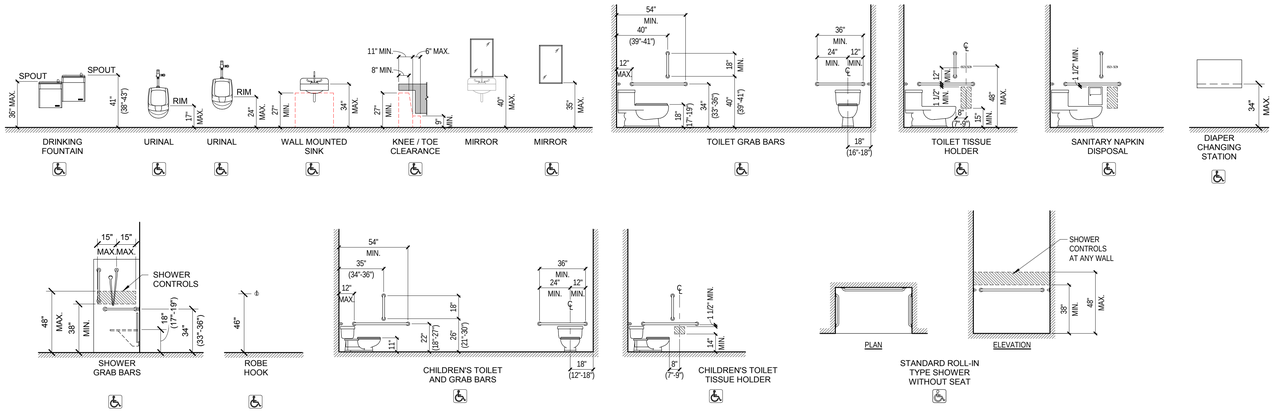
SHEET TITLE:
FIRST FLOOR PLAN - AREA C

SHEET NUMBER:
1-AE-103



MOUNTING LOCATIONS - FIXTURES AND ACCESSORIES

SCALE 1/4" = 1'-0"

MOUNTING LOCATIONS - TOILET ACCESORIES

SCALE 1/4" = 1'-0"

T1 HC ACCESSIBLE TOILET ROOM
SCALE 1/4" = 1'-0"

WCG1 TYP. HC ACCESS WATER CLOSET
SCALE 1/4" = 1'-0"

WCG2 WATER CLOSET
SCALE 1/4" = 1'-0"

UG1 TYPICAL HC ACCESS URINAL
SCALE 1/4" = 1'-0"

UG2 URINAL
SCALE 1/4" = 1'-0"

SG1 TYPICAL HC ACCESS LAV
SCALE 1/4" = 1'-0"

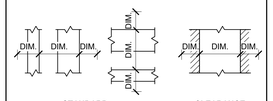
SG2 SINK
SCALE 1/4" = 1'-0"

TOILET ACCESSORIES SCHEDULE - 10 28 00

TAG	DESCRIPTION	MFR	MODEL	REMARKS
TA-1				
TA-2	Stainless Steel Mirror	Bobrick	B-165 2436	
TA-3		Bobrick	B-262	
TA-6				
TA-9				

WALL DIMENSION KEY

NOTE:
ALL WALLS ARE DIMENSIONED TO FACE OF STUD OR FACE OF MASONRY. CLEARANCE DIMENSIONS ARE FROM FACE OF STUDS OR FACE OF MASONRY.



STANDARD DIMENSIONING

CLEARANCE DIMENSIONING

TOILET ROOM & ACCESSORY NOTES:

1. ENLARGED PLANS INDICATE TYPICAL DIMENSIONS, LOCATIONS FOR ACCESSORIES AND SPECIALTIES AND REQUIRED CLEARANCES TO BE MAINTAINED. TOILET ROOM AND SINK "TYPES" ARE KEYED ON FLOOR PLANS.
2. REFER TO FLOOR PLAN SHEETS FOR TOILET ROOM AND/OR FIXTURE ORIENTATION, DOOR LOCATION(S), WALL CONSTRUCTION, AND ADDITIONAL EQUIPMENT ITEMS.
3. DIMENSIONS INDICATED ARE TYPICAL UNLESS NOTED OTHERWISE ON DIMENSIONED FLOOR PLAN SHEETS.
4. DIMENSIONS SHOWN FOR ACCESSORIES AND EQUIPMENT ITEMS AND CLEAR FLOOR SPACE ARE FROM FACE OF ROOM FINISH (SUCH AS TILE).
5. "GENERIC" PLUMBING FIXTURES AND ACCESSORIES ARE SHOWN - SEE PLUMBING DRAWINGS AND/OR PROJECT MANUAL FOR SCHEDULED FIXTURES AND ACCESSORIES.

KEYNOTE LEGEND

KEY NO.	KEYNOTE TEXT

FOR BIDS
NOT FOR CONSTRUCTION

Hoffman
Planning, Design & Construction, Inc.
800.236.2370 | hoffman.net

CONSULTANT:

MANAWA

MANAWA ELEMENTARY SCHOOL - ALTERATIONS
MANAWA MIDDLE/HIGH SCHOOL - ADDITIONS & ALTERATIONS
PART 1 - MANAWA ELEMENTARY SCHOOL
800 BEECH STREET
MANAWA, WI 54949

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PROJECT NO: 18268
CAD DWG FILE:
DRAWN BY: Author
CHECKED BY: Checker

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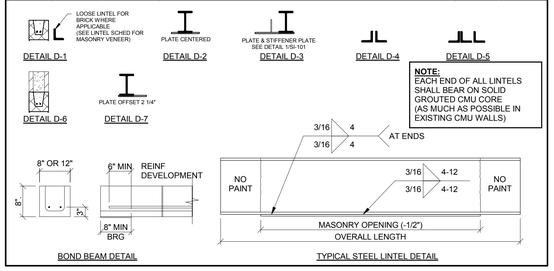
SHEET TITLE:
TOILET ROOM STANDARDS

SHEET NUMBER:
1-AE-401

MASONRY LINTEL SCHEDULE

MARK	TYPE	MAS. WIDTH	SIZE	BEARING	DETAIL
L1	STEEL	8"	W8X15 W/ 5/16" X 7" BOTTOM PLATE	8" BRG	D-2



TOILET ACCESSORIES SCHEDULE - 10 28 00

TAG	DESCRIPTION	MFR	MODEL	REMARKS
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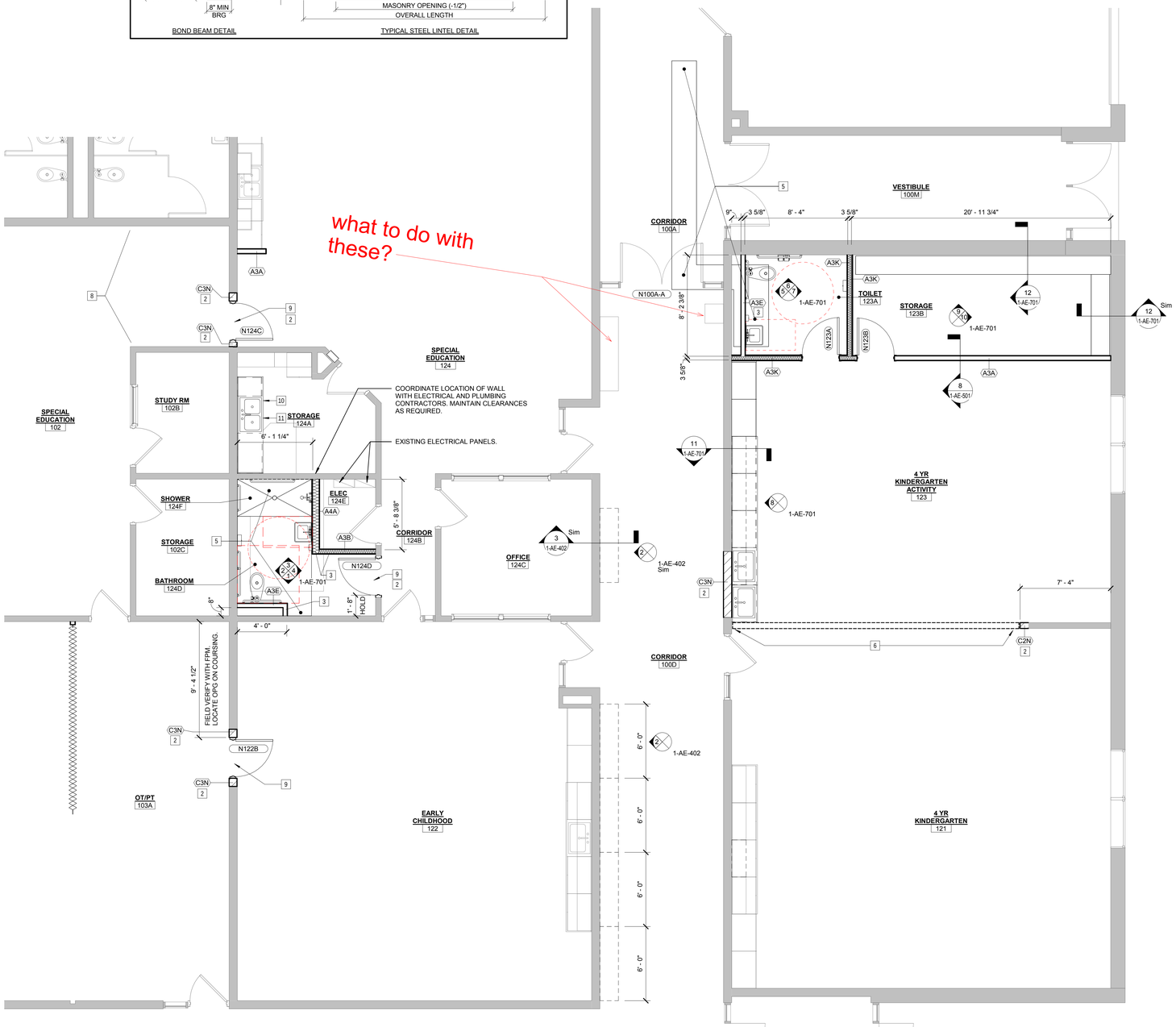
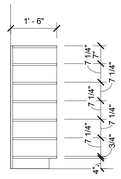
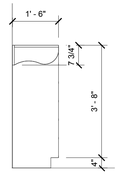
TA-2	Stainless Steel Mirror	Bobrick	B-165 2436	
TA-3		Bobrick	B-262	
TA-6				
TA-9				





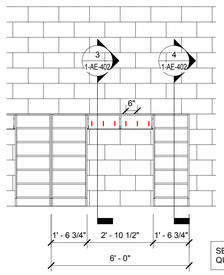
4 NEW CUBBIES SECTION 2

SCALE 1/2" = 1'-0"
AS REFERENCED BY:2 / 1-AE-402



3 NEW CUBBIES SECTION 1

SCALE 1/2" = 1'-0"
AS REFERENCED BY:1 / 1-AE-402



SEE PLANS FOR QUANTITY OF CUBBIES

2 NEW CUBBIES ELEVATION

SCALE 3/8" = 1'-0"
AS REFERENCED BY:1 / 1-AD-203

1 ENLARGED PARTIAL FLOOR PLAN - AREA C

SCALE 1/4" = 1'-0"
AS REFERENCED BY:1 / 1-AE-103

FOR BIDS
NOT FOR CONSTRUCTION

WALL DIMENSION KEY

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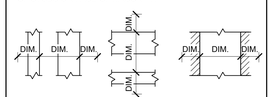

WALL TYPE NOTES

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NIC	DENOTES ITEM NOT IN CONTRACT - BY OWNER
XXXX	DENOTES WALL TYPE - SEE SHEET AE-501 FOR EXTERIOR AND AE-502 FOR INTERIOR WALLS

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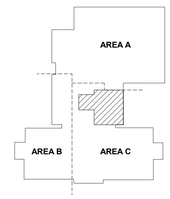
9	04 20 00 A CONCRETE MASONRY UNITS AND 05 12 00 STEEL LINTEL - SEE LINTEL SCHEDULE
10	12 35 30 - RE-INSTALL REMOVED CASEWORK
11	22 30 00 - RE-INSTALL REMOVED PLUMBING FIXTURES

KEYNOTE LEGEND

KEY NO.	KEYNOTE TEXT

TOILET ACCESSORIES KEY

TAG	DESCRIPTION
TA-1	GRAB BARS
TA-2	MIRRORS
TA-3	PAPER TOWEL DISPENSER
TA-4	PAPER TOWEL DISPENSER W/ WASTE RECEPTACLE
TA-5	WASTE RECEPTACLE
TA-6	TOILET TISSUE DISPENSER
TA-7	SANITARY NAPKIN VENDOR
TA-8	SANITARY NAPKIN DISPOSAL
TA-9	SOAP DISPENSER / SOAP DISH
TA-10	TOILET SEAT COVER DISPENSER
TA-11	BABY CHANGING STATION
TA-12	WARM AIR HAND DRYER
TA-13	FOLDING SHOWER SEAT
TA-14	SHOWER CURTAIN ROD / HOOKS
TA-15	TOWEL BAR / SHELF
TA-16	ROBE HOOK
TA-17	MOP AND BROOM HOLDER
TA-18	MEDICINE CABINET



KEY PLAN

TRUE NORTH
PLAN NORTH

Hoffman
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800.236.2370 | hoffman.net

CONSULTANT:

MANAWA ELEMENTARY SCHOOL - ALTERATIONS
MANAWA MIDDLE/HIGH SCHOOL - ADDITIONS & ALTERATIONS
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CHECKED BY:	Checker

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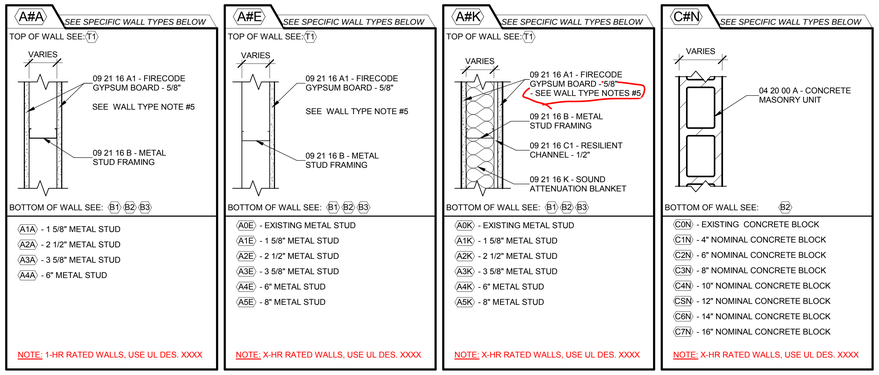
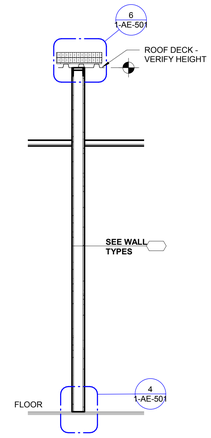
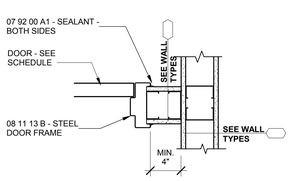
SHEET TITLE:
ENLARGED PLAN - AREA C

SHEET NUMBER:
1-AE-402



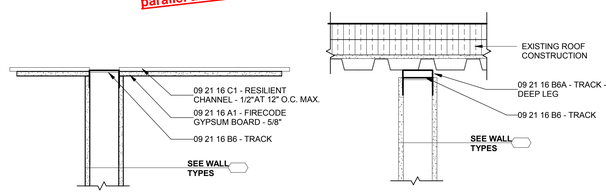


8 WALL SECTION 1
SCALE 1/2" = 1'-0"
AS REFERENCED BY:1 / 1-AE-402

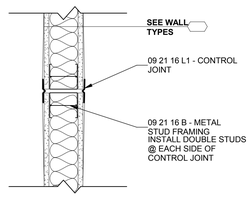


7 HM FRAME AT WALL INTERSECTION
SCALE 1 1/2" = 1'-0"
AS REFERENCED BY:

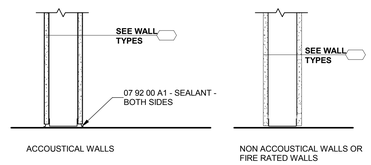
revise to show metal deck and roof joists parallel and perpendicular conditions !!!!!



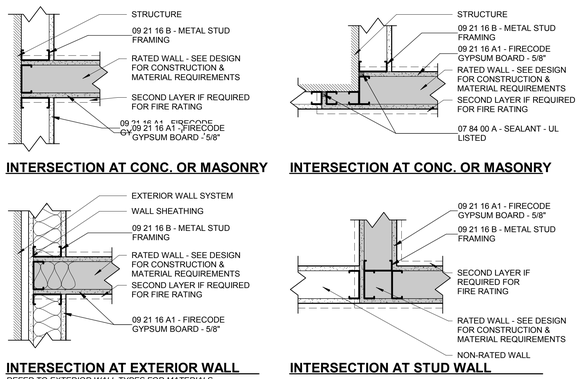
6 TOP OF INTERIOR WALL DETAILS
SCALE 1 1/2" = 1'-0"
AS REFERENCED BY8 / 1-AE-501



5 GYPSUM BOARD CONTROL JOINT
SCALE 1 1/2" = 1'-0"
AS REFERENCED BY:

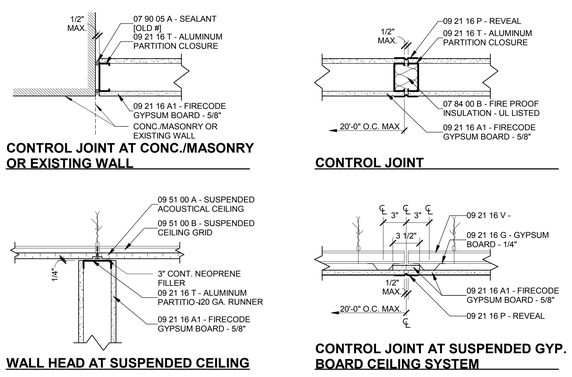


4 BASE OF METAL STUD WALLS
SCALE 1 1/2" = 1'-0"
AS REFERENCED BY8 / 1-AE-501

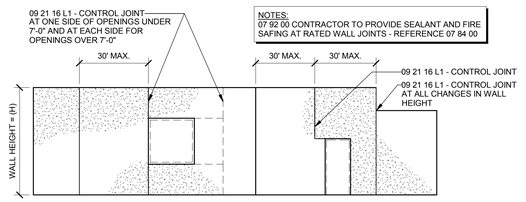


RATED WALLS APPEAR SHADED

3 RATED WALL INTERSECTIONS
SCALE 1 1/2" = 1'-0"
AS REFERENCED BY:



2 GYPSUM BOARD JOINT DETAILS
SCALE 1 1/2" = 1'-0"
AS REFERENCED BY:



1 GYPSUM BOARD CONTROL JOINT LOCATIONS
SCALE 3/16" = 1'-0"
AS REFERENCED BY:

FOR BIDS
NOT FOR CONSTRUCTION

WALL PRIORITY LEGEND

PRIORITY	#	PLAN GRAPHIC	PARTITION TYPE
HIGHEST	1	4FW 4FW	4 HOUR - FIRE WALL
	2	3FW 3FW	3 HOUR - FIRE WALL
	3	2FW 2FW	2 HOUR - FIRE WALL
	4	4FB 4FB	4 HOUR - FIRE BARRIER
	5	3FB 3FB	3 HOUR - FIRE BARRIER
	6	2FB 2FB	2 HOUR - FIRE BARRIER
MEDIUM	7	1FB 1FB	1 HOUR - FIRE BARRIER
	8	1FP 1FP	1 HOUR - FIRE PARTITION
	9	1SB 1SB	1 HOUR - SMOKE BARRIER
	10	1BW 1BW	1 HOUR - BEARING WALL
	11	5FP 5FP	1/2 HOUR - FIRE PARTITION
	12	0SP 0SP	0 HOUR - SMOKE PARTITION WALL TO LIMIT THE TRANSFER OF SMOKE (DOORS AND GLAZING FOR BORROWED LIGHTS ARE NOT RATED)
LOWEST	13		NON-RATED

NOTE: PARTITIONS WITH A HIGHER PRIORITY # TAKE PRECEDENCE OVER PARTITIONS WITH A LOWER PRIORITY # - SEE AE-501 FOR DETAILS

WALL TYPE NOTES

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KEYNOTE LEGEND

KEY NO.	KEYNOTE TEXT
04 20 00 A -	CONCRETE MASONRY UNIT
07 84 00 A -	SEALANT - UL LISTED
07 84 00 B -	FIRE PROOF INSULATION - UL LISTED
07 90 05 A -	SEALANT [OLD #]
07 92 00 A1 -	SEALANT - BOTH SIDES
08 11 13 B -	STEEL DOOR FRAME
09 21 16 A1 -	FIRECODE GYPSUM BOARD - 5/8"
09 21 16 B6 -	TRACK
09 21 16 B6A -	TRACK - DEEP LEG
09 21 16 B -	METAL STUD FRAMING
09 21 16 C1 -	RESILIENT CHANNEL - 1/2"
09 21 16 G -	GYPSUM BOARD - 1/4"
09 21 16 K -	SOUND ATTENUATION BLANKET
09 21 16 L1 -	CONTROL JOINT
09 21 16 P -	REVEAL
09 21 16 T -	ALUMINUM PARTITION CLOSURE
09 21 16 V -	
09 51 00 A -	SUSPENDED ACOUSTICAL CEILING
09 51 00 B -	SUSPENDED CEILING GRID

Hoffman
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CONSULTANT:

MANAWA

MANAWA ELEMENTARY SCHOOL - ALTERATIONS
MANAWA MIDDLE/HIGH SCHOOL - ADDITIONS & ALTERATIONS
PART 1 - MANAWA ELEMENTARY SCHOOL
800 BEECH STREET
MANAWA, WI 54949

MARK	DATE

ISSUED: PRELIMINARY
PROJECT NO: 18268
CAD DWG FILE:
DRAWN BY: Author
CHECKED BY: Checker
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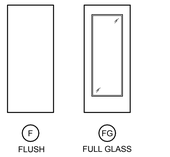
SHEET TITLE: WALL SECTIONS, WALL TYPES, WALL DETAILS
SHEET NUMBER: 1-AE-501

DOOR SCHEDULE - NEW DOORS

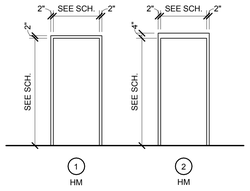
MARK	DOOR WIDTH	DOOR HEIGHT	Door Material	DOOR TYPE	FRAME DEPTH	FRAME TYPE	FRAME MATERIAL	DETAILS HEAD	DETAILS JAMB	DETAILS SILL	FIRE RATING	HARDWARE GROUP	COMMENTS
N122B	3' - 0"	7' - 0"	WD	FG	5 3/4"	2	HM	6/ES-AE-601	5/ES-AE-601			10	
N123A	3' - 0"	7' - 0"	WD	F	6 3/8"	2	HM	4/ES-AE-601	3/ES-AE-601			6	
N123B	3' - 0"	7' - 0"	WD	F	5 7/8"	2	HM	4/ES-AE-601	3/ES-AE-601			8	
N124C	3' - 0"	7' - 0"	WD	FG	5 3/4"	2	HM	6/ES-AE-601	5/ES-AE-601			10	
N124D	3' - 0"	7' - 0"	WD	FG	5 3/4"	2	HM	6/ES-AE-601	5/ES-AE-601			6	

DOOR SCHEDULE - EXISTING DOORS

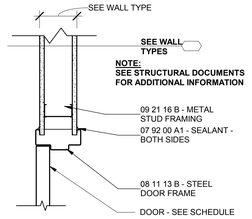
MARK	HARDWARE GROUP	COMMENTS
N100A-A		AT EACH LEAF: REMOVE DOOR STOPS. RE-CONNECT CLOSERS. PROVIDE MAGNETIC HOLD-OPEN DEVICE CONNECTED TO BUILDING FIRE ALARM SYSTEM.
N100A-B		AT EACH LEAF: REMOVE DOOR STOPS. RE-CONNECT CLOSERS. PROVIDE MAGNETIC HOLD-OPEN DEVICE CONNECTED TO BUILDING FIRE ALARM SYSTEM.
N100A-C		AT EACH LEAF: REMOVE DOOR STOPS. RE-CONNECT CLOSERS. PROVIDE MAGNETIC HOLD-OPEN DEVICE CONNECTED TO BUILDING FIRE ALARM SYSTEM.
N252		AT EACH LEAF: PROVIDE MAGNETIC HOLD-OPEN DEVICE CONNECTED TO BUILDING FIRE ALARM SYSTEM.
N253		AT EACH LEAF: PROVIDE MAGNETIC HOLD-OPEN DEVICE CONNECTED TO BUILDING FIRE ALARM SYSTEM.
N254		AT EACH LEAF: PROVIDE MAGNETIC HOLD-OPEN DEVICE CONNECTED TO BUILDING FIRE ALARM SYSTEM.
N255		AT EACH LEAF: PROVIDE MAGNETIC HOLD-OPEN DEVICE CONNECTED TO BUILDING FIRE ALARM SYSTEM.
N257		AT EACH LEAF: PROVIDE MAGNETIC HOLD-OPEN DEVICE CONNECTED TO BUILDING FIRE ALARM SYSTEM.
N258		AT EACH LEAF: PROVIDE MAGNETIC HOLD-OPEN DEVICE CONNECTED TO BUILDING FIRE ALARM SYSTEM.
N259		AT EACH LEAF: PROVIDE MAGNETIC HOLD-OPEN DEVICE CONNECTED TO BUILDING FIRE ALARM SYSTEM.
N260		AT EACH LEAF: PROVIDE MAGNETIC HOLD-OPEN DEVICE CONNECTED TO BUILDING FIRE ALARM SYSTEM.



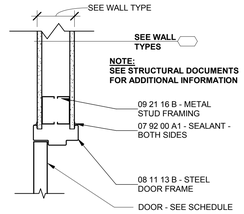
1 DOOR TYPES
SCALE 1/4" = 1'-0"
AS REFERENCED BY: DOOR SCHEDULE



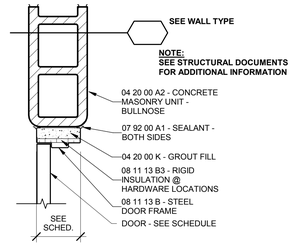
2 FRAME TYPES
SCALE 1/4" = 1'-0"
AS REFERENCED BY: DOOR SCHEDULE



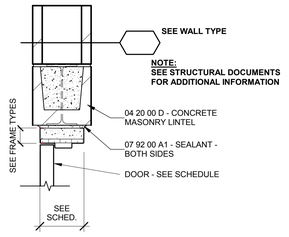
3 JAMB DETAIL
SCALE 1 1/2" = 1'-0"
AS REFERENCED BY: DOOR SCHEDULE



4 HEAD DETAIL
SCALE 1 1/2" = 1'-0"
AS REFERENCED BY: DOOR SCHEDULE



5 JAMB DETAIL
SCALE 1 1/2" = 1'-0"
AS REFERENCED BY: DOOR SCHEDULE



6 HEAD DETAIL
SCALE 1 1/2" = 1'-0"
AS REFERENCED BY: DOOR SCHEDULE

GLAZING LEGEND ????

FOR BIDS
NOT FOR CONSTRUCTION

KEYNOTE LEGEND

KEY NO.	KEYNOTE TEXT
04 20 00 A2 -	CONCRETE MASONRY UNIT - BULLNOSE
04 20 00 D -	CONCRETE MASONRY LINTEL
04 20 00 K -	GROUT FILL
07 92 00 A1 -	SEALANT - BOTH SIDES
08 11 13 B3 -	RIGID INSULATION @ HARDWARE LOCATIONS
08 11 13 B -	STEEL DOOR FRAME
09 21 16 B -	METAL STUD FRAMING

GLAZING LEGEND

G-2 INTERIOR GLAZING

G-5 INTERIOR SAFETY GLAZING - INTERIOR DOORS AND SIDELITES, SLIDING GLASS DOORS.

GLAZING CONTRACTOR SHALL PROVIDE SAFETY GLAZING AT ALL LOCATIONS REQUIRED BY ALL APPLICABLE CODES AND ORDINANCES.

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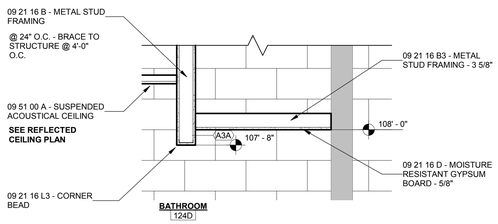
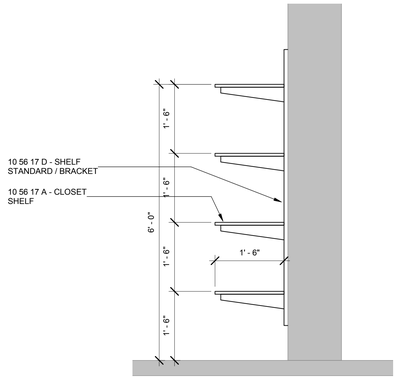
SHEET TITLE:
DOOR SCHEDULE

SHEET NUMBER:
1-AE-601

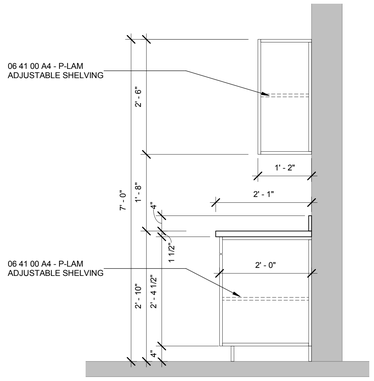
KEYNOTE LEGEND	
KEY NO.	KEYNOTE TEXT
06 41 00 A1 -	P-LAM BASE CABINET
06 41 00 A3 -	P-LAM TALL STORAGE CABINET
06 41 00 A4 -	P-LAM ADJUSTABLE SHELVING
06 41 00 A5 -	P-LAM FINISH PANELS
06 41 00 F -	MATCHING FILLER
09 21 16 B3 -	METAL STUD FRAMING - 3 5/8"
09 21 16 B -	METAL STUD FRAMING
09 21 16 D -	MOISTURE RESISTANT GYPSUM BOARD - 5/8"
09 21 16 L3 -	CORNER BEAD
09 51 00 A -	SUSPENDED ACOUSTICAL CEILING
10 56 17 A -	CLOSET SHELF
10 56 17 D -	SHELF STANDARD / BRACKET
12 36 00 A -	P-LAM COUNTERTOP
22 30 00 A -	SINK
22 30 00 B -	LAVATORY
22 30 00 Q -	WATER CLOSET
22 30 00 R -	FAUCET



13 SHOWER DETAIL
SCALE 3/4" = 1'-0"
AS REFERENCED BY3 / 1-AE-701

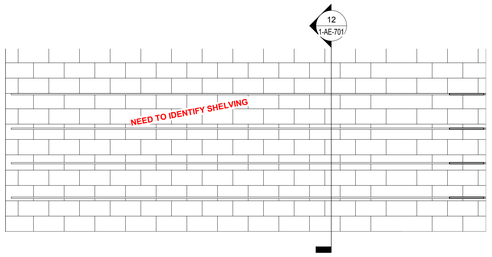


12 ROM 123B - STORAGE SHELVING
SCALE 3/4" = 1'-0"
AS REFERENCED BY:1 / 1-AE-402

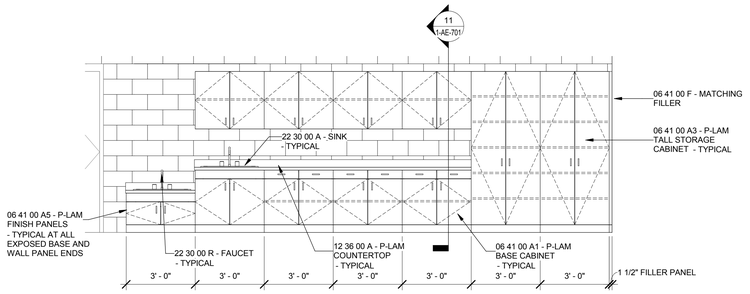


11 RM. 123 - CASEWORK SECTION
SCALE 3/4" = 1'-0"
AS REFERENCED BY:1 / 1-AE-402

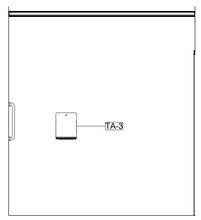
10 RM. 123B STORAGE E. WALL
SCALE 3/8" = 1'-0"
AS REFERENCED BY:1 / 1-AE-402



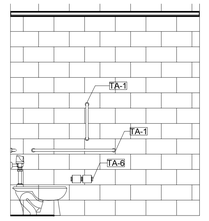
9 RM. 123B STORAGE - N. WALL
SCALE 3/8" = 1'-0"
AS REFERENCED BY:1 / 1-AE-402



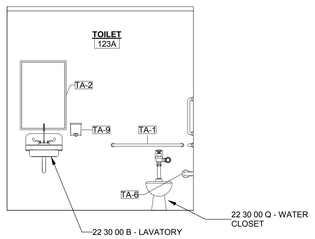
8 RM. 123 4YR KINDERGARTEN ACTIVITY - WEST WALL
SCALE 3/8" = 1'-0"
AS REFERENCED BY:1 / 1-AE-402



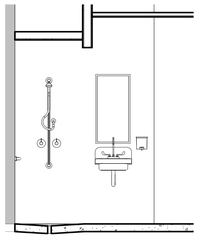
7 RM 123A TOILET - E. WALL
SCALE 3/8" = 1'-0"
AS REFERENCED BY:1 / 1-AE-402



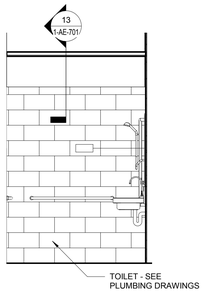
6 RM 123A TOILET - N. WALL
SCALE 3/8" = 1'-0"
AS REFERENCED BY:1 / 1-AE-402



5 RM 123A TOILET - W. WALL
SCALE 3/8" = 1'-0"
AS REFERENCED BY:1 / 1-AE-402



4 RM 124D BATHROOM - E. WALL
SCALE 3/8" = 1'-0"
AS REFERENCED BY:1 / 1-AE-402



3 RM 124D BATHROOM - N. WALL
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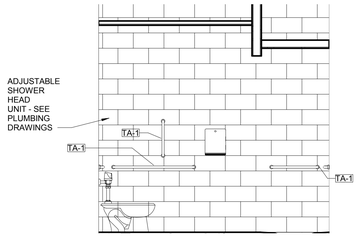
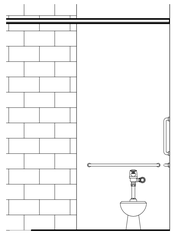
AS REFERENCED BY:1 / 1-AE-402



2 RM 124D BATHROOM - W. WALL
SCALE 3/8" = 1'-0"
AS REFERENCED BY:1 / 1-AE-402



1 RM 124D BATHROOM - S. WALL
SCALE 3/8" = 1'-0"
AS REFERENCED BY:1 / 1-AE-402

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CONSULTANT:

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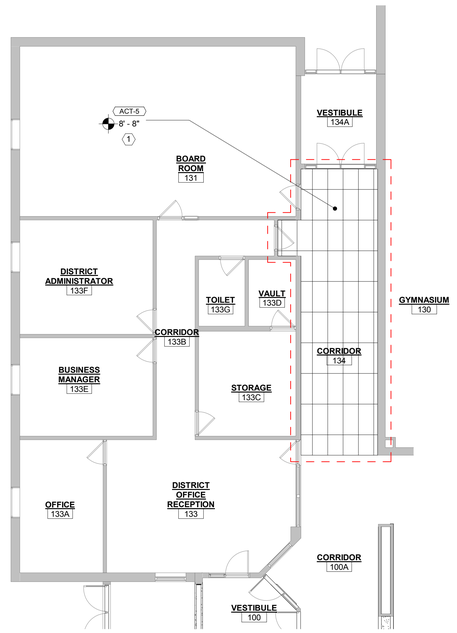
SHEET TITLE:
CASEWORK / INTERIOR ELEVATIONS

SHEET NUMBER:
1-AE-701

1 REFLECTED CEILING PLAN - AREA C
SCALE 1/8" = 1'-0"



2 PARTIAL REFLECTED CEILING PLAN - AREA A
SCALE 1/8" = 1'-0"
AS REFERENCED BY:

FOR BIDS
NOT FOR CONSTRUCTION

REFLECTED CEILING PLAN KEY:

- ACT-1 — 09 51 00 A - SUSPENDED ACOUSTICAL CEILING, 2x2 GRID AND TILE (SEE SPECIFICATIONS); USE AT-1 UNLESS OTHERWISE NOTED PER PLANS.
- ACT-2 — 09 51 00 C - SUSPENDED VINYL FACED GYPSUM BOARD CEILING, 2x2 STANDARD GRID WITH VINYL-COVERED GWB TILES
- ACT-5 — 09 51 00 A - SUSPENDED ACOUSTICAL CEILING, 2x4 GRID AND TILE (SEE SPECIFICATIONS)
- GWB-1 — 09 21 16 A - 5/8" FIRECODE GYPSUM BOARD ON 1/2" RESILIENT CHANNEL
- GWB-2 — 09 21 16 A - 5/8" FIRECODE GYPSUM GYPSUM BOARD SOFFIT, BULKHEAD OR CEILING
- GRID ALIGNMENT CHANGE
- CEILING LIGHT FIXTURES - GRAPHIC REPRESENTATION ONLY FOR GRID LAYOUT - SEE ELECTRICAL DRAWINGS FOR SPECIFIC FIXTURE INFORMATION
- 23 00 00 E - GRID HVAC SUPPLY DIFFUSER
- 23 00 00 E - GRID HVAC RETURN DIFFUSER
- (OTS) — DENOTES AREA OPEN TO EXPOSED STRUCTURE ABOVE. REFER TO ROOM FINISH SCHEDULE FOR FINISHING OF EXPOSED STRUCTURE, DECKING, DUCTWORK, CONDUITS, PIPING, ETC.
- (ECTR) — DENOTES EXISTING CEILING TO REMAIN. REFER TO MEP DRAWINGS FOR INFORMATION REGARDING REPLACEMENT OF CEILING MOUNTED FIXTURES.

REFER TO ELECTRICAL LIGHTING PLANS FOR SWITCHING, CIRCUITING, AND SPECIFIC FIXTURE TYPES

GENERAL CEILING PLAN NOTES

1. ALL CEILING HEIGHTS TAKEN ABOVE FINISH FLOOR, UNLESS OTHERWISE NOTED.
2. ALL CEILINGS PRESUMED TO BE 8'-0" ABOVE FINISHED FLOOR UNLESS NOTED OTHERWISE.
3. COORDINATE FIXTURE AND DIFFUSER LOCATIONS WITH M.E.P. DRAWINGS.
4. MECHANICAL AND ELECTRICAL DRAWINGS TAKE PRECEDENCE OVER REFLECTED CEILING PLANS FOR TYPE, QUANTITY AND LOCATION OF FIXTURES, DIFFUSERS AND GRILLES.
5. IN 2' X 2' ACT CEILINGS, WHERE TILE IS SHOWN TO BE LESS THAN 2', CUT FROM 2' x 4' TILE TO BE LONGER THAN 2 FT TO ELIMINATE SLIVERS, AND ELIMINATE THE 2' GRID SECTIONS.
6. PROVIDE HURRICANE CLIPS AT CEILING TILES AT RETURN AIR PLENUMS AND VESTIBULES (TYP.)

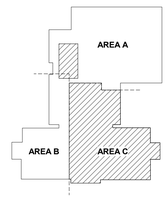
(#) KEY TO CEILING PLAN NOTES

(1) RE-INSTALL REMOVED CEILING GRID AND PANELS TO GREATEST EXTENTS POSSIBLE. PROVIDE NEW MATCHING GRID AND PANELS AT DAMAGED GRID AND PANELS AND WHERE NECESSARY. MATCH ADJACENT GRID PATTERN.

26 50 00 CONTRACTOR TO RE-INSTALL REMOVED LIGHT FIXTURES.

KEYNOTE LEGEND

KEY NO.	KEYNOTE TEXT



KEY PLAN

TRUE NORTH PLAN NORTH

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SHEET TITLE:
REFLECTED CEILING PLANS

SHEET NUMBER:
1-AF-103

MES ROOM FINISH SCHEDULE

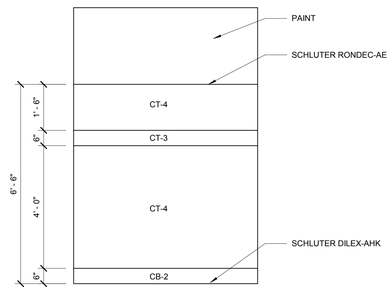
RM No.	ROOM NAME	FLOOR	BASE	WALL FINISH NORTH	WALL FINISH EAST	WALL FINISH SOUTH	WALL FINISH WEST	CEILING	CASEWORK CABINETS	CASEWORK COUNTERTOPS	REMARKS
100	VESTIBULE	EX-WT	EX-RB	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X4	-	-	
100A	CORRIDOR	EX-VCT	EX-RB	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X4	-	-	Install ADA protection for AED cabinet.
100B	COMMONS	EX-VCT	EX-RB	EX-P	EX-P	EX-P	EX-P	EX-WD/ACT 2X4	-	-	
100C	CORRIDOR	EX-VCT	EX-RB	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X4	-	-	
100D	CORRIDOR	EX-VCT	EX-RB	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X4	-	-	Relocate coat racks and add new as necessary
100E	CORRIDOR	EX-VCT	EX-RB	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X4	-	-	
100F	VESTIBULE	EX-RT	EX-RB	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X4	-	-	
100G	VESTIBULE	EX-RT	EX-RB	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X4	-	-	
100H	CORRIDOR	EX-VCT	EX-RB	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X4	-	-	
100J	VESTIBULE	EX-RT	EX-RB	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X4	-	-	
100K	CORRIDOR	EX-VCT	EX-RB	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X4	-	-	
100L	VESTIBULE	EX-RT	EX-RB	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X4	-	-	
100M	VESTIBULE	EX-RT	EX-RB	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X4	-	-	
101	ELEM. SCHOOL OFFICE	EX-CPT	EX-RB	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X4	EX	EX	
101A	NURSE	EX-VCT	EX-RB	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X4	EX	EX	
101B	TOILET	EX-CT	EX-CT	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X2 VG	-	-	
101C	TOILET	EX-CT	EX-CT	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X2 VG	-	-	
101D	OFFICE	CPT-3	RB-3	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X4	-	-	
101E	OFFICE	CPT-3	RB-3	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X4	-	-	
101F	WORKROOM	CPT-3	RB-3	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X4	EX	EX	
101G	CORRIDOR	CPT-3	RB-3	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X4	-	-	
101H	PRINCIPAL OFFICE	CPT-3	RB-3	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X4	-	-	
101J	STORAGE	EX-VCT	EX-RB	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X4	-	-	
102	SPECIAL EDUCATION	LVT-1, LVT-2	RB-2	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X4	-	-	SEE FLOORING PATTERN PLAN
102B	STUDY RM	LVT-1	RB-2	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X4	-	-	
102C	STORAGE	LVT-1	EX-RB	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X4	-	-	
103	OT/PT	EX-VCT	EX-RB	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X4	EX	EX	
103A	OT/PT	EX-VCT	EX-RB	EX-P	P-5	EX-P	EX-P	EX-ACT 2X4	EX	EX	
104	GUIDANCE	LVT-3	RB-3	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X4	-	-	
104A	GUIDANCE OFFICE	CPT-3	RB-3	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X4	-	-	
104B	CONFERENCE	CPT-3	RB-3	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X4	-	-	
104C	OFFICE	LVT-3	RB-3	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X4	-	-	
104D	STORAGE	LVT-3	RB-3	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X4	-	-	
105	CLASSROOM	CPT-4	RB-2	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X4	EX	EX	
105A	CORRIDOR	EX-VCT	EX-RB	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X4	-	-	
105B	GIRLS	EX-CT	EX-CT	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X2 VG	-	-	
105C	BOYS	EX-CT	EX-CT	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X2 VG	-	-	
105D	RESOURCE	CPT-1, CPT-4	RB-2	EX-P	EX-P	EX-P	EX-P	EX-WD/ACT 2X4	EX	EX	SEE FLOORING PATTERN PLAN
105E	VESTIBULE	EX-RT	EX-RB	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X4	-	-	
105F	STORAGE	EX-VCT	EX-RB	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X4	-	-	
106	CLASSROOM	CPT-4	RB-2	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X4	EX	EX	
107	CLASSROOM	CPT-4	RB-2	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X4	EX	EX	
108	CLASSROOM	EX-VCT	EX-RB	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X4	EX	EX	
108A	CONFERENCE	CPT-1	RB-2	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X4	-	-	
108B	STORAGE	EX-VCT	EX-RB	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X4	-	-	
109	CLASSROOM	CPT-4	RB-2	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X4	EX	EX	
110	CLASSROOM	CPT-4	RB-2	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X4	EX	EX	
111	CLASSROOM	CPT-4	RB-2	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X4	EX	EX	
112	LIBRARY	CPT-4	RB-2	EX-P	EX-P	EX-P	EX-P	EX-WD/ACT 2X4	EX	EX	
112A	LIBRARY WORK AREA	CPT-4	RB-2	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X4	EX	EX	
112B	LIBRARY OFFICE	CPT-1	RB-2	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X4	-	-	
112C	STORAGE	CPT-1	RB-2	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X4	-	-	
112D	STORAGE	EX-VCT	EX-RB	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X4	-	-	
112E	OFFICE	CPT-1	RB-2	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X4	-	-	
112F	OFFICE	CPT-1	RB-2	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X4	-	-	
113	CLASSROOM	CPT-4	RB-2	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X4	EX	EX	
113A	CORRIDOR	EX-VCT	EX-RB	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X4	-	-	
113B	GIRLS	EX-CT	EX-CT	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X2 VG	-	-	
113C	BOYS	EX-CT	EX-CT	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X2 VG	-	-	
113D	RESOURCE	CPT-1, CPT-4	RB-2	EX-P	EX-P	EX-P	EX-P	EX-WD/ACT 2X4	EX	EX	SEE FLOORING PATTERN PLAN
113E	VESTIBULE	EX-RT	EX-RB	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X4	-	-	
113F	STORAGE	EX-VCT	EX-RB	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X4	-	-	
114	CLASSROOM	CPT-4	RB-2	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X4	EX	EX	
115	CLASSROOM	CPT-4	RB-2	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X4	EX	EX	
116	CLASSROOM	EX-VCT	EX-RB	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X4	EX	EX	
116A	OFFICE	CPT-1	RB-2	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X4	-	-	
116B	STORAGE	EX-VCT	EX-RB	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X4	-	-	
117	CLASSROOM	CPT-4	RB-2	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X4	EX	EX	
118	CLASSROOM	CPT-4	RB-2	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X4	EX	EX	
119	CLASSROOM	CPT-4	RB-2	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X4	EX	EX	
120	COMPUTER LAB	LVT-1, LVT-2	RB-2	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X4	EX	EX	SEE FLOORING PATTERN PLAN
120A	STAFF ROOM	CPT-1	RB-2	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X4	EX	EX	
120B	STAFF WORKROOM	EX-VCT	EX-RB	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X4	-	-	
121	4 YR KINDERGARTEN	VCT-1	RB-2	P-1	P-1	P-1	P-1	EX-ACT 2X4 / ACT 2X4	EX	EX	Provide additional duplex receptacles
122	EARLY CHILDHOOD	EX-VCT	EX-RB	EX-P	EX-P	EX-P	P	EX-ACT 2X4	EX	EX	Provide additional duplex receptacles
123	4 YR KINDERGARTEN ACTIVITY	VCT-1	RB-2	P-1	P-1	P-1	P-1	EX-ACT 2X4 / ACT 2X4	PLAM-3	PLAM-4	Relocate existing casework; Provide additional duplex receptacles
123A	TOILET	CT-5	CB-2	P-1	P-1	P-1	P-1	ACT 2x2 VG	-	-	
123B	STORAGE	VCT-1	RB-2	P-1	P-1	P-1	P-1	ACT 2X4	PLAM-3	PLAM-4	
124	SPECIAL EDUCATION	EX-VCT / CPT-4	EX-RB	EX-P	EX-P	EX-P	P	EX-ACT 2X4	PLAM-3	PLAM-4	
124A	STORAGE	EX-VCT	EX-RB	EX-P	EX-P	EX-P	P	EX-ACT 2X4	EX	EX	
124B	CORRIDOR	EX-VCT	EX-RB	EX-P	EX-P	EX-P	P	EX-ACT 2X4	-	-	

MES ROOM FINISH SCHEDULE

RM No.	ROOM NAME	FLOOR	BASE	WALL FINISH NORTH	WALL FINISH EAST	WALL FINISH SOUTH	WALL FINISH WEST	CEILING	CASEWORK CABINETS	CASEWORK COUNTERTOPS	REMARKS
124C	OFFICE	CPT-4	RB-2	P-1	P-1	P-1	P-1	EX-ACT 2X4	-	-	
124D	BATHROOM	CT-5	CB-2	P-1	P-1	P-1	P-1	ACT 2x2 VG	-	-	
124E	ELEC	SC	RB-2	EX-P	EX-P	P-5	P-5	OTSA			
124F	SHOWER	CT-5	CB-2	CT-3, CT-4	CT-3, CT-4	-	CT-3, CT-4	GWB	-	-	SEE 2/1-AF-601 FOR WALL TILE INSTALLATION
125	BAND	LVT-1, LVT-2	RB-2	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X4	-	-	SEE FLOORING PATTERN PLAN
125A	STORAGE	EX-VCT	EX-RB	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X4	-	-	
125B	PRACTICE	LVT-1	RB-2	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X4			
125C	OFFICE	CPT-1	RB-2	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X4			
126	MUSIC	EX-VCT	EX-RB	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X4	-	-	
126A	STORAGE	EX-VCT	EX-RB	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X4	-	-	
126B	PRACTICE	VCT-1	RB-2	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X4	-	-	
126C	OFFICE	VCT-1	RB-2	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X4	-	-	
126D	PRACTICE	VCT-1	RB-2	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X4	-	-	
126E	PRACTICE	VCT-1	RB-2	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X4	-	-	
127	ART	EX-VCT	EX-RB	EX-P	EX-P	EX-P	EX-P	EXP	-	-	
127A	ART OFFICE	EX-VCT	EX-RB	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X4	-	-	
127B	ART STORAGE	EX-VCT	EX-RB	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X4	-	-	
127C	KILN	EX-SC	EX-RB	EX-P	EX-P	EX-P	EX-P	EXP	-	-	
128	CLASSROOM	EX-VCT	EX-RB	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X4	EX	EX	
128A	ACTIVITY	EX-VCT	EX-RB	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X4	-	-	
129A	STORAGE	EX-VCT	EX-RB	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X4	-	-	
129B	STORAGE	EX-SC	EX-RB	EX-P	EX-P	EX-P	EX-P	EXP	-	-	
129C	STORAGE	EX-SC	EX-RB	EX-P	EX-P	EX-P	EX-P	EXP	-	-	
130	GYMNASIUM	EX-WD	EX-RB	EX-P	EX-P	EX-P	EX-P	EXP	-	-	
130A	STORAGE	EX-SC	EX-RB	EX-P	EX-P	EX-P	EX-P	EXP	-	-	
130B	CORRIDOR	EX-CT	EX-CT	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X2 VG	-	-	
130C	BOYS LOCKER ROOM	EX-CT	EX-CT	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X2 VG	-	-	
130D	BOYS SHOWERS	EX-CT	EX-CT	EX-P	EX-P	EX-P	EX-P	EX-GYP	-	-	
130E	BOYS LOCKER RM OFFICE	EX-VCT	EX-RB	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X2 VG	-	-	
130F	CORRIDOR	EX-CT	EX-CT	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X2 VG	-	-	
130G	BOYS LOCKER RM TOILET	EX-CT	EX-CT	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X2 VG	-	-	
130H	FITNESS ROOM	EX-SC	EX-RB	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X4	-	-	
130J	CORRIDOR	EX-CT	EX-CT	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X2 VG	-	-	
130K	GIRLS LOCKER ROOM	EX-CT	EX-CT	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X2 VG	-	-	
130L	GIRLS SHOWERS	EX-CT	EX-CT	EX-P	EX-P	EX-P	EX-P	EX-GYP	-	-	
130M	GIRLS LOCKER RM OFFICE	EX-VCT	EX-RB	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X2 VG	-	-	
130N	CORRIDOR	EX-CT	EX-CT	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X2 VG	-	-	
130P	GIRLS LOCKER ROOM TOILET	EX-CT	EX-CT	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X2 VG	-	-	
131	BOARD ROOM	CPT-1, CPT-2	RB-2	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X4	EX	EX	SEE FLOORING PATTERN PLAN
133	DISTRICT OFFICE RECEPTION	EX-CPT	EX-RB	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X4	EX	EX	
133A	OFFICE	EX-CPT	EX-RB	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X4	-	-	
133B	CORRIDOR	EX-CPT	EX-RB	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X4	-	-	
133C	STORAGE	EX-VCT	EX-RB	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X4	-	-	Replace AHU-7 indoor fan coil unit, DX condensing unit and associated duct electric coils.
133D	VAULT	EX-VCT	EX-RB	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X4	-	-	
133E	BUSINESS MANAGER	CPT-3	RB-3	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X4	-	-	
133F	DISTRICT ADMINISTRATOR	CPT-3	RB-3	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X4	-	-	
133G	TOILET	EX-CT	EX-CT	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X2 VG	-	-	
134	CORRIDOR	EX-VCT	EX-RB	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X4	-	-	
134A	VESTIBULE	EX-RT	EX-RB	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X4	-	-	
135	CORRIDOR	EX-VCT	EX-RB	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X4	-	-	
135A	VESTIBULE	EX-RT	EX-RB	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X4	-	-	
135B	CUSTODIAN	EX-SC	EX-RB	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X4	-	-	
136	CORRIDOR	EX-VCT	EX-RB	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X4	-	-	
136A	VESTIBULE	EX-RT	EX-RB	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X4	-	-	
136B	ELECTRICAL	EX-SC	EX-RB	EX-P	EX-P	EX-P	EX-P	EXP	-	-	Replace generator and relocate away from building switchboard; Emergency and standby power are not segregated; Add surge suppression to emergency system.
137	KITCHEN	EX-QT	EX-QT	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X4	-	-	
137A	STORAGE	EX-QT	EX-QT	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X4	-	-	
138	RECEIVING	EX-SC	EX-RB	EX-P	EX-P	EX-P	EX-P	EXP	-	-	
138A	STORAGE	EX-SC	EX-RB	EX-P	EX-P	EX-P	EX-P	EXP	-	-	
138B	STAIRS	EX-SC	EX-RB	EX-P	EX-P	EX-P	EX-P	EXP	-	-	
139	GIRLS	EX-CT	EX-CT	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X2 VG	-	-	
140	BOYS	EX-CT	EX-CT	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X2 VG	-	-	
141	TOILET	EX-CT	EX-CT	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X2 VG	-	-	
142	STORAGE	EX-VCT	EX-RB	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X4	-	-	
143	TOILET	EX-CT	EX-CT	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X2 VG	-	-	
144	TOILET	EX-CT	EX-CT	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X2 VG	-	-	
145	STAIR	EX-SC	EX-RB	EX-P	EX-P	EX-P	EX-P	EXP	-	-	
146	CUSTODIAN	EX-SC	EX-RB	EX-P	EX-P	EX-P	EX-P	EXP	-	-	
147	IT ROOM	EX-VCT	EX-RB	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X4	-	-	
1002	ENTIRE BUILDING	--	-	-	-	-	-	-	-	-	Repair damaged drywall
1003	ENTIRE BUILDING	--	-	-	-	-	-	-	-	-	Replace deteriorated or missing sealant
WT	CLASSROOM	EX-VCT	EX-RB	EX-P	EX-P	EX-P	EX-P	EX-ACT 2X4	EX	EX	Paint exterior doors

MES FINISH MATERIAL LEGEND

TAG	DESC.	MFGR.	STYLE NAME	STYLE NO.	COLOR NAME	COLOR NO.	SIZE	INSTALL	REMARKS
CB-1	PORCELAIN TILE WALL BASE - MMHS	CERAMIC TILEWORKS	MOTION	--	MIST	--	6" HIGH		CUT FLOOR TILE TO 6"; INSTALL WITH SCHLUTER DILEX-AHK BETWEEN FLOOR AND TILE WALL BASE OR SCHLUTER RONDEC-AE ABOVE IF NO WALL TILE
CB-2	PORCELAIN TILE WALL BASE - MES	CERAMIC TILEWORKS / IRIS	ATELIER COLLECTION		OLIVE GREY - HONED	IRG1224164	6" HIGH		CUT FLOOR TILE TO 6"; INSTALL WITH SCHLUTER DILEX-AHK BETWEEN FLOOR AND TILE WALL BASE OR SCHLUTER RONDEC-AE ABOVE IF NO WALL TILE
CPT-1	CARPET TILE - MAIN	MOHAWK GROUP	LEARN & LIVE COLLECTION - SIDE STRIPE	GT419	HERITAGE	963	24" X 24"	1/4 TURN	SEE FLOORING PATTERN PLAN FOR INSTALL
CPT-2	CARPET TILE - ACCENT - BOARD ROOM	MOHAWK GROUP	COLOR BALANCE	12BY36 - GT405	ATOMIC	373	12" X 36"	MONOLITHIC	SEE FLOORING PATTERN PLAN FOR INSTALL
CPT-3	CARPET TILE - MES	INTERFACE	THE STANDARD	1467302500	MANGROVE	9361	50CM X 50CM	1/4 TURN - VERIFY	MATCHES EXISTING OFFICE CARPET TILE
CPT-4	CARPET TILE	MOHAWK GROUP	LEARN & LIVE COLLECTION - SWIPE RIGHT TILE	GT418	BROOKWOOD	969	24" X 24"	1/4 TURN	
CT-1	PORCELAIN FLOOR TILE - MMHS	CERAMIC TILEWORKS	MOTION		MIST		12" X 24"	MONOLITHIC	
CT-2	CERAMIC WALL TILE - MMHS	DALTILE	FABRIQUE		BLANC LINEN - LIGHT POLISHED	P685	12" X 24"	HORIZONTAL	SEE INTERIOR ELEVATION FOR INSTALL; SCHLUTER RONDEC-AE ABOVE WALL TILE
CT-3	CERAMIC WALL TILE ACCENT	DALTILE	RITTENHOUSE SQUARE		VERMILLION	0DM1	3" X 6"		SEE INTERIOR ELEVATION FOR INSTALL
CT-4	PORCELAIN WALL TILE - MES	CERAMIC TILEWORKS	MET WALL TILE		BIANCO		10" X 24"	VERTICAL	SEE INTERIOR ELEVATION FOR INSTALL; SCHLUTER RONDEC-AE ABOVE WALL TILE
CT-5	PORCELAIN FLOOR TILE - MES	CERAMIC TILEWORKS / IRIS	ATELIER COLLECTION		OLIVE GREY - HONED	IRG1224164	12" X 24"	MONOLITHIC	
EPX-1	EPOXY FLOORING	SHERWIN-WILLIAMS	CERAMIC CARPET		CHARCOAL				
EPX-2	EPOXY COUNTERTOP				BLACK				
EX	EXISTING	--	--	--	--	--	--	--	
LVT-1	VINYL TILE - MAIN	SHAW CONTRACT	UNITE COLLECTION - COVE		CASTER	27518	9" X 48"	ASHLAR	
LVT-2	VINYL TILE - ACCENT (10%)	SHAW CONTRACT	UNITE COLLECTION - COVE		CORNERSTONE	27585	9" X 48"	ASHLAR	10% ACCENT - RANDOM PATTERN
LVT-3	VINYL TILE - ADMIN AREA	SHAW CONTRACT	UNITE COLLECTION - COVE		SILT	27504	9" X 48"	ASHLAR	
P-1	PAINT - MAIN COLOR - MES	SHERWIN-WILLIAMS	EG-SHEL	--	MISTY	222-C1			
P-2	PAINT - DOOR FRAMES	SHERWIN-WILLIAMS	SEMI-GLOSS	--	TRICORN BLACK	251-C1	--	--	
P-3	PAINT - CEILINGS	SHERWIN-WILLIAMS	FLATMATTE	--	HIGH REFLECTIVE WHITE	256-C1	--	--	
P-4	PAINT - ACCENT COLOR	SHERWIN-WILLIAMS	EG-SHEL	--	PASSIVE	236-C1	--	--	
P-5	PAINT - MATCH EXISTING	MATCH EXISTING	MATCH EXISTING FINISH		MATCH EXISTING COLOR	MATCH EXISTING			
P-6	PAINT - MAIN COLOR - MMHS	SHERWIN-WILLIAMS	EG-SHEL	--	HIGH REFLECTIVE WHITE	256-C1	--	--	
P-7	PAINT - ACCENT RED	SHERWIN-WILLIAMS	EG-SHEL	--	POSITIVE RED	101-C7	--	--	VERIFY WITH OWNER - TO MATCH SCHOOL COLOR
PC	POLISHED CONCRETE	--					--		STAINED - GREY SWIRL PATTERN - TBD
PLAM-1	PLASTIC LAMINATE - CABINETS MMHS	NEVAMAR			TRANQUILITY	WA3000 VE	--		
PLAM-2	PLASTIC LAMINATE - COUNTERTOPS MMHS	WILSONART	--	--	PEWTER BRUSH	4779-60	--		
PLAM-3	PLASTIC LAMINATE - CABINETS MES	NEVAMAR			BLACK LODESTONE	LD6001 ARP			
PLAM-4	PLASTIC LAMINATE - COUNTERTOPS MES	FORMICA			FLINT CRYSTALL	3518 58			
RAT-1	RUBBER TILE	ECORE ATHLETIC	BEAST		RIPPIN RED	20	48" ROLLS		ALT. TARKETT / JOHNSONITE INERTIA AND TRIUMPH
RB-1	RUBBER WALL BASE - MMHS	TARKETT / JOHNSONITE	TRADITIONAL		BLACK B	40	4" HIGH		
RB-2	RUBBER WALL BASE - MES	TARKETT / JOHNSONITE	TRADITIONAL		CHARCOAL WG	20	4" HIGH		
RB-3	RUBBER WALL BASE	MATCH EXISTING	MATCH EXISTING		MATCH EXISTING				MATCH EXISTING RUBBER BASE IN ADMIN AREA
RST-1	RUBBER STAIR TREAD AND RISER	TARKETT / JOHNSONITE	INTEGRATED TREAD AND RISER WITH GRIT TAPE	VIHTR	CHARCOAL WG	20			HAMMERED FINISH; GRIT TAPE GREY
SC	SEALED CONCRETE	--	--	--	--	--	--	--	
SS-1	SOLID SURFACE - WINDOWSILLS	CORIAN			EVEREST				
SS-2	SOLID SURFACE - COUNTERTOPS	CORIAN							
WOC-1	WALK-OFF CARPET TILE - MMHS	MANNINGTON COMMERCIAL	CHARGE	--	KINETIC	11360	18" X 36"	MONOLITHIC	
WOC-2	WALK-OFF CARPET TILE - MES	MOHAWK GROUP	FIRST STEP II	QL315	WALNUT	859	24" X 24"	1/4 TURN - VERIFY	MATCHES EXISTING WALK-OFF CARPET TILE



2 WALL TILE
SCALE 1/2" = 1'-0"
AS REFERENCED BY:

FOR BIDS
NOT FOR CONSTRUCTION

GENERAL FINISH NOTES

A. ROOMS NOT SHOWN ON SCHEDULE DO NOT RECEIVE ANY FINISH WORK.

B. IN ROOMS AND AREAS WHERE WORK OCCURS BUT WITH OTHERWISE NO FINISHES INDICATED, PATCH OR FINISH AREA OF WORK TO MATCH ADJACENT SURFACES.

C. SEE REFLECTED CEILING PLANS FOR CEILING TREATMENTS, SOFFIT COLORS, ETC.

D. SEE INTERIOR ELEVATIONS FOR WALL ACCENTS, ACOUSTIC PANELS, ETC.

E. SEE FLOOR PATTERN PLANS FOR FLOOR ACCENTS.

REMARKS KEY

1 ABCDE

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CONSULTANT:

MANAWA

MANAWA ELEMENTARY SCHOOL - ALTERATIONS
MANAWA MIDDLE/HIGH SCHOOL - ADDITIONS & ALTERATIONS
PART 1 - MANAWA ELEMENTARY SCHOOL

800 BEECH STREET
MANAWA, WI 54949

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SHEET TITLE:
ROOM FINISH SCHEDULE

SHEET NUMBER:
1-AF-601

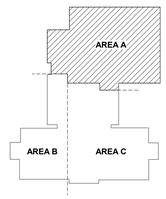
1 FIRST FLOOR PATTERN PLAN - AREA A

SCALE 1/8" = 1'-0"
AS REFERENCED BY:

PRELIMINARY
NOT FOR CONSTRUCTION

FLOOR PATTERN PLAN GENERAL NOTES

1. NOT ALL NEW FLOOR FINISHES ARE SHOWN.
2. REFER TO ROOM FINISH SCHEDULE FOR NEW FINISHES.



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SHEET TITLE:
FLOOR PATTERN PLAN - AREA A

SHEET NUMBER:
1-AF-801

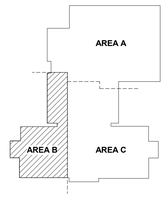
1 FIRST FLOOR PATTERN PLAN - AREA B

SCALE 1/8" = 1'-0"
AS REFERENCED BY:

PRELIMINARY
NOT FOR CONSTRUCTION

FLOOR PATTERN PLAN GENERAL NOTES

1. NOT ALL NEW FLOOR FINISHES ARE SHOWN.
2. REFER TO ROOM FINISH SCHEDULE FOR NEW FINISHES.



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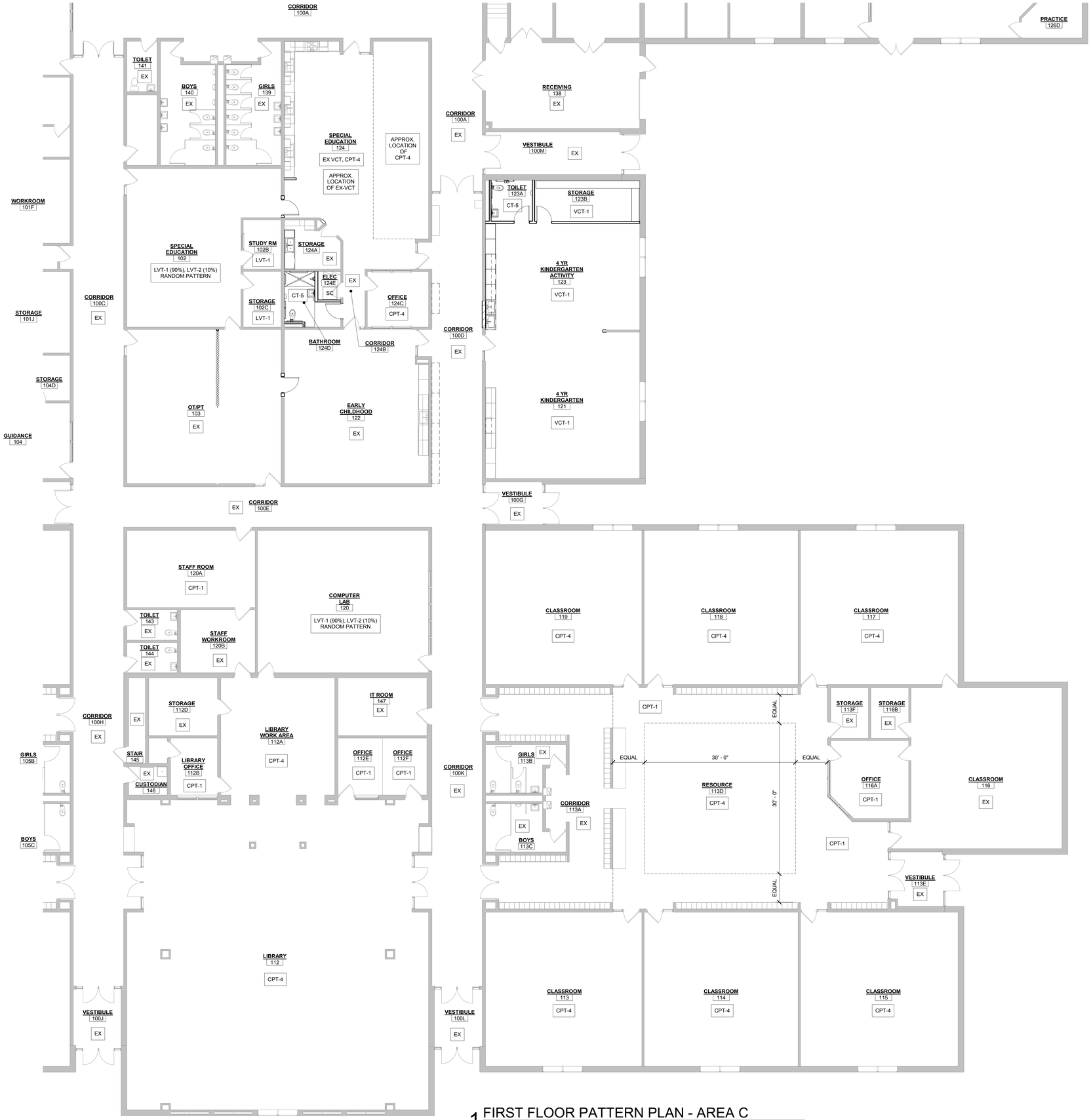
SHEET TITLE:
FLOOR PATTERN PLAN - AREA B

SHEET NUMBER:
1-AF-802



1 FIRST FLOOR PATTERN PLAN - AREA C

SCALE 1/8" = 1'-0"
AS REFERENCED BY:

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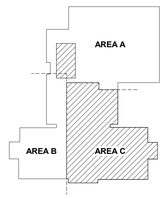
FLOOR PATTERN PLAN GENERAL NOTES

1. NOT ALL NEW FLOOR FINISHES ARE SHOWN.
2. REFER TO ROOM FINISH SCHEDULE FOR NEW FINISHES.



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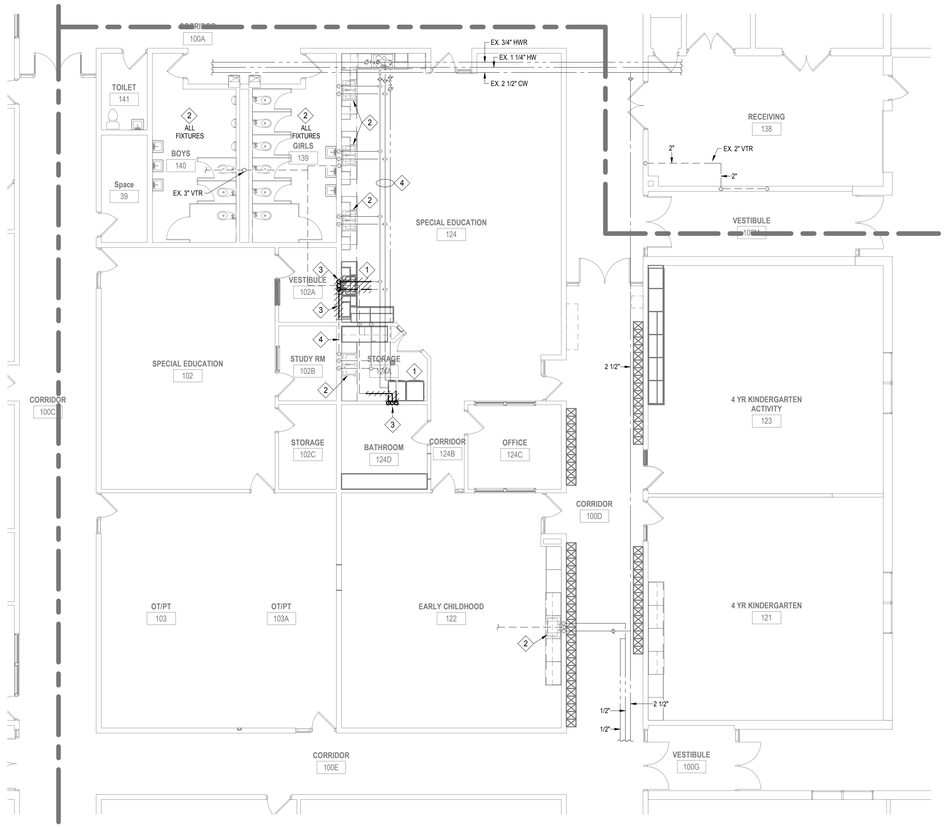
SHEET TITLE:
FLOOR PATTERN PLAN - AREA C

SHEET NUMBER:
1-AF-803

KEYED DEMOLITION NOTES:

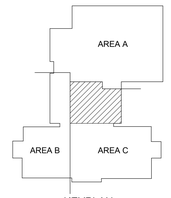
1. EXISTING PLUMBING FIXTURE AND ASSOCIATED PIPING TO BE REMOVED TO BELOW FLOOR, ABOVE CEILING TO STRUCTURE, AND CAPPED OR PLUGGED.
2. EXISTING PLUMBING FIXTURE TO REMAIN.
3. EXISTING PIPING TO BE REMOVED.
4. EXISTING PIPING TO REMAIN.



1 FIRST FLOOR PLUMBING DEMOLITION PLAN - AREA C
1/8" = 1'-0"

PLUMBING SHEET INDEX

1-PD-101	PLUMBING DEMOLITION PLAN
1-PL-101	PLUMBING NEW WORK PLANS



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414.643.4150 | FAX 414.643.4151 | harwoodeng.com
HEC Project Number 19-1004.00

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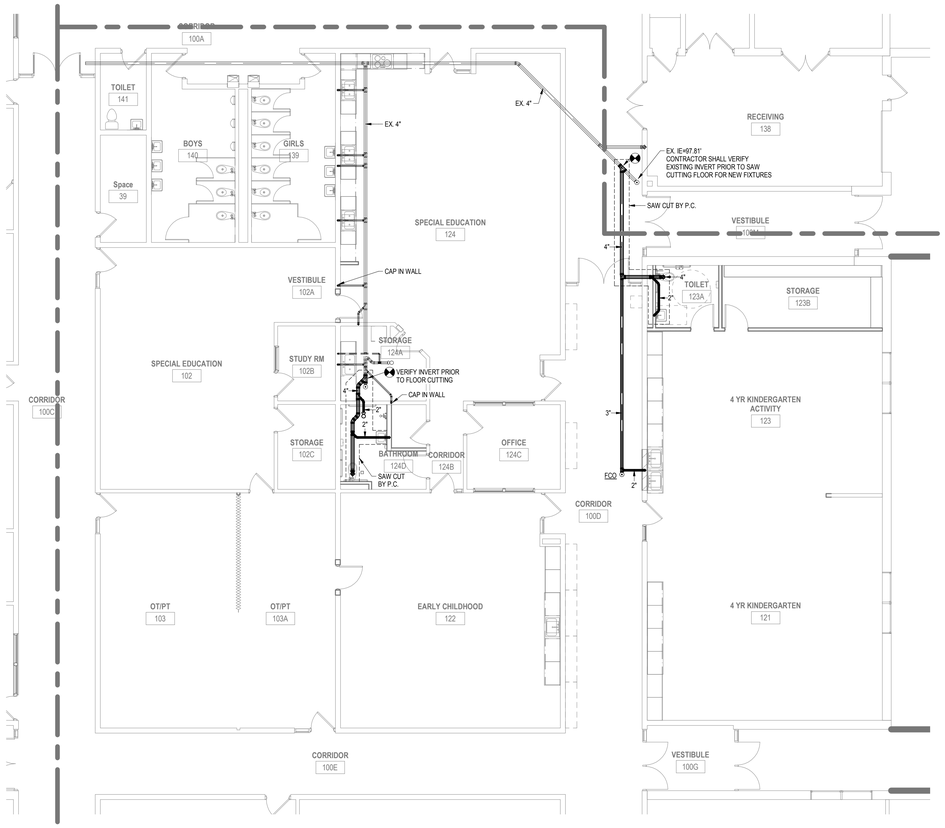
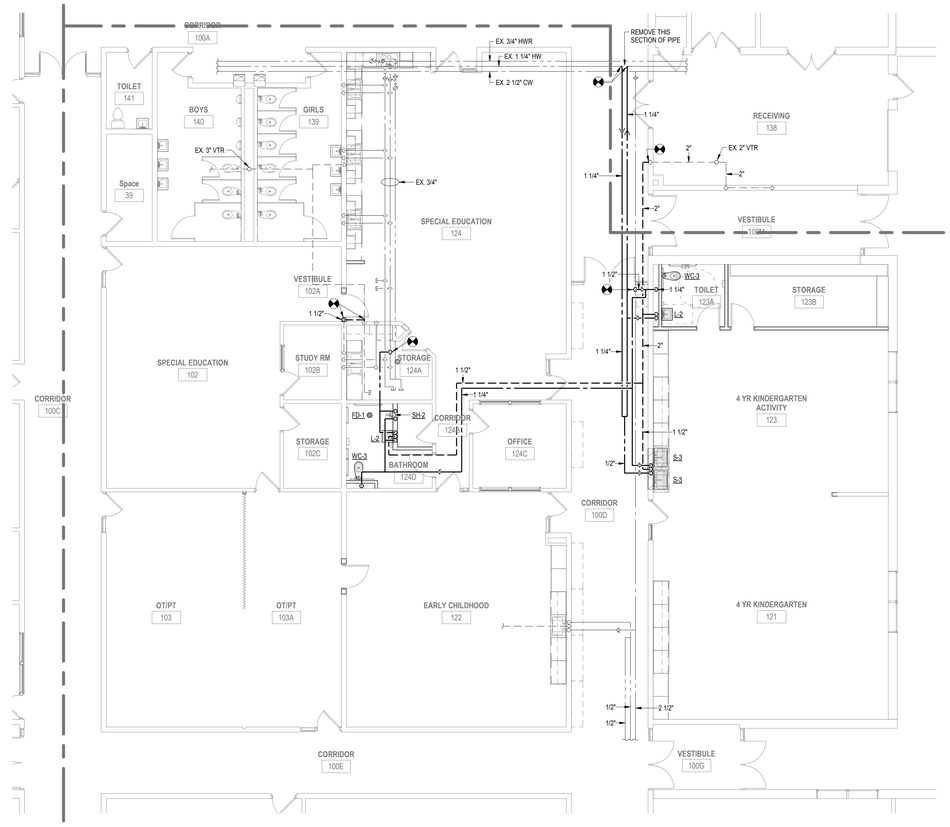
SHEET TITLE:
PLUMBING DEMOLITION PLAN

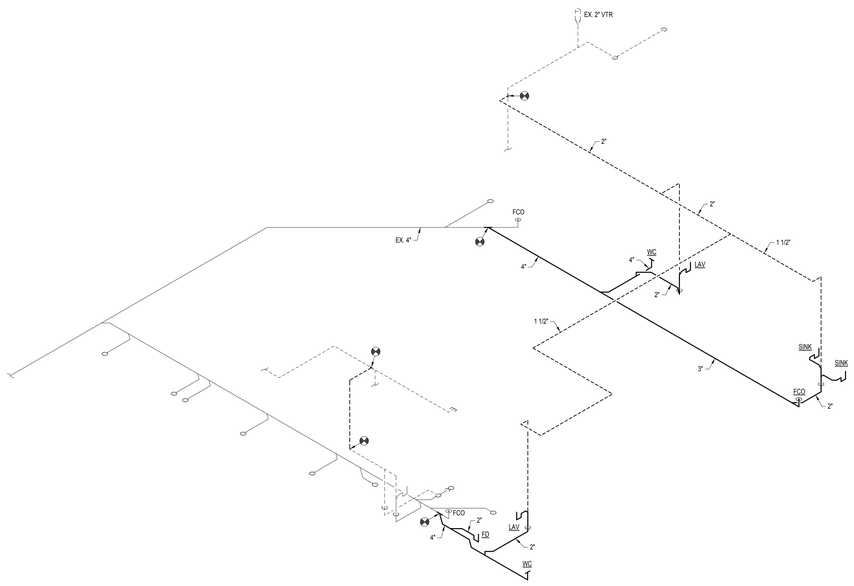
SHEET NUMBER:
1-PD-101



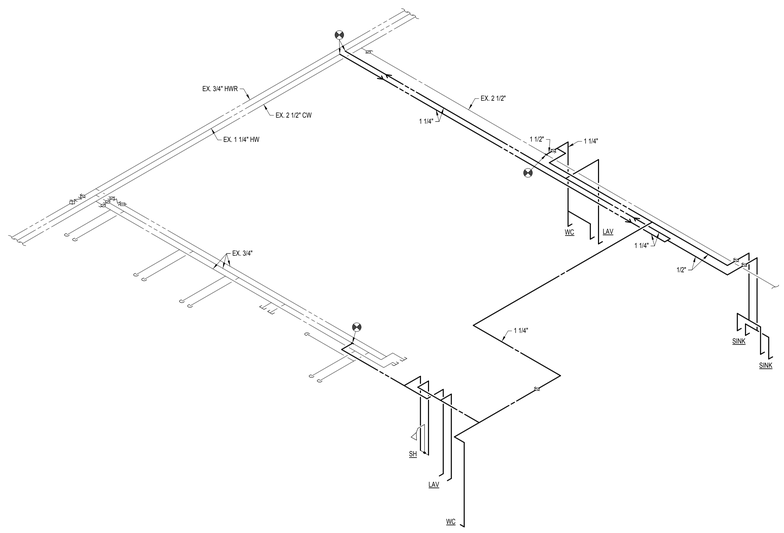
1 FOUNDATION PLUMBING PLAN - AREA C
1/8" = 1'-0"



2 FIRST FLOOR PLUMBING PLAN - AREA C
1/8" = 1'-0"



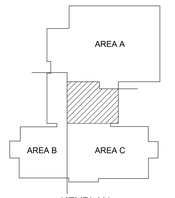
3 WASTE & VENT PIPING ISOMETRIC
NTS



4 WATER PIPING ISOMETRIC
NTS

PLUMBING LEGEND

SYMBOL	ABBR.	DESCRIPTION
	CW	COLD WATER PIPING
	HW	HOT WATER PIPING
	HWR	HOT WATER RETURN PIPING
	W	SANITARY PIPING ABOVE GROUND
	W	SANITARY PIPING BELOW GROUND
	V	SANITARY VENT PIPING ABOVE GROUND
	V	SANITARY VENT PIPING BELOW GROUND
	ST	STORM PIPING ABOVE GROUND
	ST	STORM PIPING BELOW GROUND
	UP	PIPING UP
	DN	PIPING DOWN
	C.O.	CLEANOUT
	HB / WH	HOSE BIBB / WALL HYDRANT
	FCO	FLOOR CLEANOUT
		BALANCING VALVE
		BALL VALVE
		BUTTERFLY VALVE
		CHECK VALVE
	FD	FLOOR DRAIN
	HD	HUB DRAIN OR SITE DRAIN
	RD	ROOF DRAIN
IE=00.00'	I.E.	INVERT ELEVATION
		POINT OF CONNECTION OF NEW PIPING TO EXISTING
		SHOCK ARRESTOR
		FIXTURE UNIT TAGS
	WC	WATER CLOSET
	LAV / L	LAVATORY
	MB	MOP BASIN
	SINK / SL	SINK
	UR	URINAL
	SH	SHOWER



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SHEET TITLE:
PLUMBING NEW WORK PLANS

SHEET NUMBER:
1-PL-101

HVAC SYMBOLS

- AIRFLOW (SUPPLY/OUTSIDE AIR)
- AIRFLOW (RETURN/EXHAUST)
- DOOR GRILLE
- 3/4" DOOR UNDERCUT
- SUPPLY OR OUTDOOR AIR
- RETURN OR TRANSFER
- EXHAUST
- SUPPLY DUCT TURNED AWAY
- SUPPLY DUCT TURNED TOWARD
- RECTANGLE DUCT SIZE (FIRST FIGURE IS SIDE SHOWN)
- ROUND DUCT (RIGID)
- OVAL DUCT
- SMOKE DETECTOR
- FLEXIBLE CONNECTION
- DUCT (FLEXIBLE ROUND)
- TURNING VANES
- TRANSITION (SQUARE-TO-ROUND)
- BACKDRAFT DAMPER
- VOLUME DAMPER
- FIRE DAMPER & ACCESS DOOR
- SMOKE DAMPER & ACCESS DOOR
- COMBINATION FIRE/SMOKE DAMPER & ACCESS DOOR
- MOTOR OPERATED DAMPER
- CEILING MOUNTED ACCESS PANEL
- AIR OUTLET/INLET TYPE (CFM)

MECHANICAL PIPING

- COMPRESSED AIR
- BOILER FEED WATER
- BOILER SURFACE BLOW DOWN
- BOILER BOTTOM BLOW DOWN
- CHEMICAL FEED
- CHILLED WATER SUPPLY
- CHILLED WATER RETURN
- CONDENSER WATER SUPPLY
- CONDENSER WATER RETURN
- CONDENSATE DRAIN
- GLYCOL WATER SUPPLY
- GLYCOL WATER RETURN
- HIGH PRESSURE CONDENSATE RETURN
- HIGH PRESSURE STEAM
- HOT WATER SUPPLY
- HOT WATER RETURN
- ICE WATER SUPPLY
- ICE WATER RETURN
- LIQUID PETROLEUM
- LOW PRESSURE STEAM
- LOW PRESSURE CONDENSATE RETURN
- MEDIUM PRESSURE STEAM
- MEDIUM PRESSURE CONDENSATE RETURN
- NATURAL GAS
- PUMPED CONDENSATE RETURN
- REFRIGERANT LIQUID
- REFRIGERANT SUCTION
- REFRIGERANT HOT GAS
- STEAM VENT
- TOWER WATER SUPPLY
- TOWER WATER RETURN
- VACUUM

PIPING SYMBOLS

- PIPE TURNED TOWARD
- PIPE TURNED AWAY
- PIPE TURNED AWAY
- PIPE TURNED TOWARD
- FLEXIBLE CONNECTOR
- UNION
- FLANGES
- REDUCER (CONCENTRIC)
- REDUCER (ECCENTRIC)
- PIPE CAP/CLEAN OUT
- PIPE PLUG
- FLUID FLOW DIRECTION
- PIPE GUIDE
- PIPE ANCHOR
- PIPE PITCH DIRECTION
- PRESSURE GAUGE
- TEMPERATURE GAUGE
- WATER HAMMER ARRESTOR
- AIR VENT (AUTO)
- AIR VENT (MANUAL)
- AUTOMATIC CONTROL VALVE (2-WAY)
- AUTOMATIC CONTROL VALVE (3-WAY)
- BALL VALVE
- BALANCING VALVE
- BUTTERFLY VALVE
- BACKFLOW PREVENTION VALVE
- CHECK VALVE
- EQUIPMENT DRAIN VALVE
- FILTER
- FLOW MEASUREMENT STATION
- GATE VALVE
- GAUGE CONNECTION
- GLOBE ANGLE VALVE
- GLOBE VALVE
- ISOLATION/SHUT-OFF/MANUAL VALVE
- PLUG VALVE
- PRESSURE REDUCING VALVE
- PRESSURE REGULATING VALVE
- RELIEF VALVE
- SOLENOID VALVE ONE-WAY (ELECTRIC)
- STRAINER
- STRAINER WITH BLOW OFF VALVE AND NIPPLE
- THROTTLING VALVE
- VACUUM BREAKER
- PUMP
- FLOW SENSOR
- LEVEL SENSOR
- PRESSURE SENSOR
- TEMPERATURE SENSOR

GENERAL SYMBOLS

- CARBON MONOXIDE (CO) SENSOR
- CARBON DIOXIDE (CO2) SENSOR
- DIFFERENTIAL PRESSURE SENSOR
- NITROGEN DIOXIDE (NO2) SENSOR
- ROOM SENSOR
- STATIC PRESSURE SENSOR
- HUMIDISTAT
- TEMPERATURE SENSOR
- THERMOSTAT
- INSULATED BASE THERMOSTAT
- SWITCH
- NEW CONNECTION TO EXISTING
- EXISTING TO REMAIN
- EXISTING TO BE REMOVED
- NEW TO BE INSTALLED

GENERAL NOTES

1. THE MECHANICAL CONTRACTOR SHALL EXAMINE ALL CONTRACT DOCUMENTS AND IS REQUIRED TO DO ALL WORK WHICH IS SHOWN ON THE DRAWINGS, STATED IN THE SPECIFICATIONS, OR REASONABLY IMPLIED AS NECESSARY TO COMPLETE THEIR DIVISION OF WORK FOR THIS PROJECT REGARDLESS OF WHERE IN THE CONTRACT DOCUMENTS THE WORK IS REPRESENTED. MECHANICAL CONTRACTOR TO COORDINATE WORK WITH ALL OTHER TRADES. ALL OTHER TRADE DOCUMENTS ARE TO BE CONSIDERED PART OF THIS CONTRACTORS DOCUMENTS WITH RESPECT TO COORDINATION OF WORK BETWEEN TRADES OF WORK.
2. ABBREVIATIONS AND SYMBOLS INDICATED HERE AND NOT USED IN THE CONTRACT DOCUMENTS DO NOT APPLY TO THIS PROJECT. ADDITIONAL ABBREVIATIONS MAY BE INDICATED IN THE CONTRACT DOCUMENTS.
3. THESE DRAWINGS ARE DESIGN DRAWINGS AND ARE DIAGRAMMATIC, THEY MAY NOT SHOW ALL PHYSICAL ARRANGEMENTS, OFFSETS, BENDS, OR ELBOWS WHICH MAY BE REQUIRED FOR PROPER INSTALLATION OF VARIOUS MATERIALS, EQUIPMENT, PIPING AND DUCTWORK SYSTEMS IN ALLOTTED SPACES. EXAMINE THESE AND OTHER AVAILABLE DRAWINGS TO DETERMINE SPACE LIMITATIONS AND INTERFERENCES. MAKE ANY MINOR CHANGES IN LOCATIONS OF EQUIPMENT, PIPING, AND DUCTWORK FROM THAT SHOWN ON DRAWINGS AND FOR ALL PHYSICAL DETAILS REQUIRED FOR INSTALLATION. COST FOR ADAPTING WORK TO JOB SITE CONDITIONS SHALL NOT BE CONSIDERED AS BASIS OF AN EXTRA COST TO CONTRACT.
4. ELEVATION OF PIPING AND DUCTWORK INDICATED ON THESE DRAWINGS ARE TO BE USED AS GUIDELINES TO ASSIST WITH INSTALLATIONS. MINOR CHANGES TO THESE ELEVATIONS MAY BE NECESSARY TO ELIMINATE UNFORESEEN INTERFERENCES. ANY CHANGE IN ELEVATION SHALL BE APPROVED PRIOR TO CHANGE.
5. ANY AND ALL INFORMATION SHOWN ON THESE DRAWINGS WITH RESPECT TO EXISTING STRUCTURES, UTILITIES, AND MECHANICAL SYSTEMS, IS AS EXACT AS COULD BE SECURED. THE INFORMATION IS NOT WARRANTED NOR GUARANTEED ACCURATE, FIELD VERIFY ALL EXISTING CONDITIONS PRIOR TO PROCEEDING WITH WORK.
6. ACCURATE AND LEGIBLE AS-BUILT DRAWING MARKUPS SHALL BE MAINTAINED AT THE JOB SITE, AND BE SUBMITTED PRIOR TO FINAL PAYMENT FOR THE CREATION OF FINAL RECORD DRAWINGS.
7. ALL NEW AND EXISTING ROOFING SYSTEMS SHALL BE PROTECTED FROM DAMAGE DURING CONSTRUCTION ACTIVITIES.
8. TEMPORARILY PATCH ALL ROOF OPENINGS WATERTIGHT UNTIL FINAL CLOSURE CAN BE MADE.
9. VERIFY ALL EQUIPMENT LOCATIONS AND PIPE AND DUCT ROUTING WITH OWNER PRIOR TO INSTALLATION.
10. SEQUENCE OF WORK AND/OR PLACE OF COMMENCEMENT OF WORK SHALL BE APPROVED PRIOR TO WORK BEING STARTED. SCHEDULED SHUTDOWNS SHALL BE CLOSELY COORDINATED WITH EXISTING OPERATIONS.
11. MAINTAIN 3'-0" CLEAR HORIZONTALLY IN FRONT OF ALL ELECTRICAL EQUIPMENT.
12. COORDINATE POWER REQUIREMENTS FOR ALL POWER TO MECHANICAL EQUIPMENT INCLUDING CONTROL SYSTEM WITH ELECTRICAL CONTRACTOR AND INSURE ALL COSTS ASSOCIATED WITH SUCH ARE INCLUDED IN THE PROJECT BID COST. PROVIDE ELECTRICAL POWER, TRANFORMERS, RELAYS, ETC. AS NECESSARY TO ALL HVAC AND MECHANICAL CONTROLS.
13. PROVIDE MANUFACTURER'S RECOMMENDED CLEARANCES ON ALL EQUIPMENT.

ABBREVIATIONS

A	AMPS
ABI	ALTERNATE BID ITEM
AC	DUCTLESS SPLIT SYSTEM
ACC	AIR COOLED CONDENSER
ACCU	AIR COOLED CONDENSING UNIT
ACH	AIR COOLED CHILLER
ACOMP	AIR COMPRESSOR
ACU	AIR CONDITIONING UNIT
ACV	AUTOMATIC CONTROL VALVE
AD	AIR DROP
AF	AIR FILTER OR AIR FOIL
AFC	AFTER COOLER
AFF	ABOVE FINISHED FLOOR
AHJ	AUTHORITY HAVING JURISDICTION
AHU	AIR HANDLING UNIT
AL	ALUMINUM
AMD	AIR MIXING DEVICE
ANG	AIR NATIONAL GUARD
APPROX	APPROXIMATELY
AS	AIR SEPARATOR
ASTM	AMERICAN SOCIETY FOR TESTING AND MATERIALS
AT	AIR TERMINAL
AWC	ABSORPTION CHILLER
BC	BOOSTER COIL
BH	BOOSTER HUMIDIFIER
BHP	BRAKE HORSEPOWER
BHR	CONTINUOUS BLOWDOWN HEAT RECOVERY SYSTEM
BI	BACKWARD INCLINED
BLD	BOILER BLOWDOWN SEPARATOR
BPD	BACKFLOW PREVENTION DEVICE
BRS	BRASS
BRZ	BRONZE
BS	BLACK (MILD) STEEL
BSB	BRANCH SELECTOR BOX
BTU	BUFFER TANK
BTU	BRITISH THERMAL UNIT
BTUH	BRITISH THERMAL UNIT PER HOUR
BW	BUTTWELD
BZ	BRONZE
C	CONVECTOR
CA	COMBUSTION AIR
CAD	COMPRESSED AIR DRYER
CAF	COMPRESSED AIR FILTER
CC	COOLING COIL OR CONTROLS CONTRACTOR
CD	CEILING DIFFUSER
CFM	CUBIC FEET PER MINUTE
CI	CAST IRON
COMP	COMPRESSOR
COND	CONDENSATE
COR	CONTRACTING OFFICER'S REPRESENTATIVE
CRAC	COMPUTER ROOM AIR CONDITIONING UNIT
CRP	CONDENSATE RETURN PUMP
CS	CENTRIFUGAL SEPARATOR
CT	COOLING TOWER
CTCLG	CLOSE TO CEILING
CTCLM	CLOSE TO COLUMN
CTW	CLOSE TO WALL
CU	COPPER
CUH	CABINET UNIT HEATER
DAC	DOOR AIR CURTAIN
DBA	DECIBELS, BAND A
DC	DUST COLLECTOR
DCVA	DOUBLE CHECK VALVE ASSEMBLY BPD
DDC	DIRECT DIGITAL CONTROL
DDH	DESICCANT DEHUMIDIFIER
DEMO	DEMOLISH
DF	DESTRATIFICATION FAN
DFD	DIVISION OF FACILITIES DEVELOPMENT
DIA	DIAMETER
DIM	DIMENSION
DISCH	DISCHARGE
DMPR	DAMPER
DN	DOWN
DOD	DEPARTMENT OF DEFENSE
DRC	DRY COOLER
DWG	DRAWING
DX	DIRECT EXPANSION
E	EXISTING
EA	EXHAUST AIR
EAT	ENTERING AIR TEMPERATURE
EBH	ELECTRIC BASEBOARD HEATER
EC	EVAPORATIVE COOLER OR ELECTRICAL CONTRACTOR
EDH	ELECTRIC DUCT HEATER
EF	EXHAUST FAN
EFF	EFFICIENCY
EFT	ENTERING FLUID TEMPERATURE
EG	EXHAUST GRILLE
EGLY	ETHYLENE GLYCOL
EHC	ELECTRIC HEATING COIL
EJ	EXPANSION JOINT
EL	ELEVATION
ELEC	ELECTRIC
EOM	END OF MAIN
EPDM	ETHYLENE PROPYLENE DIENE MONOMER
ERV	AIR-TO-AIR HEAT EXCHANGER
ESP	EXTERNAL STATIC PRESSURE
ET	EXPANSION TANK
ETR	EXISTING TO REMAIN
EWH	ELECTRIC WALL HEATER
EWT	ENTERING WATER TEMPERATURE
°F	FAHRENHEIT
FAF	FORCED AIR FURNACE
FC	FLUID COOLER
FCU	FAN COIL UNIT
FE	FUME EXTRACTOR
FLA	FULL LOAD AMPS
FLR	FLOOR
FM	FLOW METER
FOP	FUEL OIL PUMP
FPM	FEET PER MINUTE
FRP	FIBERGLASS REINFORCED PLASTIC
FT	FLASH TANK OR FEET
FTC	FINNED TUBE CONVECTOR
FTWC	FEET WATER COLUMN PRESSURE
GA	GAUGE
GAL	GALLON
GC	GENERAL CONTRACTOR
GFT	GLYCOL FILL TANK
GPM	GALLONS PER MINUTE
GS	GALVANIZED STEEL
H	HEIGHT
HB	HUMIDIFICATION BOILER
HC	HEATING COIL
HD	HEAD (FT)
HDB	HYDROSTATIC DESIGN BASIS
HP	HEAT PUMP OR HORSEPOWER
HPC	ERV HEAT PUMP COIL
HR	HOSE REEL
HRW	ROTARY AIR-TO-AIR EXCHANGER
HUM	HUMIDIFIER
HWB	HOT WATER BOILER
HX	FLUID HEAT EXCHANGER
HZ	HERTZ
IAW	IN ACCORDANCE WITH
ID	INSIDE DIAMETER
IE	INVERT ELEVATION
IH	INTAKE HOOD
IN	INCH
INHG	INCHES MERCURY PRESSURE
INWC	INCHES WATER COLUMN PRESSURE
IR	INFRARED HEATER
KH	KITCHEN HOOD
KW	KILOWATT
L	LOUVER OR LENGTH
LAT	LEAVING AIR TEMPERATURE
LB	POUNDS
LD	LINEAR DIFFUSER
LFT	LEAVING FLUID TEMPERATURE
LPG	LIQUIFIED PETROLEUM GAS
LS	LEVEL SWITCH
LWT	LEAVING WATER TEMPERATURE
MADP	MAXIMUM ALLOWABLE DIFFERENTIAL PRESSURE
MAU	MAKE-UP AIR UNIT
MAWP	MAXIMUM ALLOWABLE WORKING PRESSURE
MAX	MAXIMUM
MBH	THOUSANDS BTU'S PER HOUR
MC	MECHANICAL CONTRACTOR OR MECHANICAL COUPLING
MCA	MINIMUM CIRCUIT AMPACITY
MCC	MOTOR CONTROL CENTER
MFR	MANUFACTURER
MIN	MINIMUM
MMBH	MILLION BTU PER HOUR
MOCP	MINIMUM OVER CURRENT PROTECTION
MOD	MOTOR OPERATED CONTROL DAMPER
MSS	MANUFACTURERS STANDARDIZATION SOCIETY
MTL	MATERIAL
NA	NOT APPLICABLE
NC	NORMALLY CLOSED
NFPA	NATIONAL FIRE PROTECTION ASSOCIATION
NH	NO-HUB
NIC	NOT IN CONTRACT
NO	NORMALLY OPEN
NOM	NOMINAL
NPSH	NET POSITIVE SUCTION HEAD
NPSHA	NPSH AVAILABLE
NPSHR	NPSH REQUIRED
OA	OUTSIDE AIR
OC	ON CENTER
OD	OUTSIDE DIAMETER
OED	OPEN ENDED DUCT
P	HYDRONIC PUMP OR PRESSURE
PC	PLUMBING CONTRACTOR
PCP	PRESSURE POWERED CONDENSATE PUMP
PD	PRESSURE DROP/DIFFERENTIAL
PG	PROPYLENE GLYCOL
PH	PHASE
PPH	POUND PER HOUR
PROP	PROPELLER
PRV	PRESSURE REDUCING VALVE/POWERED ROOF VENTILATOR
PSI	POUNDS PER SQUARE INCH
PSIA	PSI ABSOLUTE
PSID	PSI DIFFERENTIAL
PSIG	PSI GAGE
PTAC	PACKAGED TERMINAL AIR CONDITIONER
PTHP	PACKAGED TERMINAL HEAT PUMP
PVC	POLYVINYL CHLORIDE
RA	RETURN AIR
RCP	RADIANT CEILING PANEL
RDH	REFRIGERATED DEHUMIDIFIER
RG	RETURN GRILLE
RH	RELIEF HOOD
RPM	REVOLUTIONS PER MINUTE
RTD	RESISTIVE THERMAL DEVICE
RTU	ROOF TOP UNIT
RZ	RADIANT FLOOR HEATING ZONE
SA	SUPPLY AIR
SAD	SOUND ATTENUATING DEVICE
SB	SECURITY BARRIER
SCFM	STANDARD CFM
SCH	SCHEDULE
SD	SLOT DIFFUSER/SOLDER
SF	STEAM FILTER OR SUPPLY FAN
SG	SUPPLY GRILLE
SHT	SHEET
SMLS	SEAMLESS
SMS	SNOW MELTING SYSTEM DISTRIBUTION MANIFOLD
SP	STATIC PRESSURE
SPEC	SPECIFICATIONS
SQ	SQUARE
SRV	SAFETY RELIEF VALVE
SS	STAINLESS STEEL
ST	STEAM TRAP
STD	STANDARD
STL	STEEL
SV	SOLVENT WELD
SW	SOCKET WELD
T	TEMPERATURE
TA	TRANSFER AIR
TCP	TEMPERATURE CONTROL PANEL
TDH	TOTAL DEVELOPED HEAD
TDS	TOTAL DISSOLVED SOLIDS
TEMP	TEMPERATURE
TG	TRANSFER GRILLE
TH	THREADED
TMC	TECHNOLOGY MANAGEMENT CENTER
TMV	THERMOSTATIC MIXING VALVE
TONR	TONS COOLING
TYP	TYPICAL
UC	UNIT COOLER
UFC	UNIFIED FACILITIES CRITERIA
UGD	UNDERGROUND
UH	UNIT HEATER
UNO	UNLESS NOTED OTHERWISE
UV	UNIT VENTILATOR OR ULTRAVIOLET
V	VOLTS
VA	VENT AIR
VER	VEHICLE EXHAUST REEL
VFD	VARIABLE FREQUENCY DRIVE
VI	VIBRATION ISOLATORS
VLV	VALVE
VRF	VARIABLE REFRIGERANT FLOW
W	WATTS OR WIDTH
WC	WATER COLUMN
WCC	WATER COOLED CONDENSER
WCH	WATER COOLED CHILLER
WF	WATER FILTER
WIV	WATER INLET VALVE
WHA	WATER HAMMER ARRESTOR

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MANAWA

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MANAWA MIDDLE/HIGH SCHOOL - ADDITIONS & ALTERATIONS
PART 1 - MANAWA ELEMENTARY SCHOOL
800 BEECH STREET
MANAWA, WI 54949

MARK	DATE

ISSUED: June 6, 2019
PROJECT NO: 18268
CAD DWG FILE:
DRAWN BY: RRW
CHECKED BY: DJG

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SHEET TITLE:
NOTES, SYMBOLS AND ABBREVIATIONS

SHEET NUMBER:
1-MS-001

GENERAL HVAC DEMOLITION NOTES:

1. COMPLETELY DEMOLISH ALL EXISTING DUCTWORK AS SHOWN WITH BOLD DASHED LINES, INCLUDING ALL ABANDONED AND UNUSED ACCESSORIES, INSULATION, HANGER SUPPORTS, ETC. FOR REMAINING DUCT SYSTEM. PLUG OR CAP ALL OPENINGS CREATED BY DUCT DEMOLITION. TEST DUCTWORK AS SPECIFIED, AND INSULATE OR PAINT SAME AS NEW WORK. PATCH EXISTING WALLS, ROOFS, CEILINGS, AND FLOORS DISTURBED BY DEMOLITION TO ORIGINAL CONDITION.

2. COMPLETELY DEMOLISH ALL EXISTING EQUIPMENT AS SHOWN WITH BOLD DASHED LINES, INCLUDING ALL ABANDONED AND UNUSED ACCESSORIES, INSULATION, HANGERS, SUPPORTS, BASES, CONTROLS, ETC. PATCH EXISTING WALLS, ROOFS, CEILINGS, AND FLOORS DISTURBED BY DEMOLITION TO ORIGINAL CONDITION.

3. DELIVER INDICATED EQUIPMENT TO OWNER'S DESIGNATED STORAGE SPACE ON SITE. PLUG OR CAP ALL EQUIPMENT OPENINGS TO PREVENT DIRT AND MOISTURE FROM ENTERING EQUIPMENT.

4. REINSTALL INDICATED EQUIPMENT, SAME AS NEW WORK, IN NEW LOCATION WHERE INDICATED. COMPLETELY CLEAN AND RESTORE EQUIPMENT TO GOOD OPERATING CONDITION.

5. INSTALL TEMPORARY COVERS OVER EXISTING EXTERIOR ENVELOPE OPENINGS CREATED BY REMOVED EQUIPMENT/DUCT. COVER SHALL BE WATERTIGHT, AND MEET OSHA AND OWNER REQUIREMENTS. COMPLETELY REMOVE TEMPORARY COVER WHEN OPENINGS ARE PATCHED TO FINAL CONDITION. REPAIR ANY DAMAGE TO EXISTING BUILDING COMPONENTS CAUSED BY TEMPORARY COVER.

6. WHERE BRANCH DUCTWORK IS SHOWN TO BE DEMOLISHED BACK TO THE MAIN DUCT AND THE EXISTING MAIN DUCT OPENING IS NOT TO BE RE-USED, CAP AND SEAL THE MAIN DUCT BRANCH OPENING AIRTIGHT.

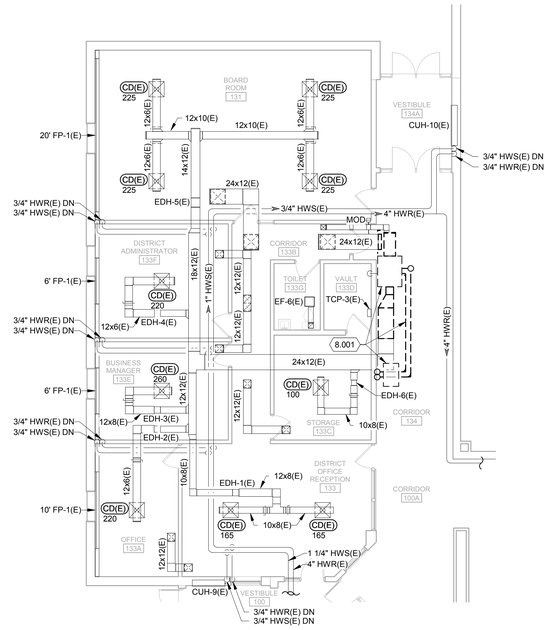
KEYED NOTES

8.001 DEMOLISH THE EXISTING INDOOR AHU-7 AND ACCU-2 LOCATED ON ROOF. REMOVE ASSOCIATED REFRIGERANT PIPING, VALVES AND DUCTWORK AS INDICATED.

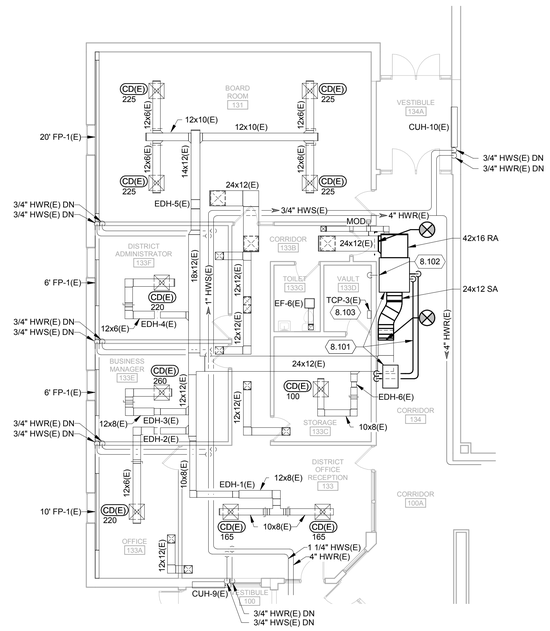
8.101 INSTALL NEW AHU-7, PIPING AND DUCTWORK IN THIS LOCATION. MOUNT OUTDOOR CONDENSING UNIT ACCU-7 ON EXISTING RAIL MOUNTS. PROVIDE REFRIGERANT PIPING, AND VALVING AS INDICATED.

8.102 CONTRACTOR TO RECONNECT CONDENSATE DRAIN TO NEW AHU-7. COORDINATE WITH EC FOR POWER, WIRING AND STARTER/DISCONNECT FOR NEW UNIT.

8.103 CONTRACTOR SHALL REPLACE DDC CONTROLLER IN THE EXISTING TCP-3 PANEL. RE-WIRE NEW AHU-7 UNIT TO NEW DDC CONTROLLER IN THE EXISTING TCP-3 PANEL. DDC CONTROLLER SHALL INTERFACE WITH BY BACNET COMMUNICATION TO THE EXISTING BUILDING AUTOMATION SYSTEM (TRIDIUM "N4". CONTRACTOR SHALL MAP NEW DDC POINTS INTO THE TRIDIUM "N4".



N 1 **FIRST FLOOR MECHANICAL DEMOLITION PLAN - PARTIAL AREA A**
1/8" = 1'-0"



N 2 **FIRST FLOOR MECHANICAL PLAN - PARTIAL AREA A**
1/8" = 1'-0"

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2019-06-06

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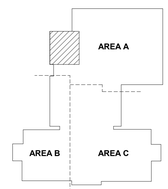

KEY PLAN

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MANAWA

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PART 1 - MANAWA ELEMENTARY SCHOOL
800 BEECH STREET
MANAWA, WI 54949

MARK	DATE
ISSUED:	June 6, 2019
PROJECT NO:	18268
CAD DWG FILE:	
DRAWN BY:	RRW
CHECKED BY:	DJG

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SHEET TITLE:
FIRST FLOOR MECHANICAL PLANS - AREA A

SHEET NUMBER:
1-MH-101

GENERAL HVAC DEMOLITION NOTES:

1. COMPLETELY DEMOLISH ALL EXISTING DUCTWORK AS SHOWN WITH BOLD DASHED LINES, INCLUDING ALL ABANDONED AND UNUSED ACCESSORIES, INSULATION, HANGER SUPPORTS, ETC. FOR REMAINING DUCT SYSTEM. PLUG OR CAP ALL OPENINGS CREATED BY DUCT DEMOLITION. TEST DUCTWORK AS SPECIFIED, AND INSULATE OR PAINT SAME AS NEW WORK. PATCH EXISTING WALLS, ROOFS, CEILINGS, AND FLOORS DISTURBED BY DEMOLITION TO ORIGINAL CONDITION.
2. COMPLETELY DEMOLISH ALL EXISTING EQUIPMENT AS SHOWN WITH BOLD DASHED LINES, INCLUDING ALL ABANDONED AND UNUSED ACCESSORIES, INSULATION, HANGERS, SUPPORTS, BASES, CONTROLS, ETC. PATCH EXISTING WALLS, ROOFS, CEILINGS, AND FLOORS DISTURBED BY DEMOLITION TO ORIGINAL CONDITION.
3. DELIVER INDICATED EQUIPMENT TO OWNER'S DESIGNATED STORAGE SPACE ON SITE. PLUG OR CAP ALL EQUIPMENT OPENINGS TO PREVENT DIRT AND MOISTURE FROM ENTERING EQUIPMENT.
4. REINSTALL INDICATED EQUIPMENT, SAME AS NEW WORK, IN NEW LOCATION WHERE INDICATED. COMPLETELY CLEAN AND RESTORE EQUIPMENT TO GOOD OPERATING CONDITION.
5. INSTALL TEMPORARY COVERS OVER EXISTING EXTERIOR ENVELOPE OPENINGS CREATED BY REMOVED EQUIPMENT/DUCT. COVER SHALL BE WATERTIGHT, AND MEET OSHA AND OWNER REQUIREMENTS. COMPLETELY REMOVE TEMPORARY COVER WHEN OPENINGS ARE PATCHED TO FINAL CONDITION. REPAIR ANY DAMAGE TO EXISTING BUILDING COMPONENTS CAUSED BY TEMPORARY COVER.
6. WHERE BRANCH DUCTWORK IS SHOWN TO BE DEMOLISHED BACK TO THE MAIN DUCT AND THE EXISTING MAIN DUCT OPENING IS NOT TO BE RE-USED, CAP AND SEAL THE MAIN DUCT BRANCH OPENING AIRTIGHT.

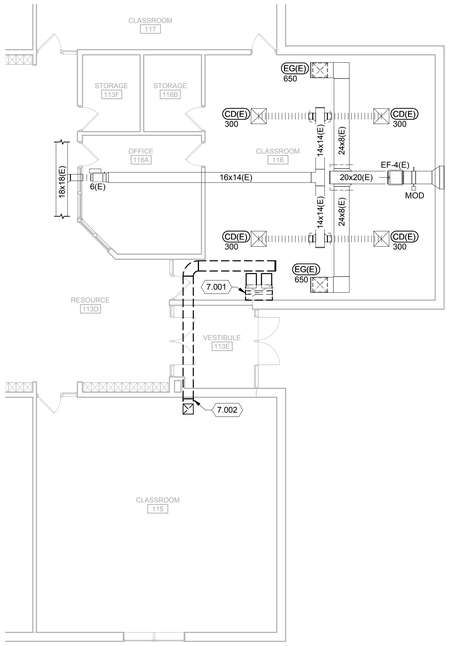
KEYED NOTES

7.001 CAREFULLY REMOVE EXISTING FUME HOOD. TO BE RELOCATED AND INSTALLED IN MIDDLE SCHOOL IN SCIENCE ROOM C-124. REMOVE ALL POWER AND CONTROL WIRING FOR FUME HOOD. FUME HOOD SWITCH TO BE REMOVED. FUME HOOD PANEL TO BE MOVE AS PART OF THE HOOD .

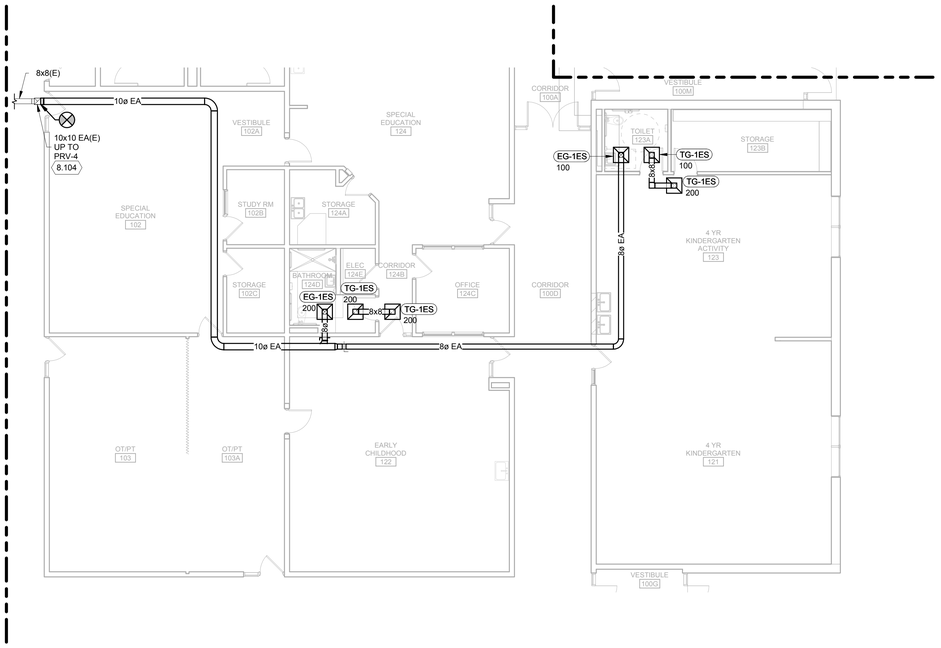
7.002 DEMOLISH EXISTING DUCTWORK AND PRV-16 LOCATED ON ROOF ASSOCIATED WITH FUME HOOD REMOVAL.

7.101 CAP REMAINING ROOF CURB LEFT BY PRV-16 REMOVAL. REFER TO CURB CAP DETAIL ON SHEET 1-MS-501.

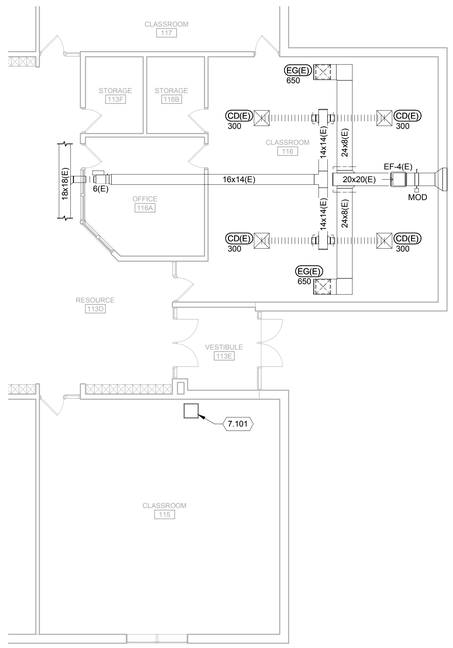
8.104 REPLACE EXISTING PRV-4 AND CURB ON ROOF WITH NEW AS SCHEDULED. RE-WIRE THE EXHAUST FAN WITH THE EXISTING DDC SYSTEM (TRIDIUM) FOR CONTROLS AND THE MONITORING OF FAN.



N 1 **FIRST FLOOR MECHANICAL DEMOLITION PLAN - PARTIAL AREA C**
1/8" = 1'-0"



N 3 **FIRST FLOOR MECHANICAL PLAN - PARTIAL AREA C**
1/8" = 1'-0"



N 2 **FIRST FLOOR MECHANICAL PLAN - PARTIAL AREA C**
1/8" = 1'-0"

FOR BIDS
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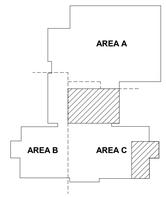
2019-06-06



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PART 1 - MANAWA ELEMENTARY SCHOOL
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MANAWA, WI 54949

MARK	DATE
ISSUED:	June 6, 2019
PROJECT NO:	18268
CAD DWG FILE:	
DRAWN BY:	RRW
CHECKED BY:	DJG

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SHEET TITLE:
FIRST FLOOR MECHANICAL PLANS - AREAS C

SHEET NUMBER:
1-MH-102

DX COOLING COIL (CC) SCHEDULE

MARK	MANUFACTURER, MODEL NUMBER	TYPE	AIR FLOW (CFM)	PD (IN WC)	COIL				CAPACITY (MBH)		EAT (°F)		LAT (°F)		MEDIA	EQUIPMENT SERVED	LOCATION	REMARKS
					FACE VEL. (FPM)	FACE AREA (FT^2)	NO. OF STAGES (2)	FINS PER INCH	TOTAL	SENS.	DB	WB	DB	WB	TYPE			
CC-7	TRANE TWE07244	DX	2,000	0.75	500	-	2	-	72.8	52.3	78.0	64.0	52.3	51.6	R-410A	AHU-7		

REMARKS:

(1) BY SAME MANUFACTURER OF AIR HANDLING UNIT.

(2) PROVIDE A DUAL CIRCUITED, R-410A COIL. (NOMINAL 6 TON)

AIR HANDLING UNIT (AHU) SCHEDULE

MARK	MANUFACTURER, MODEL NUMBER	TYPE	AIR FLOW (CFM)			SUPPLY FAN (5)				RETURN FAN					ELECTRICAL (4)			ACCESSORIES
			SUPPLY	OUTDOOR	MINIMUM	FAN TYPE	ESP (IN WC)	POWER (HP)	SPEED (RPM)	FAN TYPE	AIR FLOW (CFM)	ESP (IN WC)	POWER (HP)	SPEED (RPM)	(VOLTS/PH)	MCA	MOCP (A)	
AHU-7	TRANE TWE 07244BAA	CS / H	2,000	285	-	CENT	1.50	3	1136	-	-	-	-	-	460 /3	3	15	(2)

MARK	FUEL FIRED UNITS					(3) MTG. HEIGHT (FT)	PRE-FILTER MARK	FINAL-FILTER MARK	HEAT WHEEL MARK	HEATING COIL MARK	COOLING COIL MARK	WEIGHT (LB)	RETURN FAN		REMARKS
	FUEL TYPE	INPUT (MBH)	OUTPUT (MBH)	EAT (°F)	LAT (°F)								LOCATION	UNIT SECTIONS IN DIRECTION OF AIR FLOW	
AHU-7	-	-	-	-	-	10	MERV 8	-	-	-	CC-7		C-107	MB, AC, CC, SF	

TYPE				ACCESSORIES		SECTION TYPES					
CS	CENTRAL STATION	I	INDOOR	1	INTAKE HOOD	RF	RETURN FAN	HC	HEATING COIL	SF	SUPPLY FAN
PR	PACKAGED ROOFTOP	O	OUTDOOR	2	INLET DAMPER	EC	ECONOMIZER	AC	ACCESS	DP	DISCHARGE PLENUM
C	CUSTOM	D	DOWNFLOW	3	DISCHARGE DAMPER	MB	MIXING BOX	H	HUMIDIFIER	WH	WEATHER HOOD
IF	INDIRECT FIRED	H	HORIZONTAL	4	ROOF CURB	AB	AIR BLENDER	CC	COOLING COIL	D	DAMPER
DF	DIRECT FIRED	U	UPFLOW	5	DOUBLE WALL	BL	BLANK	ML	MOISTURE ELIMINATOR	B	BURNER
				6	COIL GUARDS	F	FILTER	ER	ENERGY RECOVERY		

FAN TYPE (1)	
AF	AIR FOIL
BI	BACKWARD INCLINED
FC	FORWARD CURVED
P	PLENUM/PLUG

REMARKS:

(1) PROVIDE PROVIDE BELT DRIVEN SUPPLY FAN.

(2) SEE SPECIFICATION SECTIONS 237313 (AHU) FOR ANY ADDITIONAL ACCESSORIES. PROVIDE PROVIDE BELT DRIVEN SUPPLY FAN.

(3) MOUNTING HEIGHT SHALL BE FROM FINISHED FLOOR TO TOP OF UNIT.

(4) REFER TO ELECTRICAL PANEL "PP1" FOR AHU-7 BREAKER LOCATION IN MEZZANINE C201 ABOVE THE KITCHEN. COORDINATE WITH EC.

(5) PROVIDE "OVERSIZED MOTOR- HIGH STATIC" FOR THE SUPPLY FAN.

AIR COOLED CONDENSING UNIT (ACCU) SCHEDULE

MARK	MANUFACTURER, MODEL NUMBER	NOM. CAP. (TON)	MIN. EER	MIN. IEER	REF. TYPE	SST (°F)	HOT GAS BYPASS	NO. OF STAGES (4)	AMB. AIR TEMP. (°F)		COMPRESSORS		ELECTRICAL (3)				(2) MAX. SOUND (DB)	MATCHING EQUIPMENT COOLING COIL	WEIGHT (LB)	LOCATION	REMARKS
									MINIMUM	MAXIMUM	QTY.	TYPE	VOLTS	PHASE	MCA	MOCP					
ACCU-7	TRANE TWE07244BAA	6	12.7	12.2	R410A	-	NO	2	0	95	2	SCR	460	3	3.0	15.0	46	AHU-7	360	ROOF	

COMPRESSOR TYPE	
RCP	RECIPROCATING
SCR	SCROLL
SCW	SCREW

REMARKS:

(1) MANUFACTURER SHALL SIZE REFRIGERANT PIPING, VALVES, AND ACCESSORIES FOR PROPER OPERATION OF SYSTEM.

(2) PER ARI STANDARD 320 "SOUND RATING OF LARGE OUTDOOR REFRIGERATING AND AIR-CONDITIONING EQUIPMENT"

(3) REFER TO ELECTRICAL PANEL "PP1" FOR CONDENING UNIT ACCU-2 BREAKER LOCATION IN MEZZANINE C201 ABOVE THE KITCHEN. COORDINATE WITH EC.

(4) PROVIDE 2-STAGE COMPRESSORS (2) AT 2.6 TON EACH WITH DIRECT DRIVE CONDENSER FANS.

EXHAUST FAN (EF) SUPPLY FAN (SF) AND POWERED ROOF VENTILATOR (PRV) SCHEDULE

MARK	MANUFACTURER, MODEL NUMBER	FAN TYPE	AIR FLOW RATE (CFM)	ESP (IN WC)	MOTOR		FAN SPEED (RPM)	DRIVE TYPE	ELECTRICAL (VOLTS/PH)	(2) MTG. HEIGHT (IN)	MAXIMUM SOUND			(1) INTERLOCK WITH EXISTING	OPENING (IN)		ACCESSORIES	WEIGHT (LB)	LOCATION	REMARKS
					(HP)	TYPE					(3) (DB)	(4) SONES	INSTALL. TYPE		LENGTH	WIDTH				
PRV-4	GREENHECK, G-095-VG	6	500	0.50	1/6	ECM	1,465	DIRECT	115 / 1	18	-	8.1	C	AHU-5	12.5	12.5	1, 8, 9, 20, 23	30	ROOF	

FAN TYPE			
CENTRIFUGAL		AXIAL	
1	SIDEWALL	8	ROOFTOP DOWNBLAST
2	INLINE	9	SIDEWALL PROPELLER
3	UTILITY	10	TUBE AXIAL
4	CABINET	11	VANE AXIAL
5	ROOFTOP UPBLAST	12	MIXED FLOW
6	ROOFTOP HOODED	13	ROOFTOP FRP UPBLAST
7	ROOFTOP FILTERED SUPPLY		

MOTOR TYPE	
ODP	OPEN DRIP PROOF
TEFC	TOTALLY ENCLOSED FAN COOLED
XPL	EXPLOSION PROOF
INV	INVERTER DUTY
TEAO	TOTALLY ENCLOSED AIR OVER
ECM	ELECTRONIC COMMUTATED

INSTALLATION TYPE	
A	FREE INLET, FREE OUTLET
B	FREE INLET, DUCTED OUTLET
C	DUCTED INLET, FREE OUTLET
D	DUCTED INLET, DUCTED OUTLET

ACCESSORIES			
1	GRAVITY BACKDRAFT DAMPER	11	OUTLET WIRE GUARD
2	MOTORIZED BACKDRAFT DAMPER	12	INLET FILTER GUARD
3	WEATHERHOOD	13	MOTOR COVER
4	WALL COLLAR	14	HOUSING INSULATION
5	MOTOR WIRE GUARD	15	BELT (OSHA) WIRE GUARD
6	MOTOR (OSHA) WIRE GUARD	16	INLET BELL
7	SHUTTER GUARD	17	INLET/OUTLET FLANGES
8	FAN SPEED CONTROLLER	18	INLET VANE DAMPER
9	NON-FUSED DISCONNECT SWITCH	19	EXTENDED LUBE LINES
10	INLET WIRE GUARD	20	MFR. ROOF CURB
		21	HOODED WALL CAP
		22	HOODED ROOF CAP
		23	HINGED ROOF CURB
		24	INLET GRILLE
		25	BASE MOUNTED VIBRATION ISOLATORS
		26	DUCT ADAPTOR
		27	HANGING SPRING ISOLATORS
		28	HANGING NEOPRENE ISOLATORS
		29	FACTORY INSULATED ANGLED FILTER BOX

REMARKS:

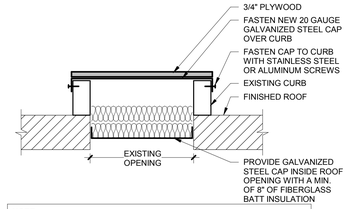
(1) SEE SPECIFICATION SECTION 230993 - HVAC SEQUENCE OF OPERATION.

(2) PROVIDE 18 INCH HIGH NEW ROOF CURB.

(3) SOUND POWER LEVEL RATING PER AMCA 301.

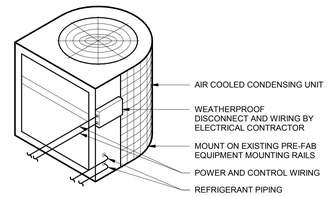
(4) LOUDNESS VALUES AT 5 FT IN A HEMISPHERICAL FREE FIELD PER AMCA 301.

(5) REFER TO ELECTRICAL PANEL "LB2" FOR PRV-4 EXHAUST FAN BREAKER LOCATION IN ELECTRICAL CLOSET A157.

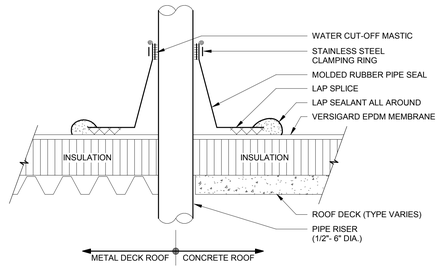


NOTE:
1. REMOVE EXISTING EQUIPMENT AND DUCTWORK AS NOTED ON PLANS THEN CAP OPENING AS SHOWN.

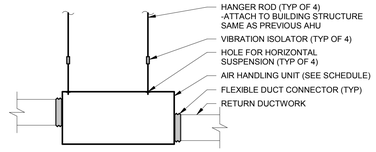
1 CURB CAP DETAIL
NO SCALE



2 CONDENSING UNIT
NO SCALE



3 ROOF PIPE PENETRATION - RUBBER SEAL
NO SCALE



4 SUSPENDED AIR HANDLING UNIT DETAIL (AHU-7)
NO SCALE

PRELIMINARY
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2019-06-06

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MANAWA

MANAWA ELEMENTARY SCHOOL - ALTERATIONS
MANAWA MIDDLE/HIGH SCHOOL - ADDITIONS & ALTERATIONS
PART 1 - MANAWA ELEMENTARY SCHOOL
800 BEECH STREET
MANAWA, WI 54949

MARK	DATE

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SHEET TITLE:
HVAC DETAILS & SCHEDULES

SHEET NUMBER:
1-MS-501

LUMINAIRE SYMBOLS

RECESSED LUMINAIRE
RECESSED TROFFER
RECESSED LINEAR
SURFACE ROUND LUMINAIRE
SURFACE SQUARE LUMINAIRE
SURFACE LINEAR
SURFACE INDUSTRIAL
SURFACE COVE STRIP
PENDANT ROUND LUMINAIRE
PENDANT SQUARE LUMINAIRE
PENDANT LINEAR
PENDANT INDUSTRIAL
(#) TRACK (# INDICATES NUMBER TRACK HEADS)
WALL SURFACE BRACKET
WALL RECESSED BRACKET
WALL SURFACE LINEAR
WALL RECESSED LINEAR
CEILING MOUNTED EXIT SIGN
WALL MOUNTED EXIT SIGN
WALL MOUNTED COMBINATION EXIT SIGN/EBU
ARROW DENOTES EXIT SIGN CHEVRON
EMERGENCY BATTERY UNIT
RECESSED EMERGENCY BATTERY UNIT
< WALL WASH MODIFIER
EMERGENCY SHADING MODIFIER

LUMINAIRE CIRCUITRY & CONTROL KEY:

A1 — LUMINAIRE TYPE
1Ra
LOWER CASE LETTER INDICATES SWITCHLEG CONTROL
"R" INDICATES LIGHTING CONTROL PANEL REFER TO LIGHTING CONTROL PANEL SCHEDULE
NUMBER INDICATES BRANCH PANEL CIRCUIT NUMBER

LUMINAIRE CONTROL SYMBOLS

OS X — OCCUPANCY SENSOR CEILING MOUNT (X REPRESENTS OCCUPANCY/PHOTO SENSOR SCHEDULE DESIGNATION)
DS X — DAYLIGHT SENSOR (X REPRESENTS OCCUPANCY/PHOTO SENSOR SCHEDULE DESIGNATION)
VS X — DAYLIGHT SENSOR CEILING MOUNT (X REPRESENTS OCCUPANCY/PHOTO SENSOR SCHEDULE DESIGNATION)
TC — ELECTRONIC TIME CLOCK
PE — PHOTO ELECTRIC CONTROL (X REPRESENTS OCCUPANCY/PHOTO SENSOR SCHEDULE DESIGNATION)
LC — LIGHTING CONTACTOR
LCP X — LIGHTING CONTROL PANEL (x REPRESENTS PANEL DESIGNATION)
PT — UL 924 LISTED EMERGENCY LIGHTING BYPASS CONTROL UNIT
PP — POWER PACK USED IN CONJUNCTION WITH OCCUPANCY SENSORS OR DAYLIGHT SENSORS
PS — REMOTE POWER SUPPLY OR DRIVER
DR — DIMMER RACK
D — DIMMER CONTROL STATION MULTI-PRESET MODULAR DIMMING SYSTEM

DIMMER NOTATIONS:

MCS	DENOTES MASTER CONTROL STATION
RS	DENOTES REMOTE STATION
ES	ENTRY STATION
PS	PARTITION STATION

L* — LOW VOLTAGE SWITCH * DENOTES SWITCH NAME, SEE LIGHTING CONTROL PANEL & SWITCH SCHEDULE.
S — SINGLE POLE SWITCH

SWITCH NOTATIONS:

3	DENOTES 3-WAY SWITCH
4	DENOTES 4-WAY SWITCH
C	MAINTAINED CONTACT, THREE POSITION, CENTER OFF
D	DENOTES WALL BOX DIMMER SWITCH
F	FAN SPEED CONTROL SWITCH
K	DENOTES KEY SWITCH
M	MOMENTARY CONTACT SWITCH
OSX	DENOTES OCCUPANCY SENSOR (X REPRESENTS SCHEDULE DESIGNATION)
P	DENOTES PILOT SWITCH
PB	PUSH BUTTON
T	DENOTES TIMER SWITCH
VSX	DENOTES VACANCY SENSOR (X REPRESENTS SCHEDULE DESIGNATION)
WL	DENOTES WET LOCATION SWITCH
X1	DENOTES EXPLOSION PROOF CLASS 1 DIVISION 1 SWITCH
X2	DENOTES EXPLOSION PROOF CLASS 1 DIVISION 2 SWITCH

SS — SWITCHES, FOR MULTI-LEVEL SWITCHING. REFER TO FLOOR PLANS AND FIXTURE SCHEDULE FOR EXACT CONTROL INTENT.
SWBK — SWITCHBANK

SERVICE & DISTRIBUTION SYMBOLS

GAP — GENERATOR ANNUNICATOR PANEL
EPO — EMERGENCY POWER OFF
PFC — POWER FACTOR CORRECTION CAPACITOR
AHF — ACTIVE HARMONIC FILTER
GROUND ACCESS WELL
GROUND ROD
GR — STATIC GROUND RECEPTACLE
LIGHTNING ROD
—G— GROUNDING CONDUCTOR
EGB — EQUIPMENT GROUND BUS
FEEDER BUS DUCT
PANELBOARD
C — CONTACTOR
P — PUSH BUTTON
EMERGENCY SHADING MODIFIER

RECEPTACLE SYMBOLS

60" — DUPLEX RECEPTACLE TEXT INDICATES MOUNTING HEIGHT
DOUBLE DUPLEX RECEPTACLE
ABOVE COUNTER DUPLEX RECEPTACLE
SIMPLEX RECEPTACLE
SPLIT WIRED DUPLEX RECEPTACLE
SPECIFIC USE RECEPTACLE. NEMA CONFIGURATIONAS NOTED ON DRAWINGS AND/OR SCHEDULE.
F — FLOOR BOX
P — POKE THRU
C — CEILING MOUNTED DUPLEX RECEPTACLE
C — CEILING MOUNTED DOUBLE DUPLEX RECEPTACLE
C — CEILING MOUNTED SPECIFIC USE RECEPTACLE. NEMA CONFIGURATIONAS NOTED ON DRAWINGS AND/OR SCHEDULE.
E — CORD REEL
SURFACE METAL RACEWAY - REFER TO DRAWINGS AND/OR SPECIFICATIONS, MOUNTED 6" ABOVE COUNTER OR AT HEIGHT AS INDICATED.
A — MULTI-OUTLET RACEWAY - OUTLETS ON CENTER AS INDICATED ON DRAWINGS AND IN THE SPECIFICATIONS, MOUNTED 6" ABOVE COUNTER OR AT HEIGHT AS INDICATED.

MULTI-OUTLET RACEWAY NOTATIONS:

A	DENOTES 2'-0" LENGTH, RECEPTACLES 6" O.C.
B	DENOTES 3'-0" LENGTH, RECEPTACLES 6" O.C.
C	DENOTES 5'-0" LENGTH, RECEPTACLES 6" OR 12" O.C.
D	DENOTES 6'-0" LENGTH, RECEPTACLES 6", 12", 18" OR 24" O.C.
F	DENOTES X'-X" LENGTH, RECEPTACLES X" O.C.

P — DATA/POWER POLE
EMERGENCY SHADING MODIFIER

RECEPTACLE NOTATIONS:

a	DENOTES SWITCH LEG FOR SWITCHED OUTLETS
D	DENOTES DEDICATED OUTLETS
EWC	DENOTES ELECTRIC WATER COOLER OUTLETS
GFCI	DENOTES GROUND FAULT INTERRUPTER OUTLETS
IG	DENOTES ISOLATED GROUND OUTLETS
H	DENOTES HORIZONTALLY MOUNTED OUTLETS
TR	DENOTES TAMPER RESISTANT SAFETY OUTLETS
USB	DENOTES COMBINATION DUPLEX/USB OUTLETS
WP	DENOTES WEATHER PROOF OUTLETS
X1	DENOTES EXPLOSION PROOF CLASS 1 DIVISION 1 OUTLETS
X2	DENOTES EXPLOSION PROOF CLASS 1 DIVISION 2 OUTLETS

RACEWAY SYMBOLS

SURFACE MOUNTED CONDUIT
CONCEALED CONDUIT IN CEILING OR WALL
WIREWAY, SIZE AND TYPE AS INDICATED ON DRAWINGS
CABLE TRAY, SIZE AND TYPE AS INDICATED ON DRAWINGS
UNDERFLOOR DUCT
J — JUNCTION BOX - CEILING MOUNTED
J — JUNCTION BOX - WALL MOUNTED
H — HANDHOLE
M — MANHOLE

MOTOR & EQUIPMENT CONNECTION SYMBOLS

ELECTRICAL CONNECTION TO EQUIPMENT AND MOTORS, SIZED PER NEC. COORDINATE REQUIREMENTS WITH CONTRACTOR FURNISHING MOTOR OR EQUIPMENT. REFER TO SPECIFICATIONS AND EQUIPMENT WIRING SCHEDULE FOR ADDITIONALWORK ASSOCIATED WITH MOTOR OR EQUIPMENT.
COMBINATION MAGNETIC CONTROLLER
M — INTERGRAL HORSEPOWER MANUAL CONTROLLER
SS — COMBINATION REDUCED VOLTAGE SOLID STATE CONTROLLER
SS — REDUCED VOLTAGE SOLID STATE CONTROLLER
VFD — VARIABLE FREQUENCY MOTOR CONTROLLER
MAGNETIC CONTROLLER - FULL VOLTAGE, ACROSS THE LINE, ELECTRICALLY HELD
NON-FUSIBLE DISCONNECT SWITCH
FUSIBLE DISCONNECT SWITCH
DOUBLE THROW SWITCH
S_{FS} — FUSED SINGLE POLE SWITCH
S_{MS} — MOTOR STARTING SWITCH WITH OVERLOADS
S_{MX} — MOTOR STARTING SWITCH WITHOUT OVERLOADS
RVS — REDUCED VOLTAGE MAGNETIC CONTROLLER
RVS — COMBINATION REDUCED VOLTAGE MAGNETIC CONTROLLER
MS — MULTI SPEED MAGNETIC CONTROLLER
MS — COMBINATION MULTI SPEED MAGNETIC CONTROLLER
ATS — AUTOMATIC TRANSFER SWITCH
MTS — MANUAL TRANSFER SWITCH
ENCLOSED CIRCUIT BREAKER
EMERGENCY SHADING MODIFIER

FIRE ALARM SYMBOLS

FACP — FIRE ALARM CONTROL PANEL
FAAP — FIRE ALARM ANNUNCIATOR PANEL
FSS — FIRE SUPPRESSION SYSTEM PANEL
KNOX — CABINET FOR HOLDING FIRE DEPARTMENT DOCUMENTS & KEYS WITH INTEGRAL TAMPER SWITCH. KNOX BRAND # 4400 OR APPROVED EQUAL. SEE DRAWING ##.
FIRE ALARM PULL STATION
H — FIRE ALARM HORN
S — FIRE ALARM SPEAKER
H — FIRE ALARM HORN/STROBE, (##) IS CANDELA RATING
S — FIRE ALARM SPEAKER/STROBE, (##) IS CANDELA RATING
S — SUPERVISED FIRE ALARM HORN LOUDSPEAKER
— FIRE ALARM STROBE, (##) IS CANDELA RATING
B — FIRE ALARM BELL
INTELLIGENT PHOTOELECTRIC SMOKE DETECTOR
ER — INTELLIGENT PHOTOELECTRIC SMOKE DETECTOR FOR ELEVATOR RECALL
SD — INTELLIGENT PHOTOELECTRIC SMOKE DETECTOR FOR SMOKE DAMPER CONTROL
H — INTELLIGENT 135ºF FIXED & RATE OF RISE HEAT DETECTOR (15ºF/M), (20ºF/M), UNLESS NOTED ON DRAWINGS
HF — HEAT DETCTOR, [190], [194] OR [200]ºF FIXED TEMP 2 WIRE OPERATION. [PROVIDE ADDRESSIBLE CONTROL MODULE]
HX — EXPLOSION PROOF HEAT DETCTOR, COMBINATION RATE OF RISE AND 135ºF FIXED TEMPERATURE, 2-WIRE OPERATION. [PROVIDE ADDRESSIBLE CONTROL MODULE.] HAZARDOUS CLASSIFICATION: [CLASS-I], [CLASS-II], [GROUP C], [GROUP D], [GROUP E], [GROUP F], AND [GROUP G].
DS — INTELLIGENT PHOTOELECTRIC DUCT SMOKE DETECTOR
CO — CARBON MONOXIDE DETECTOR
— CEILING MOUNTED FIRE ALARM STROBE, (##) IS CANDELA RATING
— CEILING MOUNTED FIRE ALARM SPEAKER/STROBE, (##) IS CANDELA RATING
CEILING MOUNTED FIRE ALARM SPEAKER
— CEILING MOUNTED FIRE ALARM HORN/STROBE, (##) IS CANDELA RATING
CEILING MOUNTED FIRE ALARM HORN
MM — MONITOR MODULE
CM — CONTROL MODULE
IM — ISOLATOR MODULE
DH — MAGNETIC DOOR HOLDER
ES — ELECTRIC DOOR STRIKE
FIRE FIGHTERS TELEPHONE
FIRE FIGHTERS TELEPHONE JACK
FS — FLOW SWITCH FOR SPRINKLER SYSTEM SUPERVISORY FLOW ALARM, NORMALLY OPEN DRY CONTACTS FOR FIRE ALARM INTERFACE, FURNISHED BY MC, WIRED BY EC.
TS — MONITOR SWITCH (TAMPER SWITCH) FOR SPRINKLER SYSTEM SUPERVISORY TROUBLE NOTIFICATION, NORMALLY OPEN DRY CONTACTS FOR FIRE ALARM INTERFACE, FURNISHED BY MC, WIRED BY EC.
PE — PRESSURE SWITCH
PS — PRE-ACTION SOLENOID
RTS/I — REMOTE TEST SWITCH WITH INDICATOR
PM — POST INDICATOR SWITCH (PROVIDE ADDRESSIBLE CONTROL MODULE).
HDS — ELEVATOR HOISTWAY DAMPER SWITCH
HA — HALON AUDIBLE ALARM
HP — FIRE HALON PULL STATION
HS — HALON STROBE
NAC — FIRE ALARM NOTIFICATION APPLIANCE EXTENDER PANEL

MASS NOTIFICATION SYMBOLS

FMCP — FIRE & MASS NOTIFICATION CONTROL PANEL
M — MASS NOTIFICATION SPEAKER/STROBE, WALL MOUNTED (#) IS CANDELA RATING
M — MASS NOTIFICATION SPEAKER, WALL MOUNTED
M — MASS NOTIFICATION STROBE, WALL MOUNTED
M # — MASS NOTIFICATION SPEAKER/STROBE, CEILING MOUNTED (#) IS CANDELA RATING
M — MASS NOTIFICATION SPEAKER, CEILING MOUNTED
M — MASS NOTIFICATION STROBE, CEILING MOUNTED

SITE SYMBOLS

GROUND MOUNTED LIGHT (ABOVE & BELOW GRADE MOUNTING)
E — ELECTRIC HANDHOLE
HH — HANDHOLE, GENERIC
E — ELECTRIC MANHOLE
M — ELECTRIC METER
ELECTRIC SERVICE PANEL
TRANS — ELECTRIC TRANSFORMER
ELECTRIC PEDESTAL BOX
FLOOD LIGHT POLE
BOLLARD LIGHT
DOUBLE LIGHT POLE
LIGHT POLE
POWER POLE
DOUBLE POWER POLE
POWER POLE WITH LIGHT

GENERAL SYMBOLS

#/E-### — DETAIL NUMBER / SHEET NUMBER
9.### — KEYED NOTE, USED TO DESCRIBE ADDITIONAL INFORMATION OF WORK REQUIRED, SPECIFIC TO THE SHEET AND/OR DETAIL IT IS SHOWN WITH.
— KITCHEN EQUIPMENT TAG. # REFERS TO CORRESPONDING NUMBER IN KITCHEN EQUIPMENT SCHEDULE.

LINE TYPE KEY

NEW WORK BY THIS CONTRACTOR (DARK SOLID LINE)
EXISTING TO BE REMOVED BY THIS CONTRACTOR (DARK DASHED LINE)
EXISTING TO REMAIN WORK (THIN SOLID LINE)
NEW WORK UNDER FLOOR BY THIS CONTRACTOR
ONE-LINE EQUIPMENT ENCLOSURE
PANEL DIVISION LINES
— CON — SITE UNDERGROUND CONDUIT
—//CON//— SITE REMOVED UNDERGROUND CONDUIT
— E — SITE UNDERGROUND ELECTRIC
— OHE — SITE OVERHEAD ELECTRIC
— //OHE// — SITE REMOVED OVERHEAD ELECTRIC
— //E// — SITE REMOVED UNDERGROUND ELECTRIC

PANEL DESIGNATION KEY

2 L N L 1

FLOOR
TYPE
SYSTEM/SOURCE
VOLTAGE
SEQUENCE NUMBER OR LETTER

NUMBER OR LETTER IN SEQUENCE I.E. 1,2,3 OR A,B,C

L - 208Y/120V
H - 480Y/277V

N - NORMAL BRANCH
U - UNINTERRUPTIBLE SOURCE
E - EMERGENCY BRANCH (NEC 700)
X - LEGALLY REQUIRED STANDBY BRANCH (NEC 701)
O - OPTIONAL STANDBY BRANCH (NEC 702)

L - LIGHTING PANELBOARD
D - DISTRIBUTION PANELBOARD
P - POWER/EQUIPMENT PANELBOARD
R - RECEPTACLE PANELBOARD
MSB - MAIN SWITCHBOARD
MCC - MOTOR CONTROL CENTER

G - GROUND FLOOR
B - BASEMENT FLOOR
1 - FIRST FLOOR
P - PENTHOUSE
M - MEZZANINE

ELECTRICAL ABBREVIATIONS

3R	NEMA 3R RATING
4X	NEMA 4X RATING
A	AMPERES
A/E	ARCHITECT / ENGINEER
AAC	ABOVE ACCESSIBLE CEILING
ACCU	AIR COOLED CONDENSING UNIT
AFF	ABOVE FINISHED FLOOR
AFG	ABOVE FINISHED GRADE
AHU	AIR HANDLING UNIT
ALT	ALTERNATE
APE	AIRCRAFT PROCESS EQUIPMENT
ATS	AUTOMATIC TRANSFER SWITCH
BLDG	BUILDING
BRKR	BREAKER
C	CONDUIT
CB	CIRCUIT BREAKER
CEB	CONCRETE EQUIPMENT BASE
CF	CIRCULATION FAN
CH	CHILLER
CHWP	CHILLED WATER PUMP
CKT	CIRCUIT
CP	CIRCULATION PUMP
CRAC	COMPUTER ROOM AIR CONDITIONER
CRP	CONDENSATION RETURN
CT	COOLING TOWER
CUH	CABINET UNIT HEATER
DC	DROP CORD
DDC	DIGITAL CONTROL PANEL
DH	DUCT HEATER
DISC	DISCONNECT
DO	DOOR OPERATOR
DWG	DRAWING
E/O	ELECTRICAL-TO-OPTICAL CONVERTER
EC	ELECTRICAL CONTRACTOR
ECB	ENCLOSED CIRCUIT BREAKER
EF	EXHAUST FAN
EM	EMERGENCY
EMT	ELECTRICAL METALLIC TUBING
ERL	EXISTING TO BE RELOCATED
ERLD	EXISTING - RELOCATED LOCATION
ES	EQUIPMENT SUPPLIER
ETR	EXISTING TO REMAIN
EWC	ELECTRICAL WATER COOLER
EWH	ELECTRICAL WATER HEATER
F	FUSED
FA	FIRE ALARM
FAF	FORCED AIR FURNACE
FCU	FAN COIL UNIT
GC	GENERAL CONTRACTOR
GD	GARBAGE DISPOSAL
GFI	GROUND FAULT INTERRUPTER
GND	GROUND
GWH	GAS WATER HEATER
HD	HAND DRYER
HP	HORSEPOWER
HVAC	HEATING, VENTILATION, AIR CONDITIONING
HWB	HOT WATER BOILER
HWP	HOT WATER PUMP
IEWH	INSTANTANEOUS ELECTRIC WATER HEATER
IH	INFRARED HEATER
IMC	INTERMEDIATE METALLIC CONDUIT
IWH	INSTANTANEOUS WATER HEATER
J-BOX	JUNCTION BOX
LBS	POUNDS
LFS	LIGHTING FIXTURE SCHEDULE
MAU	MAKE-UP AIR UNIT
MAX	MAXIMUM
MC	MECHANICAL CONTRACTOR
MCC	MOTOR CONTROL CENTER
MDF	MAIN DISTRIBUTION FRAME
MDP	MAIN DISTRIBUTION PANEL
MIN.	MINIMUM
MNS	MASS NOTIFICATION SYSTEM
MTD	MOUNTED
MTG	MOUNTING
MTS	MANUAL TRANSFER SWITCH
NIC	NOT IN CONTRACT
NL	NIGHT LIGHT
NL/EL	NIGHT LIGHT AND EMERGENCY LIGHT
NTS	NOT TO SCALE
OC	ON CENTER
OFCI	OWNER FURNISHED, CONTRACTOR INSTALLED
OFOI	OWNER FURNISHED, OWNER INSTALLED
PH	PHASE
PNL	PANEL
PVC	POLYVINYL CHLORIDE
RCP	RADIANT CEILING PANEL
RECPT	RECEPTACLE
REF	REFRIGERATOR
REQ'D	REQUIRED
RF	RETURN FAN
RGS	RIGID GALVANIZED STEEL CONDUIT MAY ALSO BE REFERENCED AS RMC OR GRC
RMC	RIGID METAL CONDUIT
RTU	ROOF TOP UNIT
S/N	SOLID NEUTRAL
SE	SERVICE ENTRANCE
SEC-P	SECURITY PANEL
SF	SUPPLY FAN
SP	SUMP PUMP
SS	STAINLESS STEEL
SW	SWITCH
SWBK	SWITCH BANK
TBR	TO BE REMOVED
TCP	TEMPERATURE CONTROL PANEL
TFA	TO FLOOR ABOVE
TFB	TO FLOOR BELOW
TYP	TYPICAL
UC	UNIT COOLER
UG	UNDERGROUND
UH	UNIT HEATER
UNO	UNLESS NOTED OTHERWISE
UV	UNIT VENTILATER
V	VOLTS
VER	VEHICLE EXHAUST REEL
VFD	VARIABLE FREQUENCY DRIVE
VS	VERSUS
W	WATTS
WCC	WATER COOLED CONDENSER
WFE	WELDING FUME EXTRACTOR
WH	WATER HEATER
WL	WET LOCATION LISTED
WP	WEATHERPROOF
XFMR	TRANSFORMER
XP	EXPLOSION PROOF

GENERAL NOTES:

1. REFER TO THE G SERIES DRAWINGS FOR CODE ANALYSIS PLANS, INFORMATION AND NOTES.
2. THE CONTRACTOR SHALL BECOME FAMILIAR WITH THE DETAILS OF WORK, VERIFY DIMENSIONS IN THE FIELD, AND ADVISE THE [ARCHITECT/ENGINEER] [CONTRACTING OFFICER] OF ANY DISCREPANCY BEFORE PERFORMING ANY WORK.
3. THE COMPLETE INSTALLATION SHALL BE IN ACCORDANCE WITH THE ADAAG (AMERICANS WITH DISABILITIES ACT ACCESSIBILITY GUIDELINES) AND ABA (ARCHITECTURAL BARRIERS ACT).
4. REFER TO ARCHITECTURAL DRAWINGS FOR FIRE RATED WALLS AND FLOORS. MAKE RATED PENETRATIONS AS REQUIRED. SEAL ALL RATED PENETRATIONS AS IDENTIFIED IN DIVISION 1 REQUIREMENTS.
5. FLUSH MOUNT ALL TOGGLE SWITCHES, RECEPTACLE , FIRE ALARM PULL STATIONS AND FIRE ALARM NOTIFICATION DEVICES AT HEIGHTS ABOVE FINISHED FLOOR AS SHOWN IN THE DEVICE MOUNTING HEIGHT DETAIL, EXCEPT WHERE OTHERWISE NOTED. DEVICES MAY BE SURFACE MOUNTED WHEN CONDUIT IS SPECIFIED EXPOSED.
6. CIRCUIT NUMBERS ARE SHOWN FOR CIRCUIT IDENTIFICATION. CIRCUITING SHALL AGREE WITH NUMBERING ON THE PANEL SCHEDULES PROVIDED. BALANCE THE LOAD ON PANELS AS EVENLY AS POSSIBLE BETWEEN EACH PHASE. COMMON NEUTRALS MAY **[NOT]** BE USED FOR BRANCH CIRCUITS. BALANCE THE LOAD ON PANEL AS EVENLY AS POSSIBLE BETWEEN EACH PHASE.
7. CIRCUITS SERVING EMERGENCY AND EXIT LUMINAIRES SHALL BE RUN IN SEPARATE RACEWAY FROM ALL OTHER CIRCUITS.
8. A #12 GREEN INSULATED GROUND CONDUCTOR SHALL BE INSTALLED WITH CIRCUIT CONDUCTORS TO ALL RECEPTACLES.
9. CONCEAL ALL CONDUIT IN WALLS, PARTITIONS, ABOVE CEILING, ETC. UNLESS OTHERWISE INDICATED ON THE PLANS OR IN THE SPECIFICATIONS. CONDUIT IN MECHANICAL ROOMS, AND STORAGE ROOMS WITHOUT CEILINGS MAY BE EXPOSED ON BUILDING STRUCTURE. WHERE RACEWAY IS REQUIRED ON EXISTING CONCRETE AND MASONRY WALLS, SURFACE RACEWAY MAY BE USED IN LIEU OF CHANNELING WALLS TO ALLOW CONCEALED ROUTING. THE RACEWAY SHALL BE SINGLE CHANNEL STYLE TYPE WITH IVORY FINISH. THIS APPLIES FOR BRANCH CIRCUIT CONDUITS UP TO 3/4" SIZE. CONDUITS LARGER THAN 3/4" MAY BE ROUTED EXPOSED, BUT INSTALLED PARALLEL AND/OR PERPENDICULAR TO BUILDING LINES AND RUN AS UNOBTRUSIVELY AS POSSIBLE.
10. BOXES LOCATED ON OPPOSITE SIDES OF NON-RATED WALLS SHALL BE OFFSET A MINIMUM OF 6" HORIZONTALLY. "THRU-THE-WALL" BOXES SHALL NOT BE ALLOWED WITHOUT PRIOR WRITTEN APPROVAL OF THE ARCHITECT/ENGINEER.
11. COORDINATE AND CO-LOCATE WALL MOUNTED RECEPTACLE LOCATIONS WITH TECHNOLOGY (VOICE/DATA,CATV,FIDS, ETC) OUTLETS SHOWN ON THE T-SERIES DRAWINGS UNLESS OTHERWISE NOTED, EACH TECHNOLOGY OUTLET SHALL BE LOCATED WITHIN 24"OF ITS ASSOCIATED RECEPTACLE. ASSOCIATED RECEPTACLE SHALL BE DEFINED AS THE RECEPTACLE NEAREST THE LOCATION OF, AND AT THE SAME HEIGHT AS,THE TECHNOLOGY OUTLET WHEN MULTIPLE RECEPTACLES ARE SHOWN ON A WALL.
12. DUPLEX RECEPTACLES FOR ELECTRIC WATER COOLERS (EWC) SHALL BE CONCEALED BEHIND WATER COOLER ACCESS PLATE OR BE DIRECTLY BELOW AND CENTERED ON EWC. CONTRACTOR SHALL VERIFY TYPE OF EWC TO BE INSTALLED.
13. CONTRACTOR SHALL COORDINATE THE LOCATION OF ALL DETECTORS WITH LUMINAIRES, SPRINKLER, AND CEILING DIFFUSERS. CENTER ALL DEVICES IN CEILING TILE PATTERN. SMOKE DETECTORS SHALL BE LOCATED NO CLOSER THAN 3 FEET TO AN AIR SUPPLY DIFFUSER OR RETURN GRILLE.
14. CONTRACTOR SHALL VERIFY ALL FURNITURE, MODULAR FURNITURE AND EQUIPMENT LOCATIONS WITH ARCHITECTURAL PLANS, ELEVATIONS AND REVIEWED SHOP DRAWINGS. PRIOR TO ELECTRICAL INSTALLATION THIS CONTRACTOR SHALL ADJUST RECEPTACLES, OUTLETS OR CONNECTION LOCATIONS TO ACCOMMODATE FURNITURE AND/OR EQUIPMENT.
15. ELECTRICAL AND TELECOMMUNICATIONS EQUIPMENT SHALL BE MOUNTED TO AVOID IMPEDANCE OF, OPERATION OF, AND/OR ACCESS TO ELECTRICAL AND MECHANICAL EQUIPMENT. ALL MOUNTING OF ELECTRICAL AND TELECOMMUNICATIONS EQUIPMENT, ON EQUIPMENT SUPPLIED BY ANOTHER CONTRACTOR, SHALL BE APPROVED IN ADVANCE BY THE OTHER CONTRACTOR.
16. CONTRACTOR TO PROVIDE SUITABLE MECHANICAL PROTECTION AROUND ALL CONDUITS STUBBED OUT FROM FLOORS, WALLS OR CEILINGS DURING CONSTRUCTION TO PREVENT BENDING OR DAMAGING OF STUB OUTS DUE TO CARELESSNESS WITH CONSTRUCTION EQUIPMENT.
17. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL OPENINGS REQUIRED IN WALLS. ALL OPENINGS SHALL BE REPAIRED TO MATCH EXISTING BY A QUALIFIED CONTRACTOR AT THE EXPENSE OF THIS CONTRACTOR. ALL CONDUITS THROUGH WALLS SHALL BE GROUTED OR SEALED INTO OPENINGS.
18. DRAWINGS INDICATE THE EXTENT OF HAZARDOUS OR WET LOCATIONS. INSTALLATION MEANS AND METHODS SHALL BE SUITABLY RATED FOR THE ENVIRONMENT INDICATED ON THE DRAWINGS.
19. CONTRACTOR SHALL REMOVE AND REINSTALL ALL CEILING TILES AS REQUIRED FOR THE EXECUTION OF ELECTRICAL WORK THAT IS OUTSIDE THE CONTRACT LIMITS OF CONSTRUCTION. CONTRACTOR SHALL REPLACE CEILING TILES WITH IDENTICAL MATERIAL WHERE DAMAGED BY THIS CONTRACTOR.
20. ALL INTERLOCKING REQUIRED BY THE DRIVE MANUFACTURER BETWEEN THE VARIABLE FREQUENCY DRIVE AND THE DISCONNECT SWITCHES SHALL BE THE RESPONSIBILITY OF THE ELECTRICAL CONTRACTOR.
21. SCCR RATINGS LISTED FOR EQUIPMENT ARE MINIMUM REQUIREMENTS FOR BUS BRACING AND DEVICE RATING. ALL EQUIPMENT SHALL BE FULLY RATED UNLESS SPECIFICALLY NOTED AS SERIES RATED.

DEMOLITION GENERAL NOTES:

1. THE INFORMATION SHOWN IS BASED ON EXISTING DRAWINGS AND SITE OBSERVATIONS TO ASSIST CONTRACTOR IN BIDDING. THE ELECTRICAL DRAWINGS INDICATE EXISTING ELECTRICAL ITEMS TO BE REMOVED. THE DRAWINGS ARE INTENDED TO INDICATE THE SCOPE OF WORK REQUIRED AND DO NOT INDICATE EVERY BOX, CONDUIT, OR WIRE THAT MUST BE REMOVED. THE CONTRACTOR SHALL VISIT THE SITE PRIOR TO SUBMITTING A BID AND VERIFY EXISTING CONDITIONS. REFER TO SPECIFICATION SECTION 26 05 02 FOR ADDITIONAL REQUIREMENTS.
2. DASHED WALLS ON THE FLOOR PLANS INDICATE EXISTING WALLS BEING DEMOLISHED. REFER TO THE ARCHITECTURAL DEMOLITION PLANS FOR THE EXACT EXTENT OF WORK REQUIRED BY THIS PROJECT. REMOVE ALL DEVICES ON DASHED WALLS NOT SHOWN ON THE CONTRACT DRAWINGS. REFER TO DEMOLITION DRAWINGS OF OTHER TRADES. WHERE MOTORS CONTROL PANELS, AND OTHER LOADS OR APPARATUS THAT HAVE ELECTRICAL CONNECTION ARE BEING REMOVED, INCLUDE DISCONNECTION AND REMOVAL OF ALL ASSOCIATED CONDUIT, WIRING, ETC.
3. ELECTRICAL ITEMS (i.e., LIGHTING FIXTURES, PANELBOARDS, DISCONNECTS, MOTOR CONTROLLERS , ETC.) REMOVED AND NOT RELOCATED REMAIN THE PROPERTY OF THE OWNER AND SHALL BE TURNED OVER TO THE OWNER, IN A STORAGE AREA TO BE DESIGNATED BY THE OWNER. EQUIPMENT BEING REMOVED SHALL BE HANDLED SO AS NOT TO FURTHER REDUCE ITS VALUE TO THE OWNER. THE CONTRACTOR SHALL DISPOSE OF MATERIAL THE OWNER DOES NOT WANT TO REUSE OR RETAIN FOR MAINTENANCE PURPOSES.
4. WHERE LIGHTS, SWITCHES, RECEPTACLES, ETC., ARE BEING REMOVED ALL ASSOCIATED CONDUIT AND WIRE BACK TO THE PANELBOARD OR FEEDER JUNCTION BOX SERVING THE DEVICE SHALL ALSO BE REMOVED, UNLESS THE CONDUIT CAN BE REUSED FOR NEW CONDUCTORS. THE CONTRACTOR SHALL DISPOSE OF MATERIAL THE OWNER DOES NOT WANT TO REUSE OR RETAIN FOR MAINTENANCE PURPOSES.
5. ALL BOXES THAT REMAIN IN PLACE IN EXISTING MASONRY WALLS THAT ARE TO REMAIN SHALL BE PROVIDED WITH A BLANK COVERPLATE. REFER TO SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS ASSOCIATED WITH TYPE AND ATTACHMENT.
6. ALL CONDUIT SHALL BE REMOVED WHERE WALLS ARE BEING REMOVED. WHERE CONDUIT IS IN THE CONCRETE SLAB, CUT OFF FLUSH, PULL OUT WIRE, AND PLUG. WHERE CONDUIT IS RUN EXPOSED, ALL ASSOCIATED CLAMPS, SUPPORTS, HANGERS, ETC., SHALL ALSO BE REMOVED. CONDUIT CONCEALED IN WALL CONSTRUCTION MAY BE ABANDONED IN PLACE IF NOT AFFECTED BY OTHER CONSTRUCTION.
7. THIS CONTRACTOR SHALL COORDINATE ALL HIS WORK, INCLUDING PHASING WITH OTHER CONTRACTORS AT THE JOB SITE BEFORE REMOVING EXISTING ELECTRICAL AND INSTALLING NEW ITEMS.
8. EXISTING CONDUIT IN GOOD CONDITION, MAY BE REUSED IN PLACE. RELOCATED EXISTING CONDUIT SHALL NOT BE ALLOWED. BONDING CONDUCTORS SHALL BE INSTALLED IN ALL REUSED CONDUIT TO ASSURE PROPER GROUND PATH.
9. MAINTAIN CIRCUIT CONTINUITY OF DEVICES LOCATED OUTSIDE OF CONSTRUCTION AREA. DEVICE AND EQUIPMENT REMOVAL IN CERTAIN LOCATIONS MAY REQUIRE THE INSTALLATION OF A JUNCTION BOX TO RECONNECT CIRCUITS THAT REMAIN IN OPERATION. EXTEND CONDUIT AND WIRING AS REQUIRED TO MAINTAIN POWER TO REMAINING EQUIPMENT.
10. BALLASTS MANUFACTURED PRIOR TO 1980 CONTAIN PCBs AND SHALL BE DISPOSED OF IN ACCORDANCE WITH SPECIFICATIONS.
11. HID AND FLUORESCENT LAMPS CONTAIN MERCURY AND SHALL BE DISPOSED OF IN ACCORDANCE WITH SPECIFICATIONS.
12. CONTRACTOR SHALL REMOVE AND INSTALL ALL CEILING TILES AS REQUIRED FOR THE EXECUTION OF ELECTRICAL WORK THAT IS OUTSIDE THE CONTRACT LIMITS OF CONSTRUCTION. CONTRACTOR SHALL REPLACE CEILING TILES WITH IDENTICAL MATERIAL WHERE DAMAGED BY THIS CONTRACTOR.
13. PROVIDE REVISED TYPED CIRCUIT DIRECTORY IN PANELBOARDS THAT HAVE CIRCUITS REMOVED OR ADDED CIRCUITS.
14. REMOVE EXPOSED ABANDONED CONDUIT, INCLUDING ABANDONED CONDUIT ABOVE ACCESSIBLE CEILING FINISHES. CUT RACEWAY FLUSH WITH WALLS AND FLOORS, PATCH SURFACES TO MATCH EXISTING. REMOVE ALL ASSOCIATED CLAMPS, HANGERS, SUPPORTS, ETC. ASSOCIATED WITH RACEWAY REMOVAL.
15. DISCONNECT AND REMOVE ABANDONED LUMINAIRES, INCLUDING BRACKETS, STEMS, HANGERS, AND OTHER ACCESSORIES.
16. DISCONNECT AND REMOVED ELECTRICAL DEVICES AND EQUIPMENT SERVING UTILIZATION EQUIPMENT THAT HAS BEEN REMOVED.

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MANAWA

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800 BEECH STREET
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MARK	DATE

ISSUED: June 6, 2019
PROJECT NO: 18268
CAD DWG FILE:
DRAWN BY: MRF
CHECKED BY: IMR

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SHEET TITLE:
NOTES, SYMBOLS & ABBREVIATIONS

SHEET NUMBER:
1-EE-001

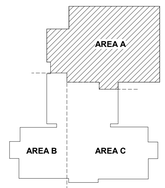
KEYED NOTES

TRUE NORTH PLAN NORTH

N N 1 **FIRST FLOOR POWER DEMOLITION PLAN - AREA A**

1/8" = 1'-0"

PRELIMINARY
NOT FOR CONSTRUCTION
2019-06-06



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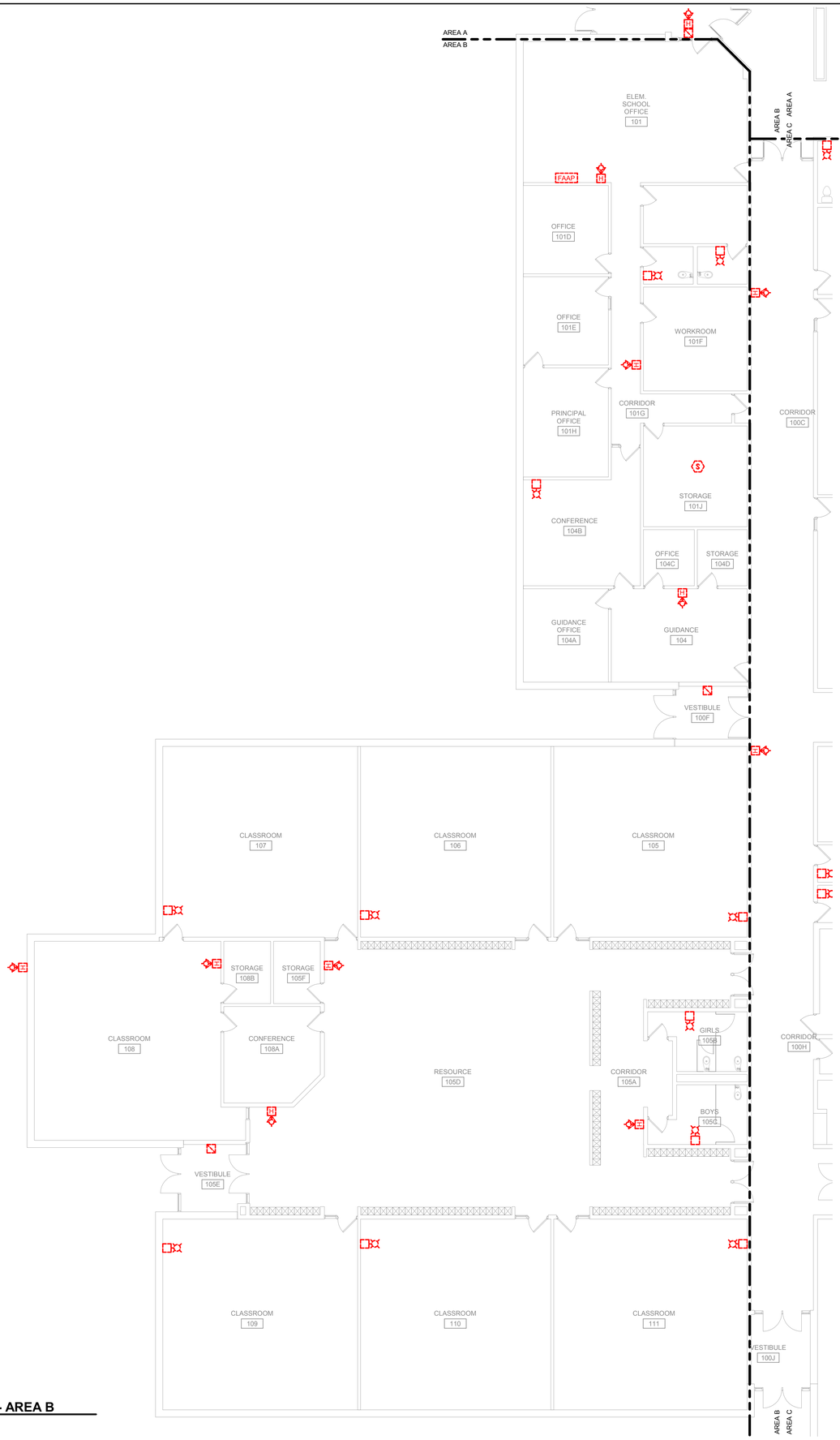
SHEET TITLE:
FIRST FLOOR POWER & FA DEMOLITION PLAN - AREA A

SHEET NUMBER:
1-EPD-101

KEYED NOTES



TRUE NORTH PLAN NORTH

FIRST FLOOR POWER DEMOLITION PLAN - AREA B

1/8" = 1'-0"

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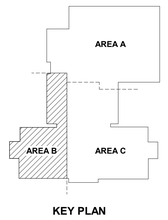
2019-06-06

FOR BIDS
NOT FOR CONSTRUCTION



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SHEET TITLE:
FIRST FLOOR POWER & FA DEMOLITION PLAN - AREA B

SHEET NUMBER:
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TRUE NORTH PLAN NORTH

FIRST FLOOR POWER DEMOLITION PLAN - AREA C

1/8" = 1'-0"

KEYED NOTES

9.004 REMOVE EXISTING DUPLEX RECEPTACLE AND ASSOCIATED WIRING BACK TO THE NEAREST JUNCTION BOX, SPLICE AS REQUIRED TO MAINTAIN CONTINUITY OF EXISTING CIRCUIT.

9.005 DISCONNECT AND REMOVE ABOVE COUNTER DUPLEX RECEPTACLES. PULL WIRING BACK TO SOURCE.

9.006 DISCONNECT AND REMOVE ALL CONNECTIONS INCLUDING WALL SWITCH AND OUTLETS FOR GARBAGE DISPOSAL, MICROWAVE AND ELECTRIC RANGE. PULL WIRING BACK TO SOURCE.

9.007 RE-CONNECT EXISTING OUTLETS AS REQUIRED TO MAINTAIN EXISTING CIRCUIT CONTINUITY.

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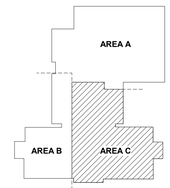

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SHEET TITLE:
FIRST FLOOR POWER & FA DEMOLITION PLAN - AREA C

SHEET NUMBER:
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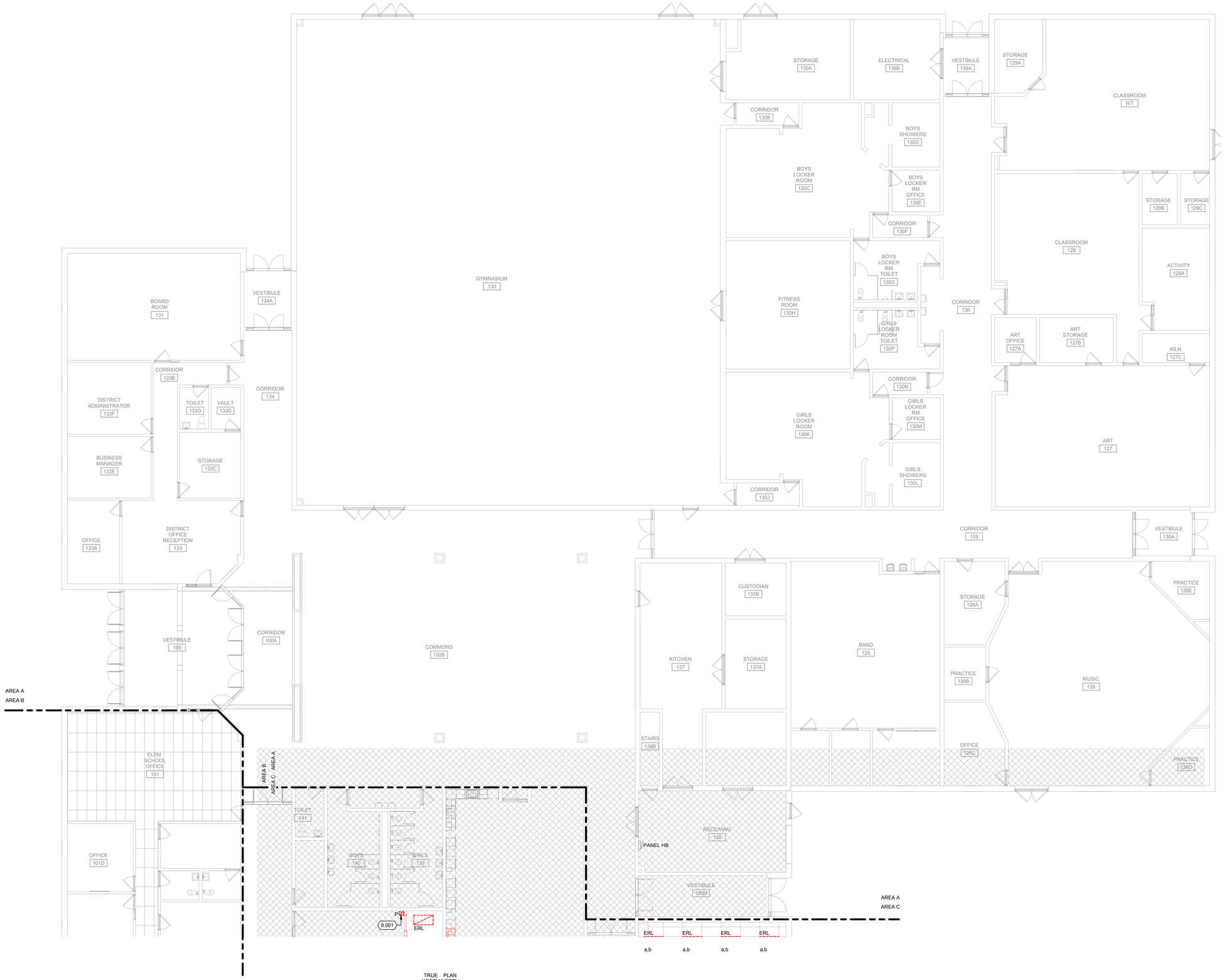
KEYED NOTES

9.001 REMOVE EXISTING SWITCH AND ASSOCIATED WIRING BACK TO NEAREST JUNCTION BOX LOCATED ABOVE CEILING.



TRUE NORTH PLAN NORTH

N N 1 **FIRST FLOOR LIGHTING DEMOLITION PLAN - AREA A**

1/8" = 1'-0"

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2019-06-06

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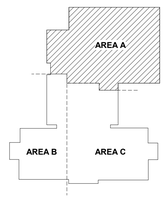

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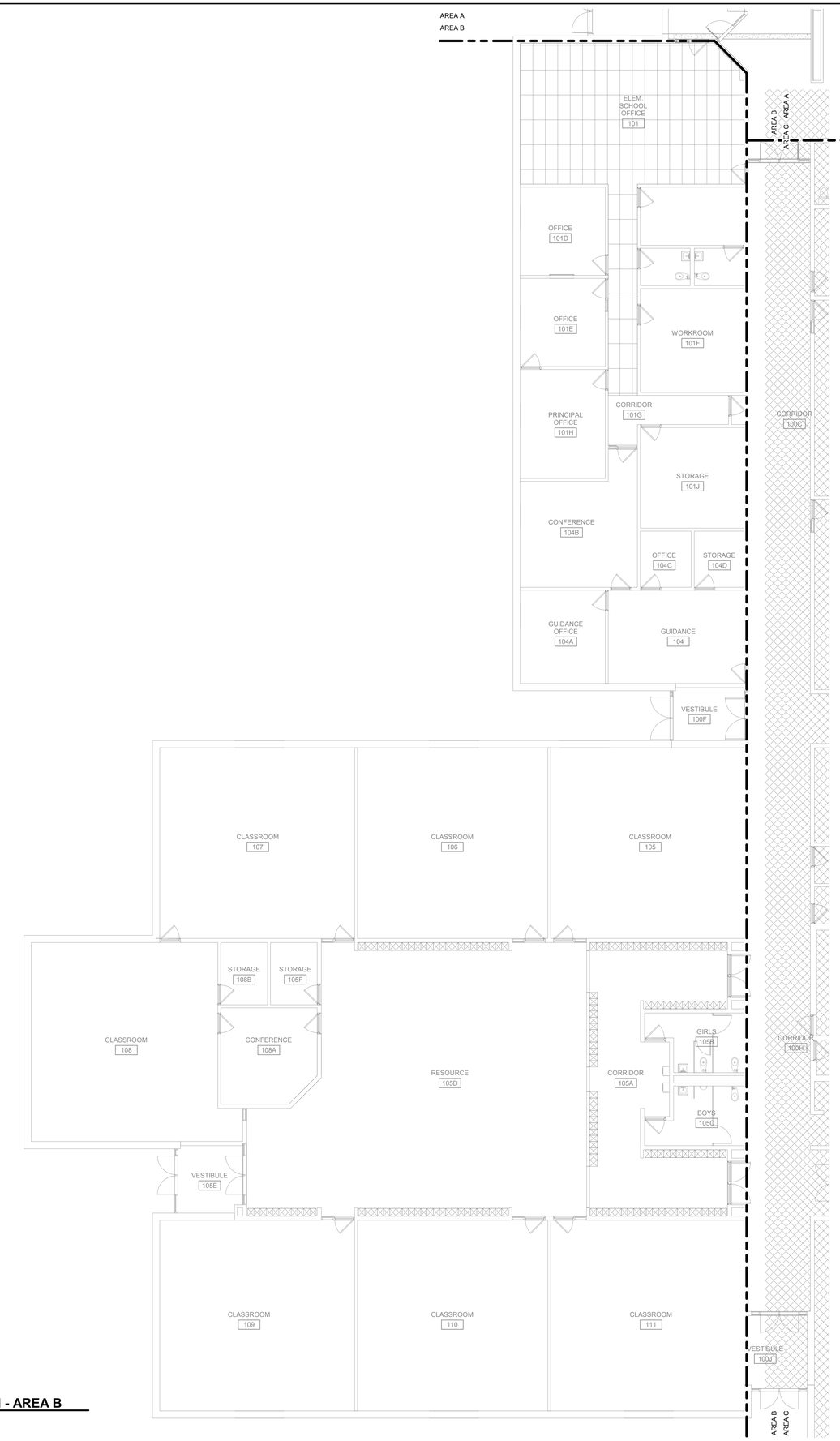
SHEET TITLE:
FIRST FLOOR LIGHTING DEMOLITION PLAN - AREA A

SHEET NUMBER:
1-ELD-101

KEYED NOTES



TRUE NORTH PLAN NORTH

FIRST FLOOR LIGHTING DEMOLITION PLAN - AREA B

1/8" = 1'-0"

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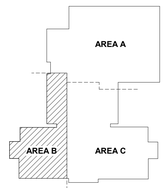
2019-06-06



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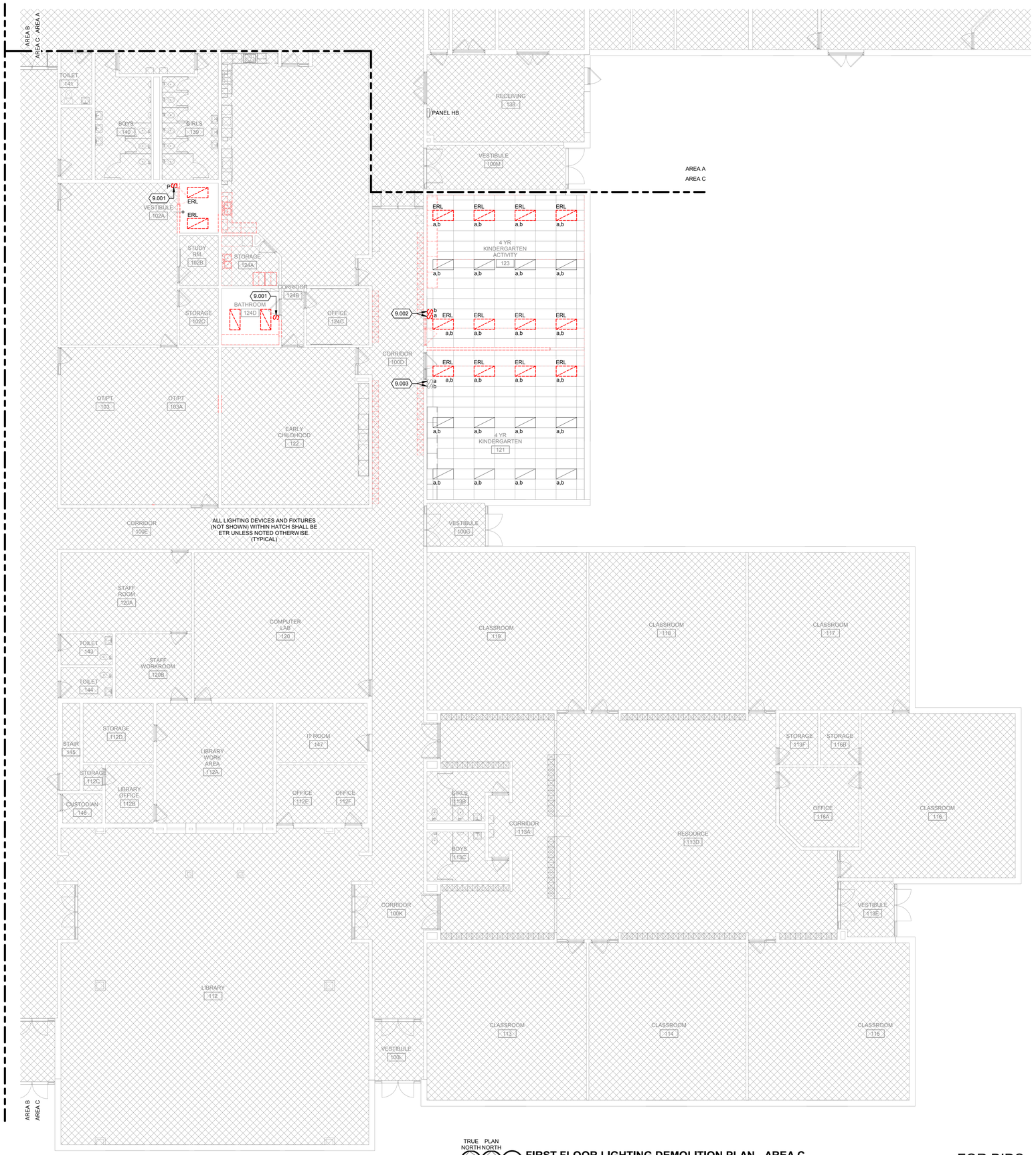

TRUE NORTH PLAN NORTH

FIRST FLOOR LIGHTING DEMOLITION PLAN - AREA C

1/8" = 1'-0"

KEYED NOTES

9.001 REMOVE EXISTING SWITCH AND ASSOCIATED WIRING BACK TO NEAREST JUNCTION BOX LOCATED ABOVE CEILING.

9.002 REMOVE EXISTING SWITCHES AND PROVIDE BLANK COVER PLATE. REMOVE ASSOCIATED WIRING BACK TO NEAREST JUNCTION BOX LOCATED ABOVE CEILING.

9.003 EXISTING SWITCHES SHALL REMAIN. MAINTAIN CONTINUITY OF THE EXISTING BRANCH CIRCUIT. SEE NEW CONSTRUCTION SHEET 1-EE-402 FOR FURTHER INFORMATION.

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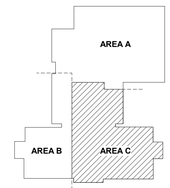
2019-06-06



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SHEET TITLE:
FIRST FLOOR LIGHTING DEMOLITION PLAN - AREA C

SHEET NUMBER:
1-ELD-103

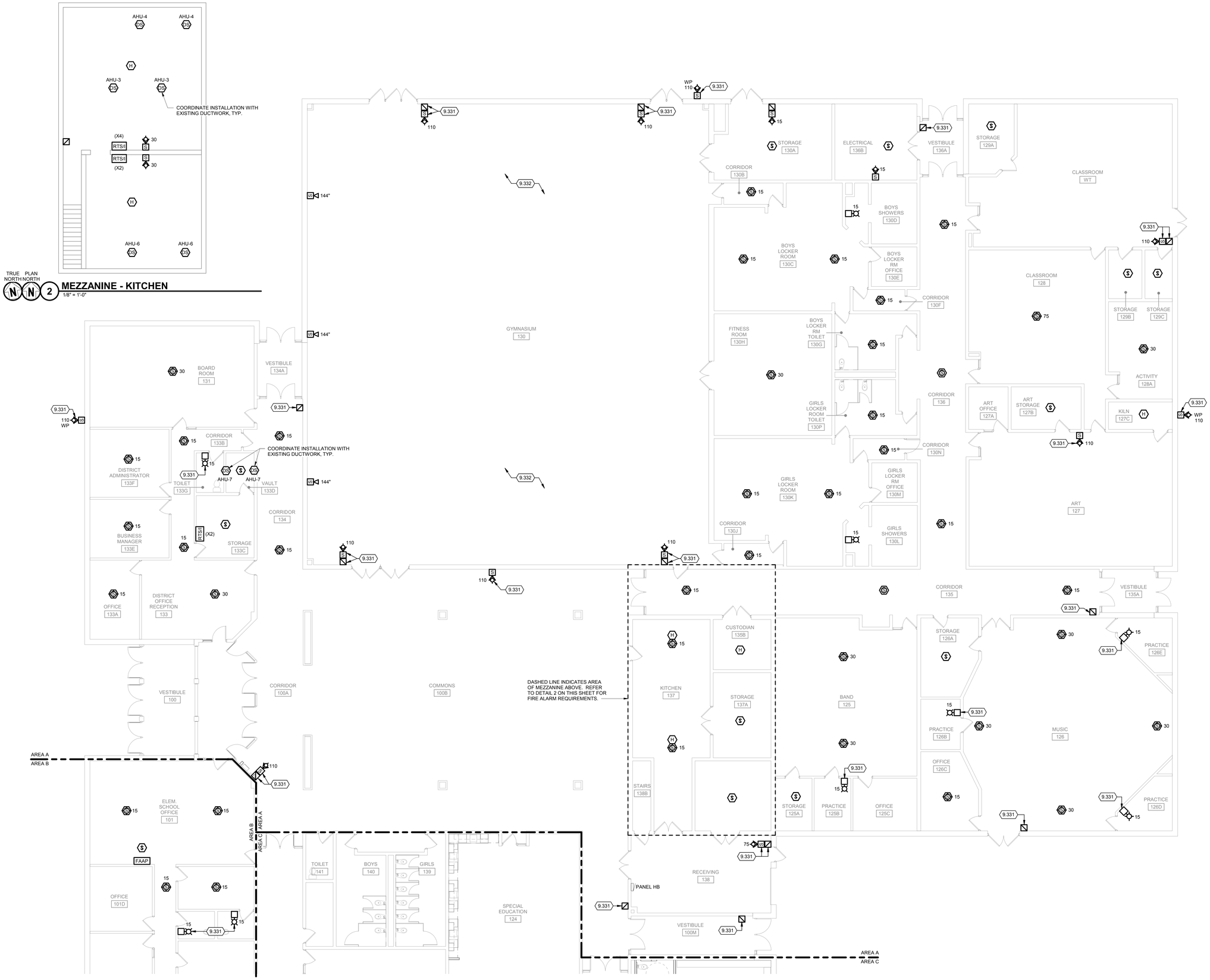
POWER GENERAL NOTES:

1. COORDINATE NEW CEILING MOUNTED FIRE ALARM DEVICES WITH EXISTING LIGHT FIXTURES.

KEYED NOTES

9.331 INSTALL NEW FIRE ALARM DEVICE ON EXISTING BACKBOX.

9.332 PROVIDE WIRE GUARD ON ALL DEVICES IN GYM.



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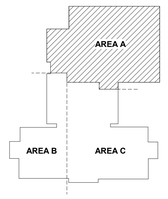

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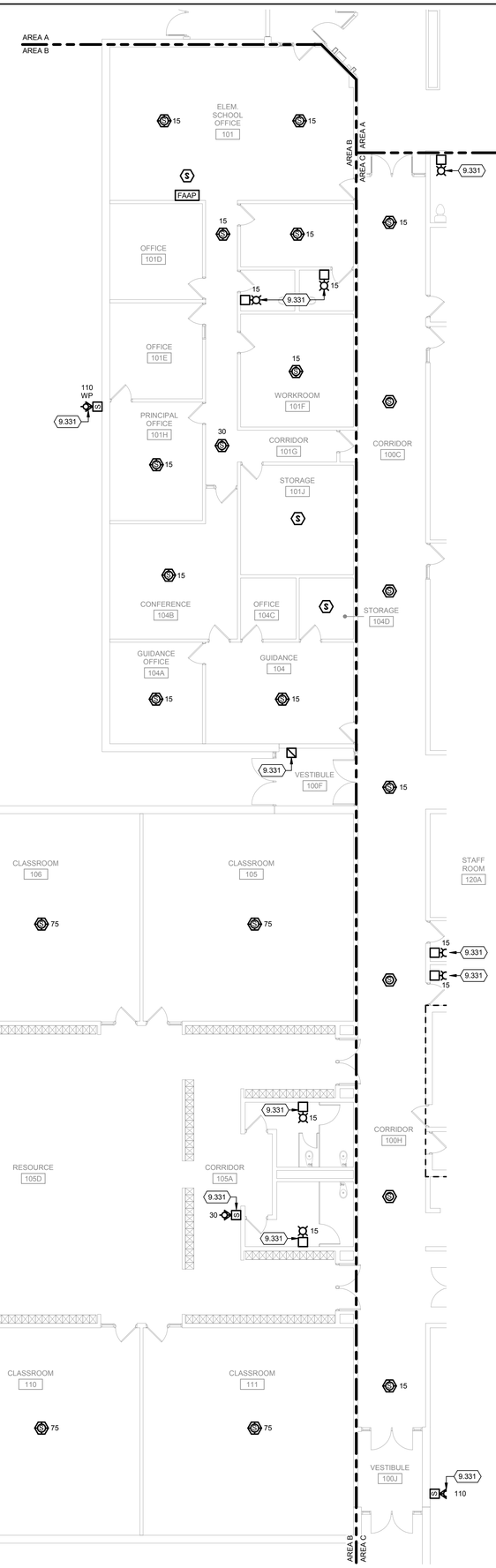
SHEET TITLE:
FIRST FLOOR POWER & FA PLAN - AREA A

SHEET NUMBER:
1-EP-101



TRUE NORTH PLAN NORTH

1 FIRST FLOOR POWER PLAN - AREA B

1/8" = 1'-0"

POWER GENERAL NOTES:

1. COORDINATE NEW CEILING MOUNTED FIRE ALARM DEVICES WITH EXISTING LIGHT FIXTURES.

KEYED NOTES

9.331 INSTALL NEW FIRE ALARM DEVICE ON EXISTING BACKBOX.

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FIRST FLOOR POWER & FA PLAN - AREA B

SHEET NUMBER:
1-EP-102

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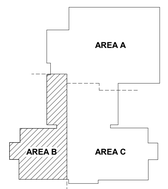
2019-06-06



KEY PLAN

FOR BIDS
NOT FOR CONSTRUCTION

POWER GENERAL NOTES:

1. COORDINATE NEW CEILING MOUNTED FIRE ALARM DEVICES WITH EXISTING LIGHT FIXTURES.

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9.331 INSTALL NEW FIRE ALARM DEVICE ON EXISTING BACKBOX.

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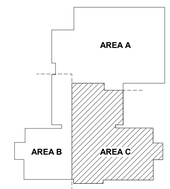

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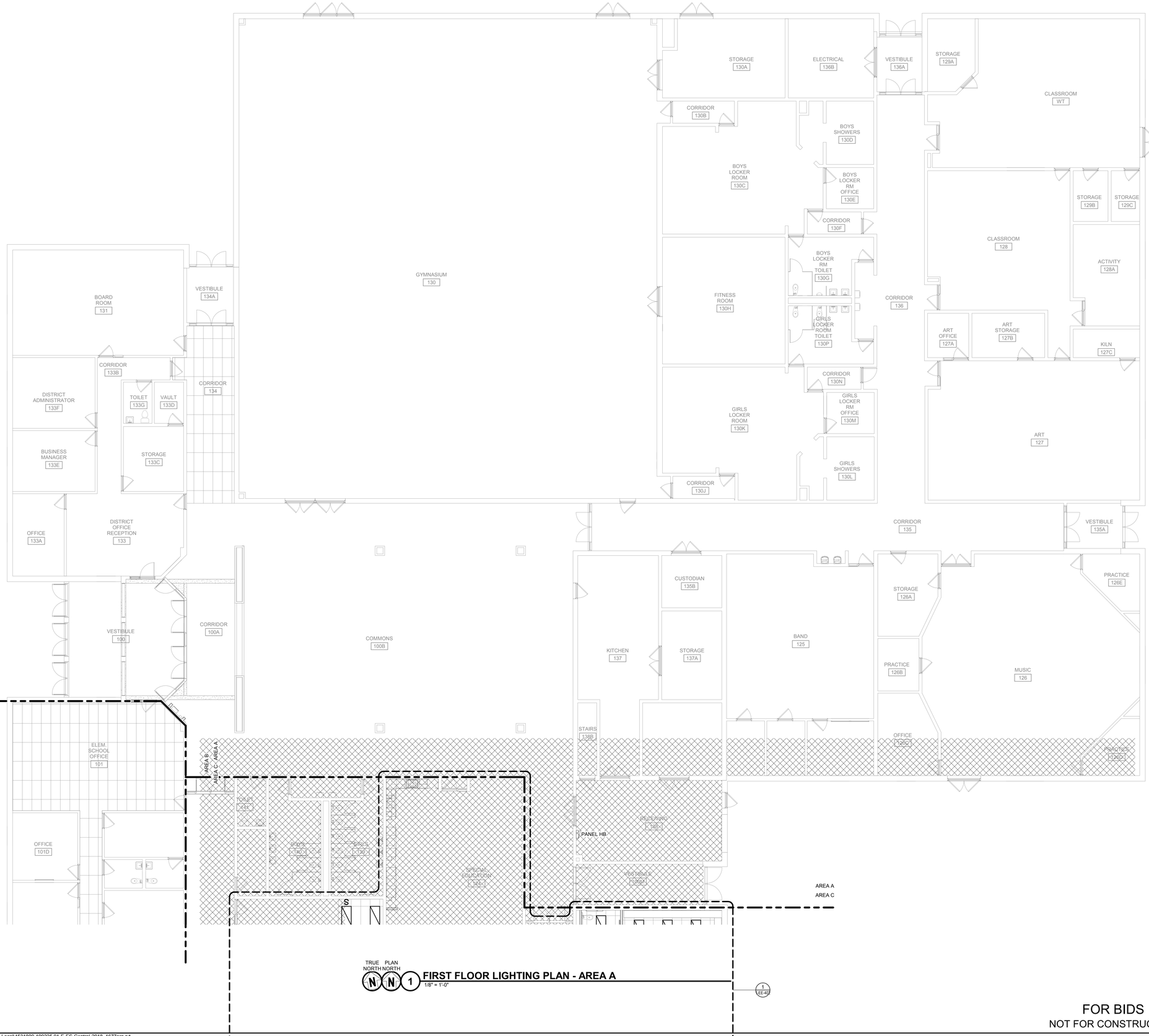
SHEET TITLE:
FIRST FLOOR POWER & FA PLAN - AREA C

SHEET NUMBER:
1-EP-103

LIGHTING GENERAL NOTES:

1. NOTES START HERE.
2. NOTES START HERE.

KEYED NOTES



TRUE NORTH PLAN NORTH

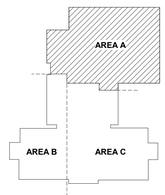
1 **FIRST FLOOR LIGHTING PLAN - AREA A**

1/8" = 1'-0"

1 / LE-402

PRELIMINARY
NOT FOR CONSTRUCTION
2019-06-06

FOR BIDS
NOT FOR CONSTRUCTION



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SHEET TITLE:
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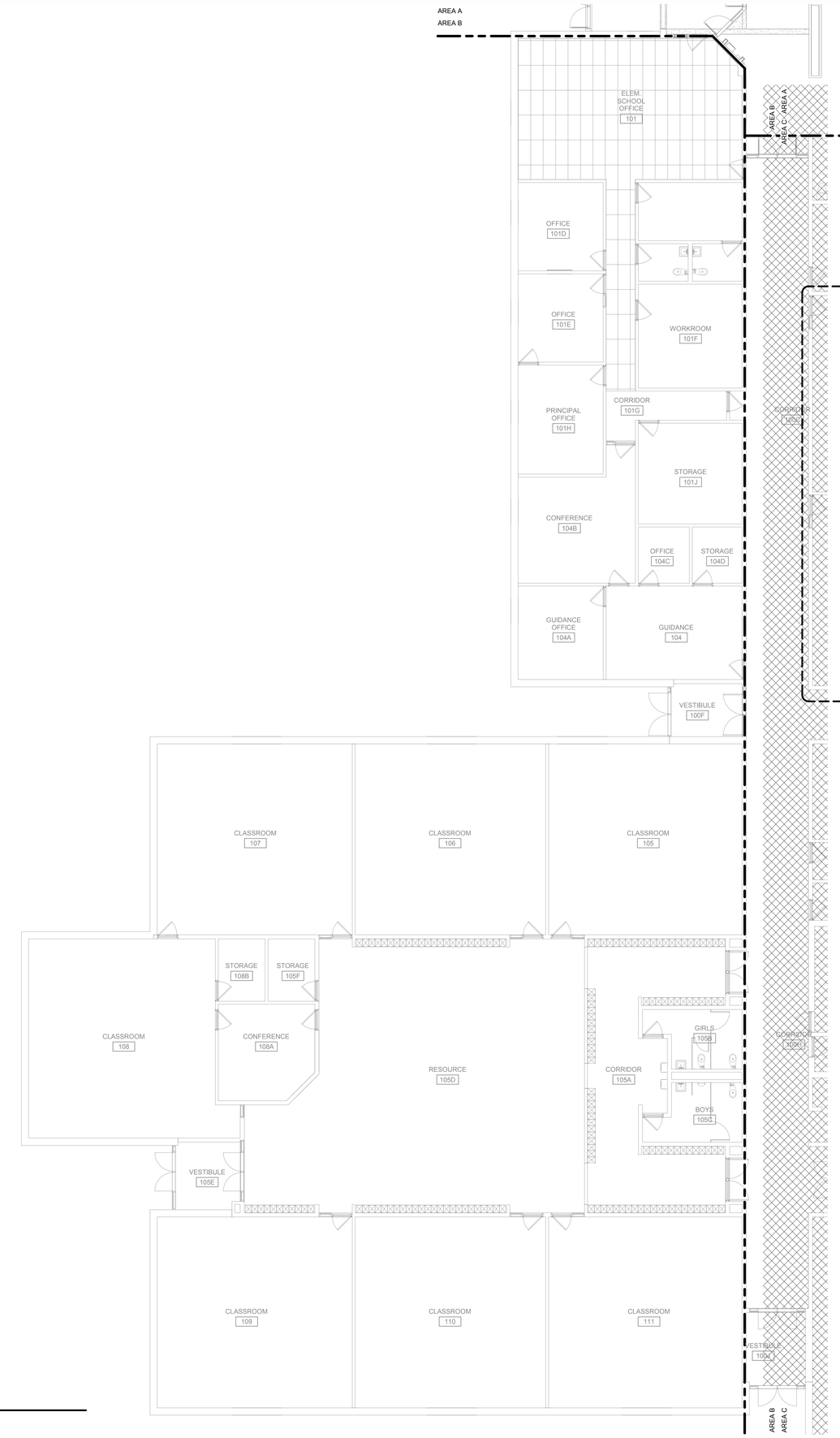
SHEET NUMBER:
1-EL-101



TRUE NORTH PLAN NORTH

FIRST FLOOR LIGHTING PLAN - AREA B

1/8" = 1'-0"

LIGHTING GENERAL NOTES:

1. NOTES START HERE.
2. NOTES START HERE.

KEYED NOTES

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MANAWA

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MANAWA MIDDLE/HIGH SCHOOL - ADDITIONS & ALTERATIONS
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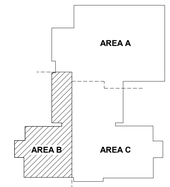

KEY PLAN

MARK	DATE
ISSUED:	June 6, 2019
PROJECT NO:	18268
CAD DWG FILE:	
DRAWN BY:	Author
CHECKED BY:	Checker

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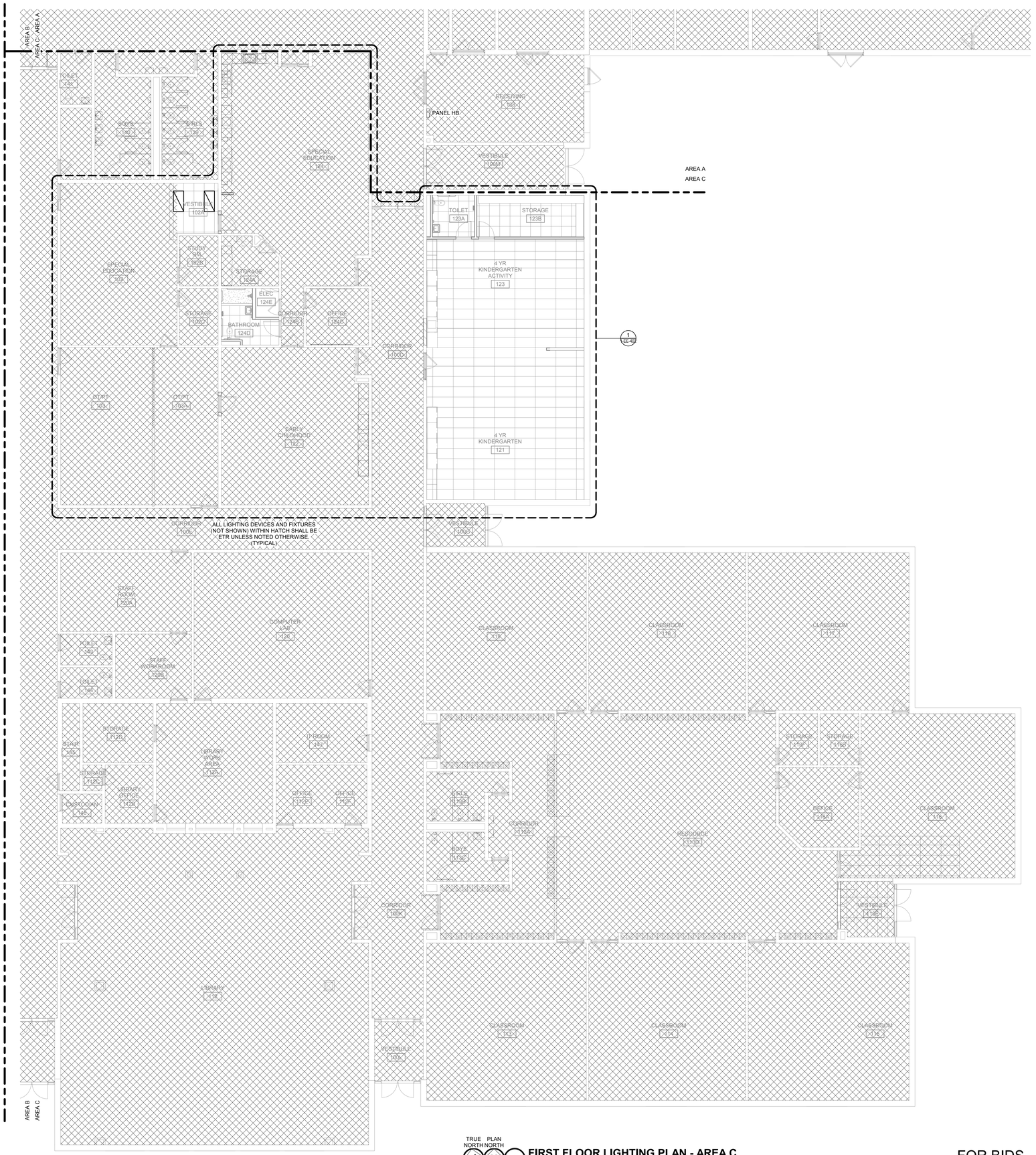
SHEET TITLE:
FIRST FLOOR LIGHTING PLAN - AREA B

SHEET NUMBER:
1-EL-102



TRUE NORTH PLAN NORTH

1 FIRST FLOOR LIGHTING PLAN - AREA C

1/8" = 1'-0"

LIGHTING GENERAL NOTES:

1. NOTES START HERE.
2. NOTES START HERE.

KEYED NOTES

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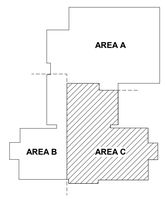

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PROJECT NO:	18268
CAD DWG FILE:	
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CHECKED BY:	IMR

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SHEET TITLE:
FIRST FLOOR LIGHTING PLAN - AREA C

SHEET NUMBER:
1-EL-103

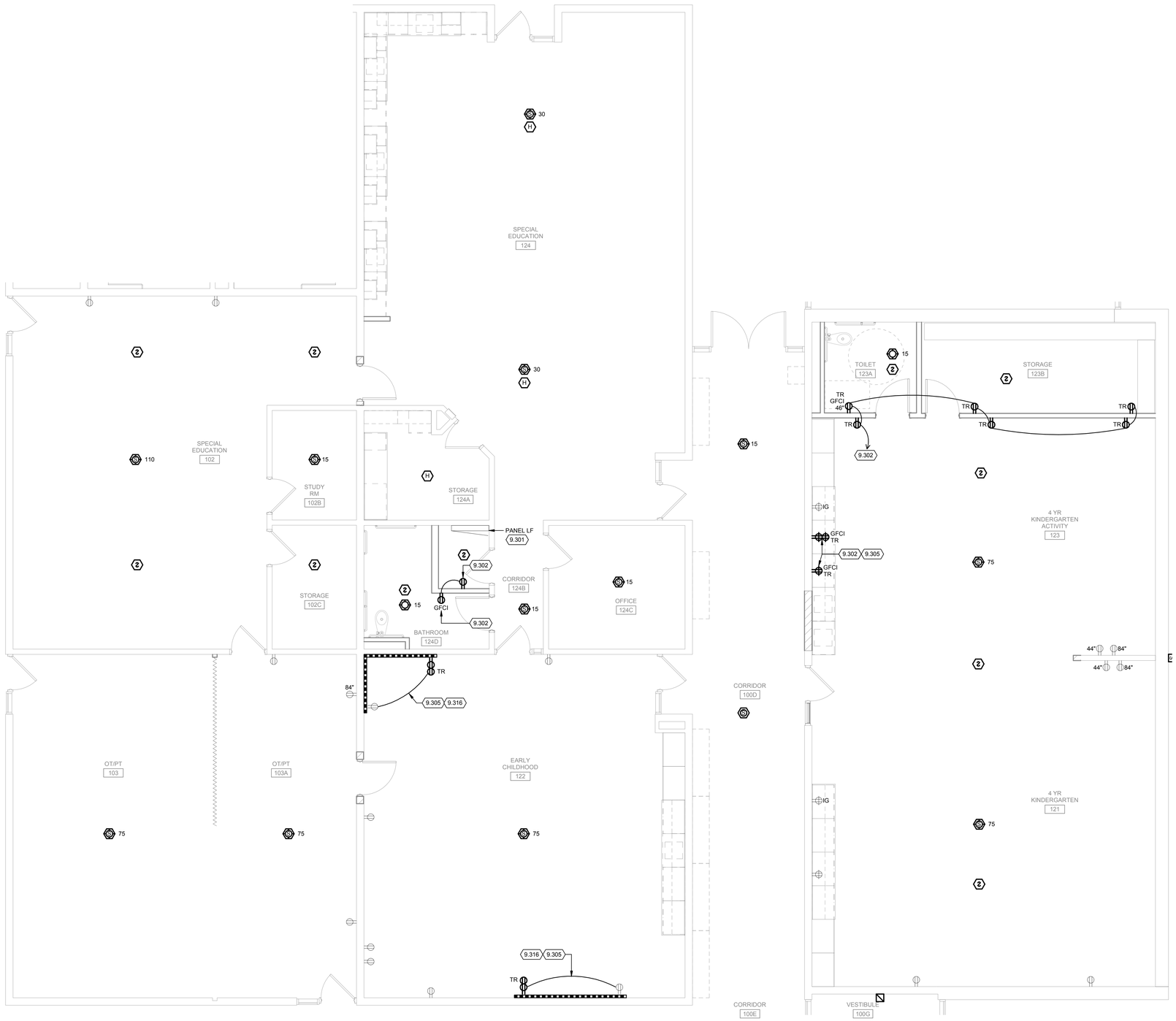
KEYED NOTES

9.301 UPDATE PANEL DIRECTORY UPON PROJECT COMPLETION.

9.302 UTILIZE (1) 120V CIRCUIT FROM PANEL 'LF' BECOMING AVAILABLE UPON DEMOLITION. PROVIDE 2#12, 1#12G. IN 1/2"C. FOR EACH GROUPING OF RECEPTACLES NOTED.

9.305 UTILIZE SURFACE WIREMOLD 700 FOR NEW INSTALLATION ON THE EXISTING MASONRY WALL.

9.316 INTERCEPT EXISTING CIRCUIT AND EXTEND TO NEW RECEPTACLE.



TRUE NORTH PLAN NORTH

ENLARGED PARTIAL FLOOR POWER PLAN - AREA C

1/4" = 1'-0"

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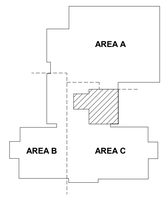
2019-06-06



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SHEET TITLE:
ENLARGED PLANS

SHEET NUMBER:
1-EE-401

KEYED NOTES

9.202 MOUNT FIXTURE AT 8'-0" AFF MEASURED FROM BOTTOM OF FIXTURE.

9.223 RECONNECT EXISTING FIXTURES AS REQUIRED. UTILIZE SURFACE WIREMOLD 700 FOR NEW INSTALLATION ON THE EXISTING MASONRY WALL.

9.224 UTILIZE EXISTING 277V LIGHTING CIRCUIT FOR NEW FIXTURE INSTALLATION.

9.225 RE-INSTALL EXISTING RELOCATED FIXTURE ON THE NEW CEILING AND RE-WIRE AS REQUIRED TO MAINTAIN EXISTING DUAL-LEVEL SWITCHING CONTROL.

9.237 WIRE INBOARD / OUTBOARD BALLASTS FOR SINGLE SWITCH OPERATION. UTILIZE EXISTING 277V LIGHTING CIRCUIT FOR NEW FIXTURE INSTALLATION.

TRUE NORTH PLAN NORTH

1 **ENLARGED PARTIAL FLOOR LIGHTING PLAN - AREA C**

1/4" = 1'-0"

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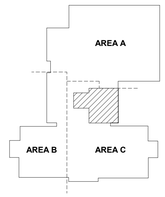
2019-06-06



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SHEET TITLE:
ENLARGED PLANS

SHEET NUMBER:
1-EE-402

OCCUPANCY/VACANCY/PHOTO SENSOR SCHEDULE

SENSOR ID	VOLTAGE	TECHNOLOGY		PATTERN	COVERAGE AREA	DESCRIPTION	MOUNTING	KEYED NOTE (TO BE SELECTED AS NEEDED)
		PIR	MICRO					
WS	120/277	X	X	180	UP TO 800 SF	SINGLE-POLE, WALL MOUNT SWITCH TYPE OCCUPANCY SENSOR. CAT# WSX PDT AUTO-ON OR VACANCY	WALL	1, 3
OS10	12-24V	X	X	360	UP TO 500 SF	CEILING MOUNTED PROGRAMMABLE WITH ADJUSTABLE TIME DELAY; HIGH HUMIDITY AND WET LOCATION LISTED	CEILING	4, 5, 6

GENERAL NOTES:

1. COLOR OF DEVICES SHALL BE COORDINATED/MATCHING COLOR OF RECEPTACLES AND SWITCHES AS IDENTIFIED IN SPECIFICATION SECTION 26 27 26
2. PROVIDE ADEQUATE SUPPORT FOR CONTROL WIRING, REFER TO WIRING DIAGRAMS SUPPLIED WITH SELECTED DEVICES. FOLLOW MANUFACTURER INSTRUCTIONS
3. FOR ADDITIONAL INFORMATION REFER TO SPECIFICATION SECTION 26 09 42.23.
4 ALL LOW VOLTAGE SENSORS SHALL BE PROVIDED WITH 20A RATED POWER PACKS WITH ZERO CROSS SWITCHING TECHNOLOGY AND MANUAL ON MODE
5 PROVIDE 8' OF ADDITIONAL WIRING ABOVE ACCESSIBLE CEILING.
6 ALL POWER PACKS AND SLAVE PACKS SHALL BE INSTALLED IN APPROVED ENCLOSURES RATED FOR THE ENVIROMENTAL SPACES WHERE THEY ARE INSTALLED
7 WHERE OCCUPANCY SENSORS CONTROLLING LIGHTS OF A DIFFERENT VOLTAGES A SEPARATE POWER/SLAVE PACK SHALL BE PROVIDED.
8 POWER PACKS ARE NOT SHOWN ON THE PLANS, IT SHALL BE CONTRACTOR/SUPPLIER RESPONSIBIILTY TO VERIFY AND COORDINATE ALL REQURIED QUANTITIES.
9 WHERE DAYLIGHT HARVESTING IS SELECTED - PROVIDE ALL REQUIRED LABOR TO SET UP DAYTIME AND NIGHT TIME TRESHOLDS PER MANUFACTURER RECOMMENDATIONS
10. SENSOR SWITCH MANUFACTURER CAT # /SERIES ARE SHOWN IN THIS SCHEDULE AS A BASIS OF DESIGN - REFER TO SPECIFICATION SECTION 26 09 23 FOR ACCEPTABLE SUBSTITUTIONS.

KEYED NOTES:

1. SMALL MOTION DETECTION
2. INTEGRATED PHOTOCELL OPTION
3. INTEGRATED PHOTOCELL IS DISABLED, REFER TO LIGHTING PLANS FOR DAYLIGHT HARVESTING INTENT AND ENABLE PHOTOCELL OPERATION AS INDICATED
4. OCCUPANCY CONTROLLED DIMMING
5. INTEGRATED PHOTOCELL WITH DIMMING CAPABILITY
6. PROVIDE WITH AUXILLARY RELAY
7. INSTALL WITHIN 3'-4" FROM THE WINDOW, PROVIDE WITH POWER PACK.
8. EXTERIOR PHOTOCELL WIRED VIA LOW VOLTAGE LIGHTING CONTROL PANEL LCP AND/OR DIMMER RACK PANEL. REFER TO RESPECTIVE LIGHTING CONTROL SCHEDULES FOR COORDINATION.

LUMINAIRE SCHEDULE

NOTE: SEE SPECIFICATION FOR ADDITIONAL INFORMATION REGARDING LUMINAIRE AND INSTALLATION REQUIREMENTS. PROVIDE OPTIONS AND ACCESSORIES REFERENCED BY THE COLUMN TITLED " OPTIONS/ACCESSORIES". MANUFACTURERS LISTED ACCEPTABLE SHALL MEET ALL REQUIREMENTS AND FEATURES INDICATED. ACCEPTABLE MANUFACTURERS MUST MEET THE PHOTOMETRIC PERFORMANCE OF THE LISTED UNIT.

ABBREVIATIONS: GWB = GYPSUM WALL BOARD; ES = EXPOSED STRUCTURE; LG = LAY-IN GRID; P = PENDANT; PLAS = PLASTER; PL = POLE MOUNTED; R = RECESSED; S = SURFACE; UNV = UNIVERSAL VOLTAGE; V = VARIES; W = WALL MOUNTED

DES.	MANUFACTURER	CATALOG SERIES	DESCRIPTION	LAMP DATA	VOLTAGE	BALLAST/ DRIVER	MOUNT	CEILING TYPE	FIXTURE DEPTH	LED SYSTEM INPUT WATTAGE	LED DELIVERED LUMENS	OPTIONS / ACCESSORIES	ACCEPTABLE MANUFACTURERS	KEYED NOTE
BF	METALUX	22FP3250C	2' X 2' LED FLAT PANEL	LED, 5000K	UNV	A	R	LG	1-3/4"	29.5	3,150			
D5	HALO	H457-TAT-E010-EL406-9-40-TL402SNS	4" DIAMETER LED DOWNLIGHT (SHOWER RATED)	LED, 4000K	UNV	D	R	GWB	5-1/2"	11	1,000	13		
S4E	METALUX	4SNLED-LD5-41SL-LC-UNV-EL14W-L850-CD1-U-AY C-CHAIN/SET	SAME AS TYPE 'S4' EXCEPT WITH INTEGRAL BATTERY OPTION	LED, 5000K	UNV	A	V	V	3-11/16"	31	4,269			

OPTIONS/ACCESSORIES CODE LISTING:

13 DAMP LOCATION LISTED
38 WET LOCATION LISTED

BALLAST/DRIVER CODE LISTING: (SEE SPECIFICATIONS)

A LED DIMMABLE POWER SUPPLY (0-10V, 10%).
B LED DIMMABLE POWER SUPPLY (0-10V, 1%).
C LED DIMMABLE POWER SUPPLY (0-10V, 5%).
D LED DIMMABLE POWER SUPPLY (0-10V).
E LED DIMMABLE POWER SUPPLY (TRAILING EDGE).
F LED DIMMABLE POWER SUPPLY 1% DIMMING LUTRON HI LUME OR EQUAL.
G LED DIMMABLE POWER SUPPLY ADVANCE XITANIUM OR EQUAL.
H LED NON-DIMMABLE POWER SUPPLY.

GENERAL NOTES:

1. ALL LED REPLACEMENT LAMPS SHALL BE TESTED FOR DIMMING COMPATABILITY WITH DIMMING SYSTEM BEING SUPPLIED. CONTRACTOR SHALL PROVIDE MINIMUM OF (4) FOUR LAMPS OF EACH TYPE LISTED IN THIS SCHEDULE OR ANY SUBSTITUTE TO BE SUPPLIES TO DIMMING SYSTEMS/DEVICE MANUFACTURER FOR TESTING TO VERIFY LAMP PERFORMANCE.
2. EC SHALL VERIFY AND COORDINATE ALL LUMINAIRE TRIMS/FLANGES WITH RESPECTIVE CEILING TYPES SCHEDULED AND/OR SUBMITTED BY THE GC PRIOR TO ORDERING OF THE LUMINAIRES. SCHEDULE INDICATES TRIM TYPES BASED ON THE GENERIC CEILING INFORMATION AVAILABLE AT THE TIME BIDDING DOCUMENTS WERE ISSUED AND DOES NOT REFLECT ACTUAL THICKNESS OF GYPSUM WALL BOARD OR PLASTER CEILING OR EXACT GRID TYPE SPECIFIED BY THE ARCHITECT.

KEYED NOTES:

1.

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2019-06-06

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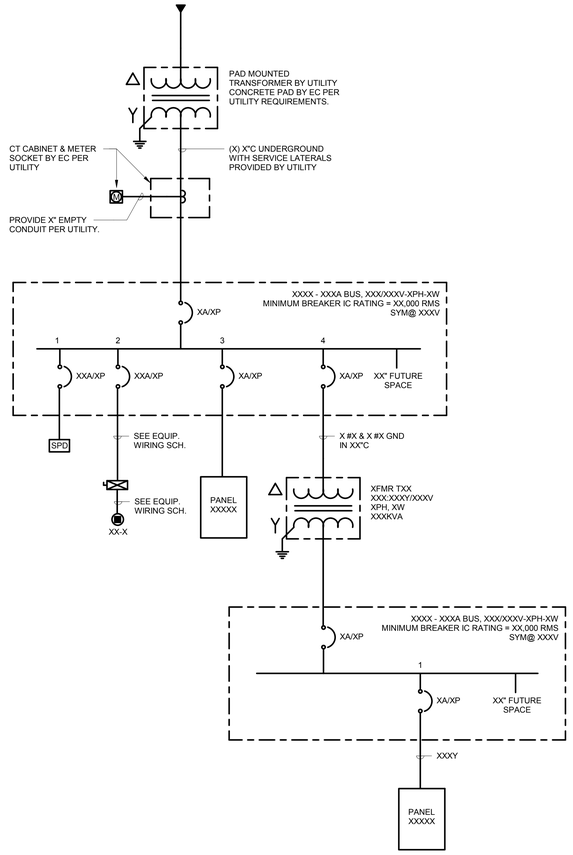
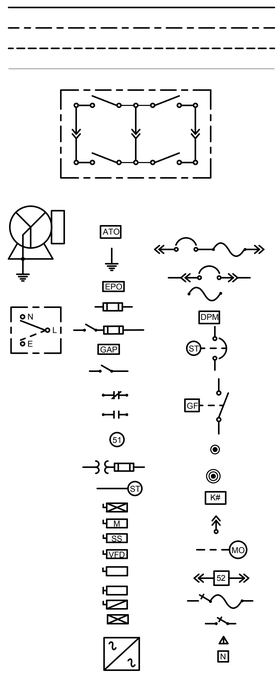
SHEET TITLE:
SCHEDULES

SHEET NUMBER:
1-EE-601



1 ONE-LINE POWER DIAGRAM
NO SCALE



ONE-LINE SYMBOLS

- AUTOMATIC TRANSFER SWITCH
- ATO — AUTOMATIC THROW OVER
- LOW VOLTAGE CIRCUIT BREAKER
- # — CURRENT TRANSFORMER (# DENOTES QUANTITY)
- MPR — MULTI FUNCTION PROTECTIVE RELAY
- DPM — DIGITAL POWER METER
- DRAWOUT BREAKER WITH CURRENT LIMITING FUSE
- DRAWOUT BREAKER
- LOW VOLTAGE FUSE
- FUSED DISCONNECT SWITCH
- GENERATOR
- ST — GROUND FAULT SHUNT TRIP BREAKER
- GF — GROUND FAULT SHUNT TRIP SWITCH
- EARTH GROUND
- K# — KEY INTERLOCK
- LA — LIGHTNING ARRESTORS
- LOAD BREAK ELBOW
- METER
- MO — MOTOR OPERATOR
- 52 — MEDIUM VOLTAGE DRAW-OUT CIRCUIT BREAKER
- MEDIUM VOLTAGE FUSED SWITCH
- MEDIUM VOLTAGE SWITCH
- MEDIUM VOLTAGE TERMINATION
- N — NEUTRAL BOND
- NON-FUSED DISCONNECT SWITCH
- NORMALLY CLOSED CONTACT
- NORMALLY OPEN CONTACT
- 51 — OVERCURRENT PROTECTIVE RELAY
- PANELBOARD (ELEVATION VIEW)
- # — POTENTIAL TRANSFORMER (# DENOTES QUANTITY)
- ST — SHUNT TRIP
- SPD — SURGE PROTECTIVE DEVICE
- TRANSFORMER
- UNINTERRUPTIBLE POWER SUPPLY (UPS)
- UTILITY CONNECTION

ONE-LINE GENERAL NOTES:

1. NOTES START HERE.
2. NOTES START HERE.

KEYED NOTES

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SHEET TITLE:
ONE-LINE DIAGRAM

SHEET NUMBER:
1-EE-901

COVER SHEET FOR PART 2

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MANAWA MIDDLE/HIGH SCHOOL - ADDITIONS & ALTERATIONS

PART 2 - MANAWA MIDDLE / HIGH SCHOOL

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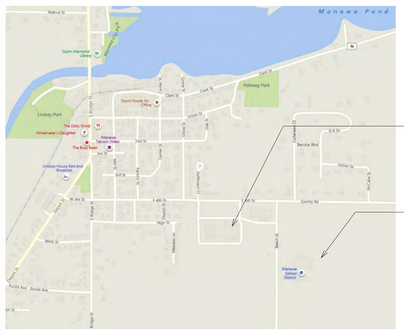
STATE LOCATION MAP



LOCAL AREA MAP

6/7/2019 9:34:27 AM BIM 360://Manawa Schools/18268 HS-Arch-18 Central.rvt

PROJECT MANUAL IS PART OF THESE CONSTRUCTION DOCUMENTS

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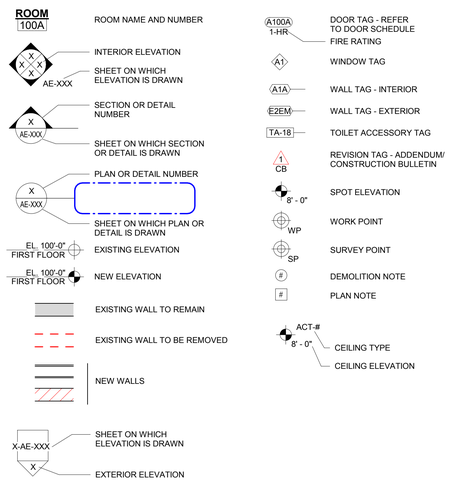
SHEET TITLE:
TITLE SHEET

SHEET NUMBER
2-GI-001

ABBREVIATIONS

AB	ANCHOR BOLT	ID	INSIDE DIAMETER
ACC	ACCESSIBLE	IF	INSIDE FACE
ACT	ACOUSTICAL CEILING TILE	INSUL	INSULATION
ADA	AMERICANS WITH DISABILITIES ACT	IS	INSIDE
ADJ	ADJACENT	ISF	INSIDE FACE OF
AFF	ABOVE FINISHED FLOOR	JAN	JANITOR
AHU	AIR HANDLING UNIT	JT	JOINT
ALT	ALTERNATE		
ALUM	ALUMINUM	L	ANGLE
		LAM	LAMINATE
B PL	BASE PLATE	LAV	LAVATORY
BF	BOTH FACES	LL	LIVE LOAD
BLDG	BUILDING	LP	LIGHT POLE
BLKG	BLOCKING	LPT	LOW POINT
BM	BENCH MARK	LT	LIGHT
BOT	BOTTOM	LVR	LOUVER
BRG	BEARING		
		MATL	MATERIAL
CB	CATCH BASIN	MAX	MAXIMUM
CJ	CONSTRUCTION JOINT	MECH	MECHANICAL
CJ	CONTROL JOINT	MFG	MANUFACTURER
CL	CENTER LINE	MH	MANHOLE
CLG	CEILING	MIN	MINIMUM
CLG HT	CEILING HEIGHT	MO	MASONRY OPENING
CLR	CLEAR	MTL	METAL
CMU	CONCRETE MASONRY UNIT		
CO	CLEANOUT	NIC	NOT IN CONTRACT
COL	COLUMN	NO	NUMBER
CONC	CONCRETE	NTS	NOT TO SCALE
CONT	CONTINUOUS		
CONTR	CONTRACTOR	OC	ON CENTER
CPT	CARPET	OD	OUTSIDE DIAMETER
CSMT	CASEMENT	OFD	OVERFLOW DRAIN
CSWK	CASEWORK	OPH	OPPOSITE HAND
CT	CERAMIC TILE	OPNG	OPENING
CTR	CENTER	OPT	OPTIONAL
		OS	OUTSIDE
DEMO	DEMOLITION	OSF	OUTSIDE FACE OF
DF	DRINKING FOUNTAIN		
DH	DOUBLE HUNG	PART	PARTITION
DIA	DIAMETER	PCC	PRECAST CONCRETE
DIM	DIMENSION	PL	PROPERTY LINE
DL	DEAD LOAD	PLAM	PLASTIC LAMINATE
DS	DOWNSPOUT	PLAS	PLASTER
DT	DRAIN TILE	PT	PAINT
EJ	EXPANSION JOINT	QT	QUARRY TILE
EL	ELEVATION		
ELEV	ELEVATOR	R	RADIUS
EQ	EQUAL	R	RISER
EQUIP	EQUIPMENT	RD	ROOF DRAIN
EWC	ELECTRIC WATER COOLER	REC	RECESSED
EXC	EXCAVATE	REF	REFERENCE
EXIST	EXISTING	RFG	ROOFING
EXP BT	EXPANSION BOLT	RO	ROUGH OPENING
FC BRK	FACE BRICK	SCP	SCUPPER
FCO	FLOOR CLEANOUT	SHTHG	SHEATHING
FD	FLOOR DRAIN	SP	SURVEY POINT
FDTN	FOUNDATION	SSTL	STAINLESS STEEL
FE	FIRE EXTINGUISHER	STL JST	STEEL JOIST
FEC	FIRE EXTINGUISHER CABINET	SUSP	SUSPENDED
FIN FLR	FINISH FLOOR		
FO	FACE OF	T or TR	TREAD
FTG	FOOTING	TO	TOP OF
		TYP	TYPICAL
GB	GRAB BAR		
GALV	GALVANIZED	UL	UNDERWRITERS LABORATORY
GSB	GYPSUM SHEATHING BOARD	UNEX	UNEXCAVATED
GYP BD	GYPSUM BOARD	UNO	UNLESS NOTED OTHERWISE
HB	HOSE BIB	VB	VINYL BASE
HC	HANDICAP	VCT	VINYL COMPOSITE TILE
HCP	HANDICAPPED	VTR	VENT THROUGH ROOF
HDR	HEADER		
HDW	HARDWARE	WC	WATER CLOSET
HM	HOLLOW METAL	W/O	WITH OUT
HPT	HIGH POINT	WP	WORK POINT
		WWF	WELDED WIRE FABRIC

DRAWING SYMBOLS LEGEND:



GENERAL NOTES:

1. ALL WORK OF ALL TRADES SHALL BE COMPLETED IN ACCORDANCE WITH ALL GOVERNING CODES AND ORDINANCES. IF ANY CONTRACTOR OBSERVES THAT ANY OF THE CONTRACT DOCUMENTS ARE AT VARIANCE WITH APPLICABLE LAWS, STATUTES, BUILDING CODES, OR ORDINANCES, THEY SHALL PROMPTLY NOTIFY HOFFMAN.
2. EACH CONTRACTOR SHALL VERIFY ALL CONDITIONS AND DIMENSIONS AT THE SITE; NEITHER THE OWNER NOR HOFFMAN ASSUMES RESPONSIBILITY FOR CONDITIONS OR DIMENSIONS SHOWN AS EXISTING.
3. NOTIFY HOFFMAN IMMEDIATELY IF ANY HAZARDOUS MATERIALS ARE ENCOUNTERED DURING DEMOLITION, REMODELING, OR EXCAVATION, AND STOP WORK IN THE IMMEDIATE AREA UNTIL A COURSE OF ACTION IS DETERMINED. DO NOT ABATE.
4. CONTRACTOR IS RESPONSIBLE FOR REVIEWING ALL CONTRACT DOCUMENTS FOR WORK PERTAINING TO THEIR SCOPE, INCLUDING CODE AND REFERENCE SHEETS. KEYNOTE LIST ON INDIVIDUAL SHEETS MAY NOT INCLUDE ALL KEYNOTES ON THAT SHEET.
5. PLAN NOTES ARE GLOBAL; INDIVIDUAL PLAN NOTES MAY NOT BE PRESENT ON EVERY PLAN SHEET.
6. NEITHER HOFFMAN NOR THE OWNER ARE RESPONSIBLE FOR ERRORS IN SCALING DUE TO PRINTING, REPRODUCTION, OR ELECTRONIC FILE CREATION. SCALE AT YOUR OWN RISK.

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PART 2 SHEET INDEX

MANAWA MIDDLE/HIGH SCHOOL
515 E. 4TH ST.,
MANAWA, WI 54949

GENERAL

2-GI-001	TITLE SHEET FOR MIDDLE / HIGH SCHOOL
2-GI-002	SHEET INDEX, SYMBOLS, GENERAL NOTES, CONSULTANTS LIST

LIFE SAFETY

2-GI-101	CODE PLANS
2-GI-102	CODE INFORMATION
2-GI-103	CODE INFORMATION
2-GI-501	RATED ASSEMBLIES

CIVIL

2-C100	EXISTING CONDITIONS SURVEY
2-C101	SITE DEMOLITION
2-C102	SITE LAYOUT
2-C103	SITE GRADING, DRAINAGE AND EROSION CONTROL PLAN
2-C104	SITE DETAILS
2-C105	SITE DETAILS
2-C106	SITE DETAILS

STRUCTURAL

2-SI-100	GENERAL NOTES
2-SI-101	SCHEDULES
2-SB-101	FOUNDATION PLAN - AREA A
2-SB-102	FOUNDATION PLAN - AREAS C & D
2-SB-501	FOUNDATION DETAILS
2-SB-502	FOUNDATION DETAILS
2-SF-200	OVERALL ROOF FRAMING PLAN
2-SF-201	FRAMING PLANS - AREA A
2-SF-202	FRAMING PLANS - AREA C
2-SF-501	FRAMING DETAILS
2-SF-502	FRAMING DETAILS
2-SF-503	FRAMING DETAILS

ARCHITECTURAL

2-AD-100	OVERALL FIRST FLOOR DEMOLITION PLAN
2-AD-101	DEMOLITION PLAN - LOWER LEVEL
2-AD-102	DEMOLITION PLAN - AREA A
2-AD-103	DEMOLITION PLAN - AREA B
2-AD-104	DEMOLITION PLAN - AREA C
2-AD-105	DEMOLITION PLAN - AREA D
2-AD-106	DEMOLITION PLAN - AREA E
2-AD-107	DEMOLITION PLAN - AREA F
2-AD-108	DEMOLITION PLANS -LOWER LEVEL & FIRST FLOOR CEILINGS
2-AD-109	DEMOLITION PLAN - CEILING PLENUM
2-AE-101	LOWER LEVEL FLOOR PLAN
2-AE-102	FLOOR PLAN - AREA A
2-AE-103	FLOOR PLAN - AREA B
2-AE-104	FLOOR PLAN - AREA C
2-AE-105	FLOOR PLAN - AREA D
2-AE-106	FLOOR PLAN - AREA E
2-AE-107	FLOOR PLAN - AREA F
2-AE-150	OVERALL ROOF PLAN
2-AE-151	ROOF PLAN - AREA A
2-AE-152	ROOF PLAN - AREA C
2-AE-201	EXTERIOR ELEVATIONS - AREA A
2-AE-202	EXTERIOR ELEVATIONS - AREAS C AND F
2-AE-301	BUILDING SECTIONS - AREA A
2-AE-302	BUILDING SECTIONS - AREAS C & D
2-AE-310	WALL SECTIONS - AREA A
2-AE-311	WALL SECTIONS - AREA A
2-AE-312	WALL SECTIONS - AREA A
2-AE-313	WALL SECTIONS - AREA A
2-AE-314	WALL SECTIONS - AREA C
2-AE-315	WALL SECTIONS - AREA C
2-AE-401	TOILET ROOM STANDARDS, LOCKER TYPES
2-AE-402	ENLARGED PLAN - LOWER LEVEL
2-AE-403	ENLARGED PLAN - AREA C
2-AE-404	ENLARGED PLANS BAND & STAGE RAMP PLANS & SECTION
2-AE-405	ENLARGED PLANS - AREAS E & F
2-AE-406	ELEVATOR PLANS AND SECTIONS
2-AE-450	STAIR PLANS AND SECTIONS
2-AE-451	STAIR PLANS AND SECTIONS
2-AE-452	STAIR PLANS AND SECTIONS
2-AE-501	INTERIOR WALL TYPES AND DETAILS
2-AE-502	EXTERIOR WALL TYPES INT. & EXT. WALL DETAILS
2-AE-503	BUILDING PLAN DETAILS
2-AE-504	STANDARD DETAILS
2-AE-505	WALL DETAILS
2-AE-506	WALL DETAILS
2-AE-507	WALL DETAILS
2-AE-520	ROOF DETAILS 1
2-AE-521	ROOF DETAILS 2
2-AE-530	EXTERIOR DOOR DETAILS
2-AE-531	INTERIOR DOOR DETAILS
2-AE-532	INTERIOR DOOR DETAILS
2-AE-601	DOOR SCHEDULE, DOOR & FRAME TYPES
2-AE-630	STOREFRONT ELEVATIONS
2-AE-631	STOREFRONT AND CURTAINWALL ELEVATIONS
2-AE-632	STOREFRONT AND CURTAINWALL DETAILS
2-AE-701	INTERIOR ELEVATIONS
2-AE-702	INTERIOR ELEVATIONS
2-AE-703	INTERIOR ELEVATIONS
2-AE-704	INTERIOR ELEVATIONS
2-AE-705	INTERIOR ELEVATIONS
2-AE-706	INTERIOR ELEVATIONS
2-AF-101	REFLECTED CEILING PLAN - LOWER LEVEL
2-AF-102	REFLECTED CEILING PLAN - AREA A
2-AF-103	REFLECTED CEILING PLAN - AREA B
2-AF-104	REFLECTED CEILING PLAN - AREA C
2-AF-105	REFLECTED CEILING PLAN - AREA D
2-AF-106	REFLECTED CEILING PLAN - AREA E
2-AF-107	REFLECTED CEILING PLAN - AREA F
2-AF-501	CEILING DETAILS
2-AF-601	ROOM FINISH SCHEDULE
2-AF-801	FLOOR PATTERN PLAN - LOWER LEVEL
2-AF-802	FLOOR PATTERN PLAN - AREA A
2-AF-803	FLOOR PATTERN PLAN - AREA B
2-AF-804	FLOOR PATTERN PLAN - AREA C
2-AF-805	FLOOR PATTERN PLAN - AREA D
2-AF-806	FLOOR PATTERN PLAN - AREA E
2-AF-807	FLOOR PATTERN PLAN - AREA F
2-AF-901	EQUIPMENT PLAN - AREA A LOWER LEVEL

PLUMBING

2-PD-101	LOWER LEVEL PLUMBING DEMOLITION PLANS – AREA A
2-PD-103	FIRST FLOOR PLUMBING DEMOLITION PLAN – AREA C
2-PD-104	FIRST FLOOR PLUMBING DEMOLITION PLAN – AREA D
2-PD-105	FIRST FLOOR PLUMBING DEMOLITION PLAN – AREA F
2-PL-001	FOUNDATION PLUMBING PLAN – AREA A
2-PL-003	FOUNDATION PLUMBING PLAN – AREA C
2-PL-005	FOUNDATION PLUMBING PLAN – AREA E
2-PL-006	FOUNDATION PLUMBING PLAN – AREA F
2-PL-100	LOWER LEVEL PLUMBING PLAN – AREA A
2-PL-103	FIRST FLOOR PLUMBING PLAN – AREA C
2-PL-104	FOUNDATION & FIRST FLOOR PLUMBING PLAN – AREA D
2-PL-105	FIRST FLOOR PLUMBING PLAN – AREA E
2-PL-106	FIRST FLOOR PLUMBING PLAN – AREA F
2-PL-200	WASTE AND VENT PIPING ISOMETRICS
2-PL-201	WASTE AND VENT PIPING ISOMETRICS
2-PL-300	WATER PIPING ISOMETRICS
2-PL-301	WATER PIPING ISOMETRICS

HVAC

2-MS-001	NOTES, SYMBOLS & ABBREVIATIONS
2-MHD-100	OVERALL FIRST FLOOR HVAC DEMOLITION PLAN
2-MHD-101	LOWER LEVEL HVAC DEMOLITION PLAN
2-MHD-102	FIRST FLOOR HVAC DEMOLITION PLAN - AREA A
2-MHD-104	FIRST FLOOR HVAC DEMOLITION PLAN - AREA C
2-MHD-106	FIRST FLOOR HVAC DEMOLITION PLAN - AREA E
2-MHD-107	FIRST FLOOR HVAC DEMOLITION PLAN - AREA F
2-MHD-108	OVERALL ROOF HVAC DEMOLITION PLAN
2-MH-100	OVERALL FIRST FLOOR HVAC PLAN
2-MH-101	LOWER LEVEL HVAC PLAN
2-MH-102	FIRST FLOOR HVAC PLAN - AREA A
2-MH-103	FIRST FLOOR HVAC PLAN - AREA B
2-MH-104	FIRST FLOOR HVAC PLAN - AREA C
2-MH-105	FIRST FLOOR HVAC PLAN - AREA D
2-MH-106	FIRST FLOOR HVAC PLAN - AREA E
2-MH-107	FIRST FLOOR HVAC PLAN - AREA F
2-MH-108	OVERALL ROOF HVAC PLAN
2-MP-100	OVERALL FIRST FLOOR PIPING PLAN
2-MP-101	LOWER LEVEL PIPING PLAN
2-MP-102	FIRST FLOOR PIPING PLAN - AREA A
2-MP-103	FIRST FLOOR PIPING PLAN - AREA B
2-MP-104	FIRST FLOOR PIPING PLAN - AREA C
2-MP-105	FIRST FLOOR PIPING PLAN - AREA D
2-MP-106	FIRST FLOOR PIPING PLAN - AREA E
2-MP-107	FIRST FLOOR PIPING PLAN - AREA F
2-MS-501	HVAC DETAILS
2-MS-511	PIPING DETAILS
2-MS-601	HVAC SCHEDULES
2-MS-602	HVAC SCHEDULES
2-MS-603	HVAC SCHEDULES
2-MS-611	PIPING SCHEDULES
2-MS-612	PIPING SCHEDULES
2-MS-901	CONTROL SCHEMATICS

ELECTRICAL

2-EE-001	NOTES, SYMBOLS & ABBREVIATIONS
2-EPD-100	OVERALL FIRST FLOOR POWER & FIRE ALARM DEMOLITION PLAN
2-EPD-101	LOWER LEVEL POWER & FIRE ALARM DEMOLITION PLAN
2-EPD-102	FIRST FLOOR POWER & FIRE ALARM DEMOLITION PLAN - AREA A
2-EPD-103	FIRST FLOOR POWER & FIRE ALARM DEMOLITION PLAN - AREA B
2-EPD-104	FIRST FLOOR POWER & FIRE ALARM DEMOLITION PLAN - AREA C
2-EPD-105	FIRST FLOOR POWER & FIRE ALARM DEMOLITION PLAN - AREA D
2-EPD-106	FIRST FLOOR POWER & FIRE ALARM DEMOLITION PLAN - AREA E
2-EPD-107	FIRST FLOOR POWER & FIRE ALARM DEMOLITION PLAN - AREA F
2-ELD-101	LOWER LEVEL LIGHTING DEMOLITION PLAN
2-ELD-102	FIRST FLOOR LIGHTING DEMOLITION PLAN - AREA A
2-ELD-103	FIRST FLOOR LIGHTING DEMOLITION PLAN - AREA B
2-ELD-104	FIRST FLOOR LIGHTING DEMOLITION PLAN - AREA C
2-ELD-105	FIRST FLOOR LIGHTING DEMOLITION PLAN - AREA D
2-ELD-106	FIRST FLOOR LIGHTING DEMOLITION PLAN - AREA E
2-ELD-107	FIRST FLOOR LIGHTING DEMOLITION PLAN - AREA F
2-EPD-901	ONE-LINE DIAGRAM - DEMOLITION
2-EP-100	OVERAL FIRST FLOOR POWER & FIRE ALARM PLAN
2-EP-101	LOWER LEVEL POWER & FIRE ALARM PLAN
2-EP-102	FIRST FLOOR POWER & FIRE ALARM PLAN - AREA A
2-EP-103	FIRST FLOOR POWER & FIRE ALARM PLAN - AREA B
2-EP-104	FIRST FLOOR POWER & FIRE ALARM PLAN - AREA C
2-EP-105	FIRST FLOOR POWER & FIRE ALARM PLAN - AREA D
2-EP-106	FIRST FLOOR POWER & FIRE ALARM PLAN - AREA E
2-EP-107	FIRST FLOOR POWER & FIRE ALARM PLAN - AREA F
2-EL-101	LOWER LEVEL LIGHTING PLAN
2-EL-102	FIRST FLOOR LIGHTING PLAN - AREA A
2-EL-103	FIRST FLOOR LIGHTING PLAN - AREA B
2-EL-104	FIRST FLOOR LIGHTING PLAN - AREA C
2-EL-105	FIRST FLOOR LIGHTING PLAN - AREA D
2-EL-106	FIRST FLOOR LIGHTING PLAN - AREA E
2-EL-107	FIRST FLOOR LIGHTING PLAN - AREA F
2-EE-401	ENLARGED PLAN
2-EE-501	DETAILS
2-EE-601	SCHEDULES
2-EE-602	SCHEDULES
2-EE-XXX	X
2-EE-XXX	X
2-EE-XXX	X
2-EE-XXX	X
2-EE-901	ONE-LINE DIAGRAM

TECHNOLOGY

2-TE-001	NOTES, SYMBOLS & ABBREVIATIONS
2-TE-100	OVERALL FIRST FLOOR COMM DEMOLITION PLAN
2-TE-101	LOWER LEVEL COMM DEMOLITION PLAN
2-TE-102	FIRST FLOOR COMM DEMOLITION PLAN - AREA A
2-TE-103	FIRST FLOOR COMM DEMOLITION PLAN - AREA B
2-TE-104	FIRST FLOOR COMM DEMOLITION PLAN - AREA C
2-TE-105	FIRST FLOOR COMM DEMOLITION PLAN - AREA D
2-TE-106	FIRST FLOOR COMM DEMOLITION PLAN - AREA E
2-TE-107	FIRST FLOOR COMM DEMOLITION PLAN - AREA F
2-TA-100	OVERALL FIRST FLOOR COMM PLAN
2-TA-101	LOWER LEVEL COMM PLAN
2-TA-102	FIRST FLOOR COMM PLAN - AREA A
2-TA-103	FIRST FLOOR COMM PLAN - AREA B
2-TA-104	FIRST FLOOR COMM PLAN - AREA C
2-TA-105	FIRST FLOOR COMM PLAN - AREA D
2-TA-106	FIRST FLOOR COMM PLAN - AREA E
2-TA-107	FIRST FLOOR COMM PLAN - AREA F
2-TA-401	ENLARGED PLANS
2-TE-501	DETAILS
2-TE-601	SCHEDULES
2-TE-70-1	ONE-LINE DIAGRAMS

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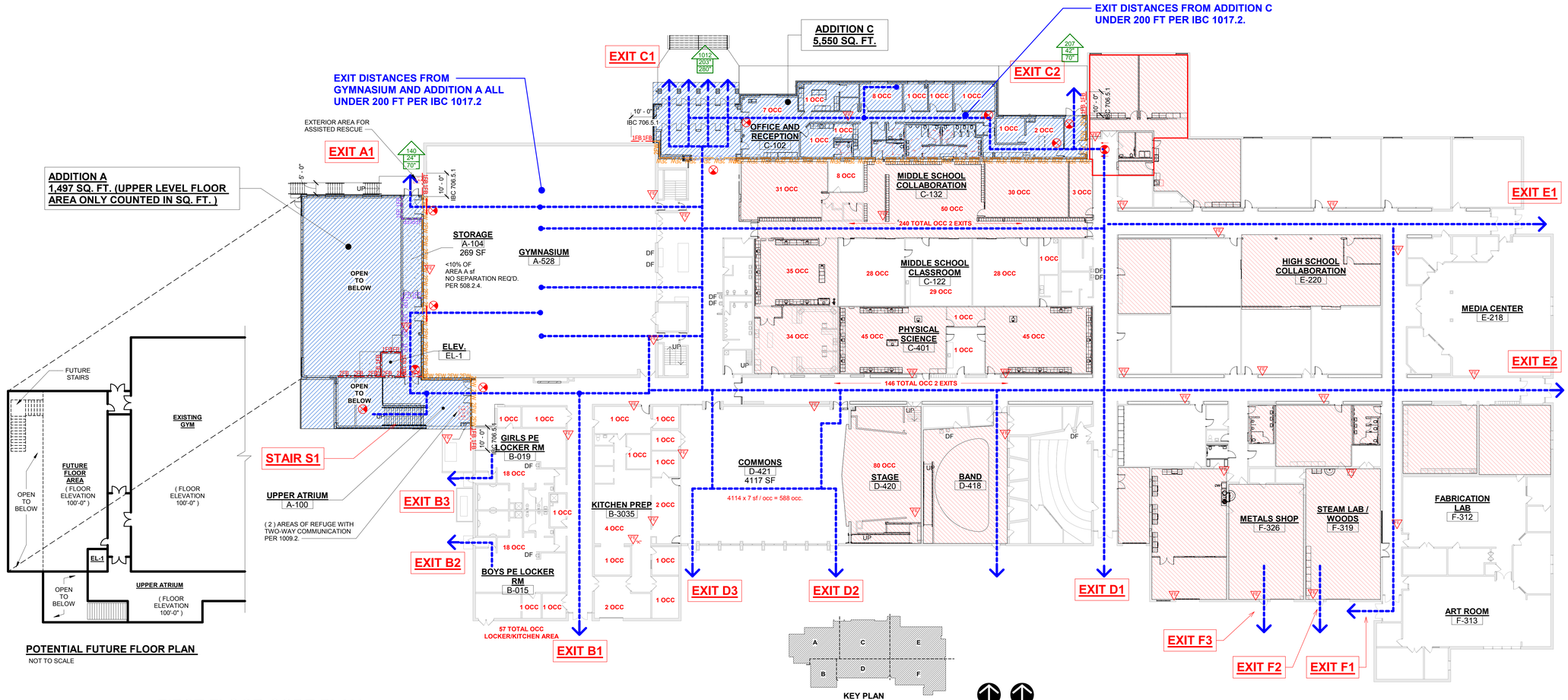
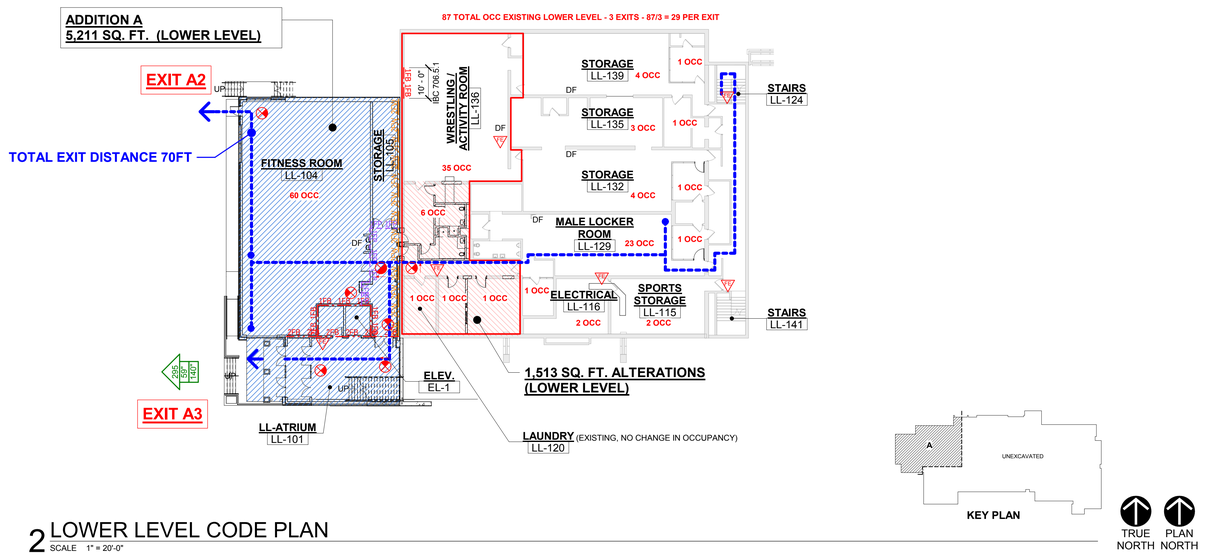


POTENTIAL FUTURE FLOOR PLAN

NOT TO SCALE

1 FIRST FLOOR CODE PLAN

SCALE 1" = 20'-0"



2 LOWER LEVEL CODE PLAN

SCALE 1" = 20'-0"

WALL PRIORITY LEGEND

PRIORITY	#	PLAN GRAPHIC	PARTITION TYPE
HIGHEST	1	2PW 2PW	2 HOUR - FIRE WALL
	2	2FB 2FB	2 HOUR - FIRE BARRIER
MEDIUM	3	1FB 1FB	1 HOUR - FIRE BARRIER
LOWEST	4	1FP 1FP	1 HOUR - FIRE PARTITION

WALL TO LIMIT THE TRANSFER OF SMOKE, DOORS AND GLAZING FOR BORROWED LIGHTS ARE NOT RATED)

NOTE: PARTITIONS WITH A HIGHER PRIORITY # TAKE PRECEDENCE OVER PARTITIONS WITH A LOWER PRIORITY # - SEE AE-501 FOR DETAILS

CODE SHEET KEY

- 72" / 56" / 57/3 — PROVIDED WIDTH / REQUIRED WIDTH / OCCUPANT LOAD
- FIRE EXTINGUISHER
- FIRE EXTINGUISHER TYPE "K"
- EXIT LIGHT
- EGRESS PATH
- A.O.R. — AREA OF REFUGE
- E.A.A.R. — EXTERIOR AREA FOR ASSISTED RESCUE
- AREAS OF ADDITION
- AREAS OF ALTERATION
- OUTLINE OF AREA PROHIBITED DURING CONSTRUCTION DUE TO EXCEEDING EXIT DISTANCE

BUILDING DATA SUMMARY:

APPLICABLE CODES:

Building, Accessibility, and Life Safety:
- 2015 IBC and IEBC as modified per Wisconsin SPS 362
- 2013 ASHRAE 90.1 (Energy Compliance) per SPS 363.0401(1)
- 2009 ICC/ANSI A117.1

Fire Protection:
- 2009 IFC

Plumbing:
- 2009 IPC as modified per Wisconsin SPS 381 through 387

HVAC:
- 2015 IMC as modified per Wisconsin SPS 364
- 2015 IFGC as modified per Wisconsin SPS 365

Electrical:
- 2011 NEC as modified per Wisconsin SPS 316

BUILDING OCCUPANCIES (IBC CH. 3)

PRIMARY
- E Education

SECONDARY
- E (A-2) Cafeteria / Commons (per IBC 303.1, exc. 4)
- E (A-3) Gymnasium, Fitness (per IBC 303.1, exc. 4)
- B Administrative Offices
- S-1 Storage / Mechanical

IBC CH. 4 - SPECIAL DETAILED REQTS.
- ATRIUM
- 404.3, exception 1: Atrium not sprinklered. Separate by 2-hour fire barrier.
- 404.4: Provide Fire Alarm.
- 404.5: Smoke Control: no smoke control system required due to only connecting two stories.

IBC CH. 5 - BUILDING AREA

SUMMARY DESCRIPTION OF BUILDING AREAS

THE EXISTING SCHOOL'S SQUARE FOOTAGE DOES NOT ALLOW ADDITIONAL SQ. FT. WITHOUT SEPARATION.

THEREFORE FIRE WALLS WILL BE UTILIZED TO COMPLETELY SEPARATE THE NEW ADDITIONS FROM THE EXISTING BUILDING.

Existing High School, first floor:	93,261 sf
Level 2 Alterations, first floor:	26,966 sf
Level 2 percentage (<50% required):	= 28.9%
Existing High School, lower level:	11,678 sf
Level 2 Alterations, lower level:	1,513 sf
Level 2 percentage (<50% required):	= 12.8%
Building Addition A:	5,211 + 1,497 = 6,708 sf
Building Addition C:	5,550 sf
Total Addition Area:	= 12,258 sf
TOTAL EXISTING AREA:	93,261 + 11,678 = 104,939 sf
TOTAL ALTERATION AREA:	26,966 + 1,513 = 28,479 sf
TOTAL ADDITION AREA:	12,258 sf
TOTAL SQ. FT.:	145,676 sf

TABLE 508.2 ACCESSORY OCCUPANCIES
STORAGE S-1:
NO RATING IF < 10% FLOOR AREA

IBC CH. 6 - BUILDING CLASS OF CONSTRUCTION
- Type IIB

IBC CH. 7 - FIRE AND SMOKE PROTECTION
- Table 706.4 Fire Wall Fire-Resistance Ratings, note a. In Type II or V Construction, walls shall be permitted to have a 2-hour fire-resistance rating.
- 706.5: Fire walls terminate at interior surface of noncombustible finish, provided noncombustible finish extends not less than 4 feet both sides of the fire wall.
- 713.4: Elevator shaft 1-hour fire barrier.

IBC CH. 9 - FIRE PROTECTION SYSTEMS
- New Additions: Not sprinklered
  1. Addition A (A-3 Occupancy) non sprinklered per IBC 903.2.1.3
  2. Addition C (B Occupancy) non sprinklered per IBC table 506.2 area limitations not being exceeded.
- Existing Building: Not sprinklered per IEBC 804.2.2 exc. 2

IBC CH. 10 - MEANS OF EGRESS
- Refer to life safety plan.

IBC CH. 11 - ACCESSIBILITY
- new construction and all Level 2 Alterations meet all accessibility requirements per IBC Chapter 11 and ANSI A117.1 (2009 edition).

IBC CH. 29 - PLUMBING SYSTEMS
- ADDITION A - 60 occupants capacity - REQ'D: 2 WC, 2 LAV's. PROVIDED: 3 WC, 3 LAV's. No additional drinking fountains required.
- ADDITION C - 20 person capacity - REQ'D: 1 WC, 1 LAV. PROVIDED: 2 WC's, 4 LAV's. No additional drinking fountains required.
- ALTERATION AREA - 50 additional students + 4 staff.
  25 MALES: REQ'D: 1 WC. PROVIDED: 2 WC, 2 UR, 3 LAV's.
  25 FEMALES: REQ'D: 1 WC. PROVIDED: 4 WC, 3 LAV's.
  REQ'D: 1 additional DF. PROVIDED: 2 additional DF's.

IECC - ENERGY CODE
- COMCheck used for energy compliance, Code 90.1 (2013) Standard.

EGRESS WIDTH CALCULATIONS

GYMNASIUM
OCCUPANT LOAD 1048 PER LOCAL FIRE MARSHAL.
1048 OCC. X .2" / OCC. = 210" EXIT WIDTH REQUIRED.
MIN. (4) EXITS REQ'D PER 1006.2.1.1
(16) 35" DOOR OPENINGS PROVIDED = 560"
DISTRIBUTED PER 1007.1.2.
697 OCC. TO EAST DOORS.
117 OCC. TO S.E. DOORS.
117 OCC. TO S.W. DOORS.
117 OCC. TO N.W. DOORS.

EXIT A1 - FIRST FLOOR
117 OCCUPANTS
REQUIRED EXIT WIDTH: 117 OCC. X .2" / OCC. = 24".
PROVIDED: (2) 35" DOOR OPENINGS = 70"

EXIT A2 - LOWER LEVEL
30 OCCUPANTS
REQUIRED EXIT WIDTH: 30 OCC. X .2" / OCC. = 6".
PROVIDED: (1) 35" DOOR OPENING = 35"

EXIT A3 - LOWER LEVEL:
295 OCCUPANTS
(265 FIRST FLOOR, 30 LOWER LEVEL)
REQUIRED EXIT WIDTH: 295 OCC. X .2" / OCC. = 59".
PROVIDED: (4) 35" DOOR OPENINGS = 140".

EXIT C1 FIRST FLOOR:
1012 OCCUPANTS
(700 GYM, 195 CLASSROOMS, 95 COMMONS, 10 STAGE, 12 NEW ADDITION).
REQUIRED EXIT WIDTH: 1012 OCC. X .2" / OCC. = 203".
PROVIDED: (8) 35" DOOR OPENINGS = 280".

EXIT C2 FIRST FLOOR:
207 OCCUPANTS
(12 NEW ADDITION, 195 CLASSROOMS.)
REQUIRED EXIT WIDTH: 207 OCC. X .2" / OCC. = 42".
PROVIDED: (2) 35" DOOR OPENINGS = 70".

EXITS E1, E2, F1, F2, D1, D2, D3, B1, B2 AND B3 ALL FIRST FLOOR:
NO ADDITIONAL OCCUPANT LOAD.
EXISTING EXITS TO REMAIN.

STAIR S1
205 OCCUPANTS
(117 GYM, 18 KITCHEN / LOCKERS, 63 COMMONS, 7 STAGE)
REQUIRED STAIR WIDTH: 201 OCC. X .3" / OCC. = 62".
PROVIDED: 91".

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CONSULTANT:

MANAWA

MANAWA ELEMENTARY SCHOOL - ALTERATIONS
MANAWA MIDDLE/HIGH SCHOOL - ADDITIONS & ALTERATIONS
PART 2 - MANAWA MIDDLE / HIGH SCHOOL
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SHEET TITLE: CODE PLANS

SHEET NUMBER: 2-GI-101

FOR BIDS
NOT FOR CONSTRUCTION

705.8 OPENINGS
705.8.1 ALLOWABLE AREA OF OPENINGS
EXCEPTION 2:
BUILDINGS WHOSE EXTERIOR BEARING WALLS, EXTERIOR NON-BEARING WALLS AND EXTERIOR PRIMARY STRUCTURAL FRAME ARE NOT REQUIRED TO BE FIRE-RESISTIVE RATED SHALL BE PERMITTED TO HAVE UNLIMITED UNPROTECTED OPENINGS.

THEREFORE, UNPROTECTED OPENINGS ALLOWED.

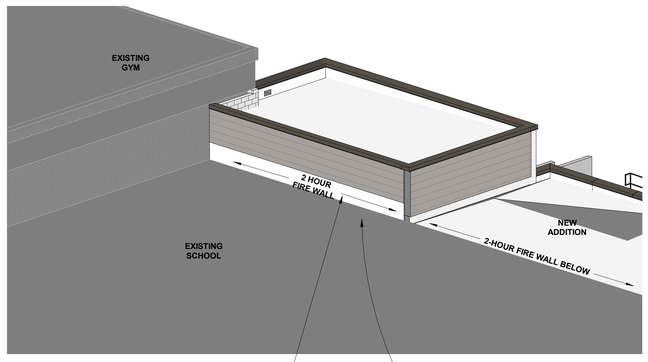
706 FIRE WALLS
706.6 VERTICAL CONTINUITY, EXCEPTION 3:
WALLS SHALL BE PERMITTED TO TERMINATE AT THE UNDERSIDE OF NONCOMBUSTIBLE ROOF SHEATHING, DECK OR SLABS WHERE BOTH BUILDINGS ARE PROVIDED WITH NOT LESS THAN A CLASS B ROOF COVERING. OPENINGS IN THE ROOF SHALL NOT BE LOCATED WITHIN 4 FEET OF THE FIRE WALL.

REFER TO SECTION 3 / 2-AE-314

REFER TO SECTION 3 / 2-AE-315

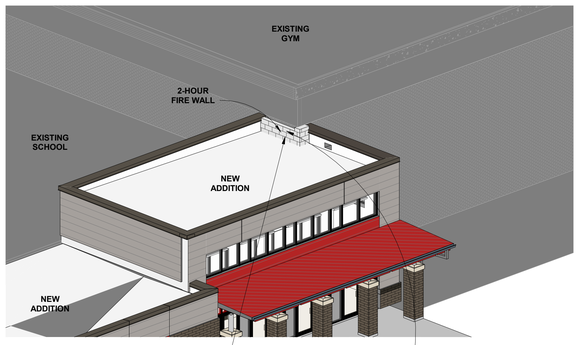
706 FIRE WALLS
706.5 HORIZONTAL CONTINUITY
EXTEND FIRE WALL MIN. 18" BEYOND EXTERIOR WALL.

6 ADDITION 'C' VIEW FROM NORTHWEST
N.T.S.



REFER TO: DETAIL 3 SHEET 2-AE-302

5 ADDITION 'C' VIEW FROM SOUTHEAST
SCALE
AS REFERENCED BY:



REFER TO: DETAIL 1 SHEET 2-AE-316

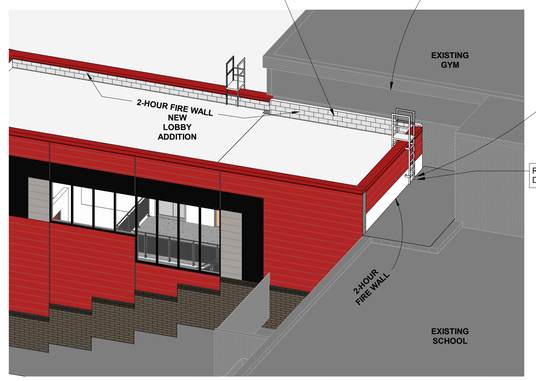
4 ADDITION 'C' VIEW FROM NORTHEAST
N.T.S.

706 FIRE WALLS
706.6 VERTICAL CONTINUITY
706.6.1 - STEPPED BUILDINGS
FIRE WALL SHALL TERMINATE NOT LESS THAN 30 INCHES ABOVE THE LOWER ROOF LEVEL, PROVIDED THE EXTERIOR WALL FOR A HEIGHT OF 15 FEET ABOVE THE LOWER ROOF IS NOT LESS THAN 1-HOUR FIRE-RESISTANCE RATED CONSTRUCION FROM BOTH SIDES WITH OPENINGS PROTECTED BY FIRE ASSEMBLIES HAVING A FIRE PROTECTION RATING OF NOT LESS THAN 3/4 HOUR.

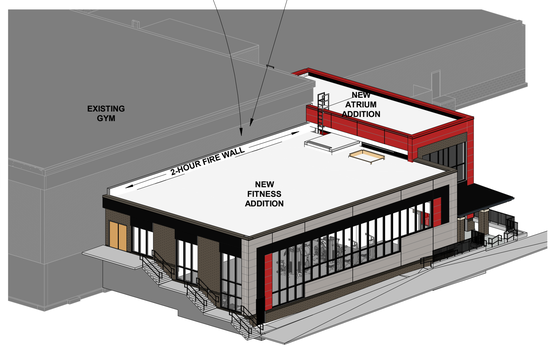
REFER TO: DETAIL 3 SHEET 2-AE-301

REFER TO: DETAIL 4 SHEET 2-AE-301

REFER TO: DETAIL 2 SHEET 2-AE-313



2 ADDITION 'A' VIEW FROM SOUTHEAST
N.T.S.



3 ADDITION 'A' VIEW FROM NORTHWEST
N.T.S.

FOR BIDS
NOT FOR CONSTRUCTION

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CONSULTANT:

MANAWA

MANAWA ELEMENTARY SCHOOL - ALTERATIONS
MANAWA MIDDLE/HIGH SCHOOL - ADDITIONS & ALTERATIONS
PART 2 - MANAWA MIDDLE / HIGH SCHOOL
515 E. 4th STREET
MANAWA, WI 54949

MARK	DATE

ISSUED: 6 JUN 2019
PROJECT NO: 18268
CAD DWG FILE:
DRAWN BY: Author
CHECKED BY: Checker

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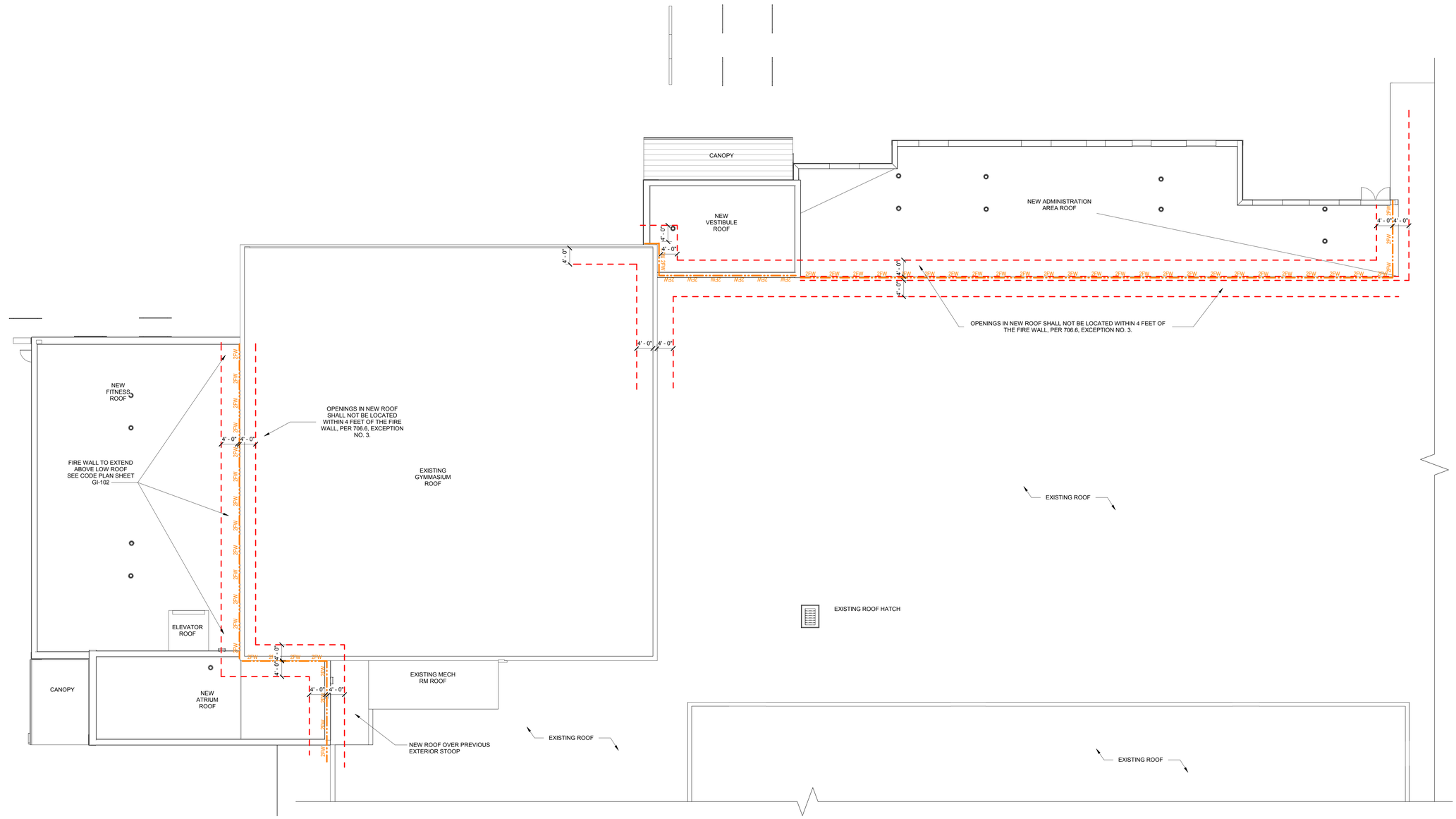
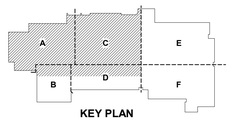
SHEET TITLE:
CODE INFORMATION

SHEET NUMBER:
2-GI-102



1 PARTIAL ROOF PLAN

SCALE 3/32" = 1'-0"
AS REFERENCED BY: 2 / 2-AD-104



KEY PLAN

TRUE NORTH

PLAN NORTH

FOR BIDS
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CONSULTANT:

MANAWA

MANAWA ELEMENTARY SCHOOL - ALTERATIONS
MANAWA MIDDLE/HIGH SCHOOL - ADDITIONS & ALTERATIONS
PART 2 - MANAWA MIDDLE / HIGH SCHOOL
515 E. 4th STREET
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MARK	DATE

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PROJECT NO: 18268
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SHEET TITLE:
CODE INFORMATION

SHEET NUMBER:
2-GI-103

Design No. U905

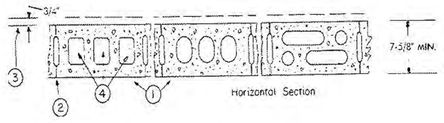
March 11, 2016

Bearing Wall Rating — 2 HR.

Nonbearing Wall Rating — 2 HR

This design was evaluated using a load design method other than the Limit States Design Method (e.g., Working Stress Design Method). For jurisdictions employing the Limit States Design Method, such as Canada, a load restriction factor shall be used — See Guide BXUV or BXUV7.

** Indicates such products shall bear the UL or cUL Certification Mark for jurisdictions employing the UL or cUL Certification (such as Canada), respectively.*



1. **Concrete Blocks* —** Various designs. Classification D-2 (2 hr). See **Concrete Blocks** category for list of eligible manufacturers.

2. **Mortar —** Blocks laid in full bed of mortar, nom. 3/8 in. thick, of not less than 2-1/4 and not more than 3-1/2 parts of clean sharp sand to 1 part Portland cement (proportioned by volume) and not more than 50 percent hydrated lime (by cement volume). Vertical joints staggered.

3. **Portland Cement Stucco or Gypsum Plaster —** Add 1/2 hr to classification if used. Where combustible members are framed in wall, plaster or stucco must be applied on the face opposite framing to achieve a max. Classification of 1-1/2 hr. Attached to concrete blocks (Item 1).

4. **Loose Masonry Fill —** If all core spaces are filled with loose dry expanded slag, expanded clay or shale (Rotary Kiln Process), water repellant vermiculite masonry fill insulation, or silicone treated perlite loose fill insulation add 2 hr to classification.

5. **Foamed Plastic* —** (Optional-Not Shown) — 1-1/2 in. thick max, 4 ft wide sheathing attached to concrete blocks (Item 1).
ATLAS ROOFING CORP — "EnergyShield Pro Wall Insulation" and "EnergyShield Pro 2 Wall Insulation"

CARLISLE COATINGS & WATERPROOFING INC — Type R2+ Sheath

FIRESTONE BUILDING PRODUCTS CO L L C — "Enverge™ CI Foil Exterior Wall Insulation" and "Enverge™ CI Glass Exterior Wall Insulation"

HUNTER PANELS — Types Xci-Class A, Xci 286

RMAX OPERATING L L C — "TSX-8500", "TSX-8510", "Thermasheath-XP", "ECOMAXci", "Thermasheath-3", "Durasheath-3"

THE DOW CHEMICAL CO — Types Thermax Sheathing, Thermax Light Duty Insulation, Thermax Heavy Duty Insulation, Thermax Metal Building Board, Thermax White Finish Insulation, Thermax ci Exterior Insulation, Thermax XARMOR ci Exterior Insulation, Thermax IH Insulation, Thermax Plus Liner Panel, Thermax Heavy Duty Plus (HDP) and TUFF-R™ ci Insulation

5A. **Building Units —** As an alternate to Items 5, min. 1-in thick polyisocyanurate composite foamed plastic insulation boards, nom. 48 by 48 or 96 in.
RMAX OPERATING L L C — "Thermasheath-SI", "ECOBASEci", "ThermaBase-CI"

** Indicates such products shall bear the UL or cUL Certification Mark for jurisdictions employing the UL or cUL Certification (such as Canada), respectively.*

Last Updated on 2016-03-11

The appearance of a company's name or product in this database does not in itself assure that products so identified have been manufactured under UL's Follow-Up Service. Only those products bearing the UL Mark should be considered to be Certified and covered under UL's Follow-Up Service. Always look for the Mark on the product.

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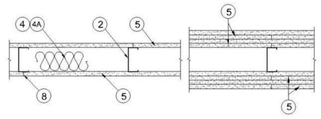
Design No. U419

September 02, 2011

Nonbearing Wall Ratings — 1, 2, 3 or 4 Hr (See Items 4 & 5)



1. **Floor and Ceiling Runners —** (Not shown) — For use with Item 2 - Channel shaped, fabricated from min 25 MSG corrosion-protected steel, min depth to accommodate stud size, with min 1-1/4 in. long legs, attached to floor and ceiling with fasteners 24 in. OC max.

1A. **Framing Members* - Floor and Ceiling Runners —** Not shown - In lieu of Item 1 — For use with Item 2A, proprietary channel shaped, min. 3-5/8 in. deep, fabricated from min. 0.015 in. (min bare metal thickness) galvanized steel, attached to floor and ceiling with fasteners 24 in. OC max. Effective thickness is 0.034 in.

CLARKDIETRICH BUILDING SYSTEMS — UltraSTEEL®.

1B. **Framing Members* - Floor and Ceiling Runners —** (Not shown - In lieu of Item 1) — For use with Item 2A, proprietary channel shaped, min. 2-1/2 in. deep, fabricated from min. 0.015 in. (min bare metal thickness) galvanized steel, attached to floor and ceiling fasteners 24 in. OC. max. Effective thickness is 0.034 in.

CLARKDIETRICH BUILDING SYSTEMS — UltraSTEEL®.

1F. **Floor and Ceiling Runners —** (Not shown)—For use with Item 2B- Channel shaped, fabricated from min 20 MSG corrosion-protected or galv steel, min depth to accommodate stud size, with min 1 in. long legs, attached to floor and ceiling with fasteners spaced max 24 in. OC.

1G. **Framing Members* — Floor and Ceiling Runners —** (Not shown, As an alternate to Item 1) — For use with Items 2F, 5F or 5G or 5I only, channel shaped, fabricated from min. 0.015 in. (min bare metal thickness) galvanized steel, attached to floor and ceiling with fasteners 24 in. OC. max.

CLARKDIETRICH BUILDING SYSTEMS — CD ProTRAK **DMFCWBS L L C** — ProTRAK

2. **Steel Studs —** Channel shaped, fabricated from min 25 MSG corrosion-protected steel, min depth as indicated under Item 5, spaced a max of 24 in. OC. Studs to be cut 3/8 to 3/4 in. less than assembly height.

2A. **Framing Members* - Steel Studs —** In lieu of Item 2 - Proprietary channel shaped studs, min. depth as indicated under Item 5, fabricated from min. 0.015 in. (min bare metal thickness) galvanized steel, spaced a max of 24 in. OC. Studs to be cut 3/4 in. less than assembly height. Allowable use of studs is shown in the table below. For direct attachment of gypsum board only. Effective thickness is 0.034 in.

CLARKDIETRICH BUILDING SYSTEMS — UltraSTEEL®.

2B. **Steel Studs —** (As an alternate to Item 2, For use with Items 5B & 5E) Channel shaped, fabricated from min 20 MSG corrosion-protected or galv steel, 3-1/2 in. min depth, spaced a max of 16 in. OC. Studs friction-fit into floor and ceiling runners. Studs to be cut 5/8 to 3/4 in. less than assembly height.

2F. **Framing Members* — Steel Studs —** (Not shown, As an alternate to Item 2) —For use with Items 1G, 5F or 5G or 5I only, channel shaped studs, min depth as indicated under Item 5F, 5G or 5I, fabricated from min. 0.015 in. (min bare metal thickness) galvanized steel, spaced a max of 24 in. OC. Studs to be cut 3/4 in. less than assembly height.

CLARKDIETRICH BUILDING SYSTEMS — CD ProSTUD

DMFCWBS L L C — ProSTUD

3. **Wood Structural Panel Sheathing —** (Optional, For use with Item 5 Only.)- (Not Shown) - 4 ft wide, 7/16 in. thick oriented strand board (OSB) or 15/32 in. thick structural I sheathing (plywood) complying with DOC PS1 or PS2, or APA Standard PRP-108, manufactured with exterior glue, applied horizontally or vertically to the steel studs. Vertical joints centered on studs, and staggered one stud space from wallboard joints. Attached to studs with 1-1/4 in. long bugle self-drilling tapp ing screws with a min. head diam. of 0.292 in. at maximum 6 in. OC. in the perimeter and 12 in. OC. in the field. When used, fastener lengths for gypsum panels increased by min. 1/2 in.

4. **Batts and Blankets* —** (Required as indicated under Item 5) — Mineral wool batts, friction fitted between studs and runners. Min nom thickness as indicated under Item 5. See **Batts and Blankets (BKNV or BZJZ) Categories** for names of Classified companies.

4A. **Batts and Blankets* —** (Optional) — Placed in stud cavities, any glass fiber or mineral wool insulation bearing the UL Classification Marking as to Surface Burning Characteristics and/or Fire Resistance. See **Batts and Blankets (BKNV or BZJZ) Categories** for names of Classified companies.

5. **Gypsum Board* —** Gypsum panels with beveled, square or tapered edges, applied vertically or horizontally. Vertical joints centered over studs and staggered one stud space on opposite sides of studs. Vertical joints in adjacent layers (multilayer systems) staggered one stud cavity. Horizontal joints need not be backed by steel framing. Horizontal edge joints and horizontal butt joints on opposite sides of studs need not be staggered. Horizontal edge joints and horizontal butt joints in adjacent layers (multilayer systems) staggered a min of 12 in. The thickness and number of layers for the 1 hr, 2 hr, 3 hr and 4 hr ratings are as follows:

Gypsum Board Protection on Each Side of Wall

Rating, Hr	Min Stud Depth, in. Items 2, 2D, 2E, 2G and 2F	Min Stud Depth, in. Item 2A	No. of Layers & Thkns of Panel	Min Thkns of Insulation (Item 4)
1	3-1/2	3-5/8	1 layer, 5/8 in. thick	Optional
1	2-1/2	3-5/8	1 layer, 1/2 in. thick	1-1/2 in.
1	1-5/8	3-5/8	1 layer, 3/4 in. thick	Optional
2	1-5/8	2-1/2	2 layers, 1/2 in. thick	Optional
2	1-5/8	2-1/2	2 layers, 5/8 in. thick	Optional
2	3-1/2	3-5/8	1 layer, 3/4 in. thick	3 in.

UNITED STATES GYPSUM CO — 1/2 in. thick Type C, IP-X2, IPC-AR or WRC; 5/8 in. thick Type SCX, SHX, WRX, IP-X1, AR, C, WRC, FRX-G, IP-AR, IP-X2, IPC-AR ; 3/4 in. thick Types IP-X3 or ULTRACODE

When Item 7B, Steel Framing Members*, is used, Nonbearing Wall Rating is limited to 1 Hr. Min. stud depth is 3-1/2 in., min. thickness of insulation (Item 4) is 3 in., and two layers of gypsum board panels (1/2 in. or 5/8 in. thick) shall be attached to furring channels as described in Item 6. One layer of gypsum board panels (1/2 in. or 5/8 in. thick) attached to opposite side of stud without furring channels as described in Item 6.

5A. **Gypsum Board* —** (As an alternate to Item 5) — 5/8 in. thick, 24 to 54 in. wide, applied horizontally as the outer layer to one side of the assembly. Secured as described in Item 6.

UNITED STATES GYPSUM CO — Type FRX-G, SHX.

5C. **Gypsum Board* —** (For Use With Item 2C) Rating Limited to 1 Hour. 5/8 in. thick, 48 in. wide, Gypsum panels with beveled, square or tapered edges, applied vertically or horizontally. (Vertical Application) - The gypsum board is to be installed on each side of the studs with 1 in. long Type S coated steel screws spaced 8 in. OC starting 4 in. from the edge of the board at the vertical edges and 12 in. OC starting 6 in. from the edge of the board at the center of each board. Gypsum boards are to be secured to the top and bottom track with screws spaced 8 in. OC starting 4 in. from the board edge. Fasteners shall not penetrate through both the stud and the track at the same time. Vertical joints are to be centered over studs and staggered one stud cavity on opposite sides of studs. (Horizontal Application) - The gypsum board is to be installed on each side of the studs with 1 in. long Type S coated steel screws spaced 8 in. OC starting 4 in. from the edge of the board at the vertical edges and 12 in. OC starting 6 in. from the edge of the board at the center of each board. Gypsum boards are to be secured to the top and bottom track with screws spaced 8 in. OC starting 4 in. from the board edge. Fasteners shall not penetrate through both the stud and the track at the same time. All horizontal joints are to be backed as outlined under section VI of Volume 1 in the Fire Resistive Directory.

UNITED STATES GYPSUM CO — Type SCX.

5D. **Gypsum Board* —** (As an alternate to Item 5) — 5/8 in. thick, 48 in. wide, applied vertically or horizontally. Secured as described in Item 6. For use with Items 1 and 2 only.

UNITED STATES GYPSUM CO — Type USGX.

5F. **Gypsum Board* —** (As an alternate to Item 5) — For use with Items 1G and 2F and limited to 1 Hour Rating only, Gypsum panels with beveled, square or tapered edges, applied vertically, and fastened to the steel studs with 1 in. long Type S screws spaced 8 in. OC along vertical and bottom edges and 12 in. OC in the field. Vertical joints centered over studs and staggered one stud cavity on opposite sides of studs. Steel stud depth shall be a minimum 3-5/8 in.

UNITED STATES GYPSUM CO — 5/8 in. thick Type SCX.

5G. **Gypsum Board* —** (As an alternate to Item 5) — For use with Items 1G and 2F only, Gypsum panels with beveled, square or tapered edges, applied vertically or horizontally, as specified in the table below and fastened to the steel studs as described in Item 6. Vertical joints centered over studs and staggered one stud cavity on opposite sides of studs. Vertical joints in adjacent layers (multilayer systems) staggered one stud cavity. Horizontal joints need not be backed by steel framing. Horizontal edge joints and horizontal butt joints on opposite sides of studs need not be staggered. Horizontal edge joints and horizontal butt joints in adjacent layers (multilayer systems) staggered a min of 12 in. The thickness and number of layers for the 2 hr, 3 hr and 4 hr ratings are as follows:

Gypsum Board Protection on Each Side of Wall

Rating, Hr	Min Stud Depth, in. Item 2F	No. of Layers & Thickness of Panel	Min Thkns of Insulation (Item 4)
2	1-5/8	2 layers, 1/2 in. thick	Optional
2	1-5/8	2 layers, 5/8 in. thick	Optional

UNITED STATES GYPSUM CO — 1/2 in. thick Type C, IP-X2, IPC-AR or; 5/8 in. thick Type SCX, SHX, IP-X1, AR, C, , FRX-G, IP-AR, IP-X2, IPC-AR ; 3/4 in. thick Types IP-X3 or ULTRACODE

6. **Fasteners —** (Not shown) — For use with Items 2 and 2F - Type S or S-12 steel screws used to attach panels to studs (Item 2) or furring channels (Item 7). **Single layer systems:** 1 in. long for 1/2 and 5/8 in. thick panels or 1-1/4 in. long for 3/4 in. thick panels, spaced 8 in. OC when panels are applied horizontally, or 8 in. OC along vertical and bottom edges and 12 in. OC in the field when panels are applied vertically. **Two layer systems:** First layer- 1 in. long for 1/2 and 5/8 in. thick panels or 1-1/4 in. long for 3/4 in. thick panels, spaced 16 in. OC. Second layer- 1-5/8 in. long for 1/2 in., 5/8 in. thick panels or 2-1/4 in. long for 3/4 in. thick panels, spaced 16 in. OC with screws offset 8 in. from first layer. **Three-layer systems:** First layer- 1 in. long for 1/2 in., 5/8 in. thick panels, spaced 24 in. OC. Second layer- 1-5/8 in. long for 1/2 in., 5/8 in. thick panels, spaced 24 in. OC. Screws offset min 6 in. from layer below. Third layer- 2-1/4 in. long for 1/2 in., 5/8 in. thick panels, spaced 24 in. OC. Screws offset min 6 in. from layer below. **Four-layer systems:** First layer- 1 in. long for 1/2 in., 5/8 in. thick panels, spaced 24 in. OC. Second layer- 1-5/8 in. long for 1/2 in., 5/8 in. thick panels, spaced 24 in. OC. Third layer- 2-1/4 in. long for 1/2 in. thick panels or 2-5/8 in. long for 5/8 in. thick panels, spaced 24 in. OC. Fourth layer- 2-5/8 in. long for 1/2 in. thick panels or 3 in. long for 5/8 in. thick panels, spaced 12 in. OC. Screws offset min 6 in. from layer below.

6A. **Fasteners —** (Not shown) —For use with Item 2A - Type S or S-12 steel screws used to attach panels to studs (Item 2A). **Single layer systems:** 1 in. long for 1/2 and 5/8 in. thick panels or 1-1/4 in. long for 3/4 in. thick panels, spaced 8-1/2 in. OC with additional screws 1 in. and 2-1/2 in. from edges of the board when panels are horizontally. or 8 in. OC along vertical and bottom edges and 12 in. OC in the field when panels are applied vertically. **Two layer systems applied vertically:** First layer- 1 in. long for 1/2 and 5/8 in. thick panels or 1-1/4 in. long for 3/4 in. thick panels, spaced 16 in. OC. Second layer- 1-5/8 in. long for 1/2 in., 5/8 in. thick panels or 2-1/4 in. long for 3/4 in. thick panels, spaced 16 in. OC with screws offset 8 in. from first layer. **Two layer systems applied horizontally:** First layer- 1 in. long for 1/2 in., 5/8 in. thick panels, spaced 16 in. OC starting 8 in. from edge of the board with an additional screw placed 1-1/4 in. from each edge of the board. Second layer- 1-5/8 in. long for 1/2 in., 5/8 in. thick panels or 2-1/4 in. long for 3/4 in. thick panels, spaced 16 in. OC starting 8 in. from each edge of the board with an additional screw placed 1-1/4 in. from each edge of the board with screws offset 8 in. from first layer. **Three-layer systems:** First layer- 1 in. long for 1/2 in., 5/8 in. thick panels, spaced 24 in. OC. Second layer- 1-5/8 in. long for 1/2 in., 5/8 in. thick panels, spaced 24 in. OC. Third layer- 2-1/4 in. long for 1/2 in., 5/8 in. thick panels or 2-5/8 in. long for 5/8 in. thick panels, spaced 12 in. OC. Screws offset min 6 in. from layer below. For all layers, an additional screw shall be placed 1-1/4 in. from each edge of the board. **Four-layer systems:** First layer- 1 in. long for 1/2 in., 5/8 in. thick panels, spaced 24 in. OC. Second layer- 1-5/8 in. long for 1/2 in., 5/8 in. thick panels, spaced 24 in. OC. Third layer- 2-1/4 in. long for 1/2 in. thick panels or 2-5/8 in. long for 5/8 in. thick panels, spaced 12 in. OC. Screws offset min 6 in. from layer below. For all layers, an additional screw shall be placed 1-1/4 in. from each edge of the board.

7. **Furring Channels —** (Optional, not shown, for single or double layer systems) — Resilient furring channels fabricated from min 25 MSG corrosion-protected steel, spaced vertically a max of 24 in. OC. Flange portion attached to each intersecting stud with 1/2 in. long Type S-12 steel screws. Not for use with Item 5A and 5E.

7B. **Framing Members* —** (Optional, Not Shown) — As an alternate to Item 7, for single or double layer systems, furring channels and Steel Framing Members on only one side of studs as described below:

a. **Furring Channels —** Formed of No. 25 MSG galv steel, spaced 24 in. OC perpendicular to studs. Channels secured to studs as described in item b. Batts and Blankets placed in stud cavity as described in Item 5. Two layers of gypsum board attached to furring channels as described in Item 5. Not for use with Item 5A and 5E.

b. **Steel Framing Members* —** Used to attach furring channels (Item 7Ba) to one side of studs (Item 2) only. Clips spaced 48 in. OC., and secured to studs with two No. 8 x 21/2 in. coarse drywall screws, one through the hole at each end of the clip. Furring channels are friction fitted into clips.

KINETICS NOISE CONTROL INC — Type Isomax

7C. **Framing Members* —** Optional - Not Shown - Used as an alternate method to attach resilient channels (Item 7). Clips attached at each intersection of the resilient channel and the steel studs (Item 2). Resilient channels are friction fitted into clips, and then clips are secured to the steel stud with min. 1 in. long Type S12 steel screws through the center hole of the clip and the resilient channel flange.

KEENE BUILDING PRODUCTS CO INC — Type RC Assurance.

8. **Joint Tape and Compound —** Vinyl or casein, dry or premixed joint compound applied in two coats to joints and screw heads of outer layers. Paper tape, nom 2 in. wide, embedded in first layer of compound over all joints of outer layer panels. Paper tape and joint compound may be omitted when gypsum panels are supplied with a square edge.

9. **Siding, Brick or Stucco —** (Optional, not shown) — Aluminum, vinyl or steel siding, brick veneer or stucco, meeting the requirements of local code agencies, installed over gypsum panels. Brick veneer attached to studs with corrugated metal wall ties attached to each stud with steel screws, not more than each sixth course of brick.

10. **Caulking and Sealants* —** (Optional, not shown) — A bead of acoustical sealant applied around the partition perimeter for sound control.

UNITED STATES GYPSUM CO — Type AS

*Bearing the UL Classification Mark

Last Updated on 2011-09-02

THIS SHEET TO BE ELIMINATED.

UL DESIGNS TO BE ON 8.5 X 11 SHEETS AND INSERTED INTO SPECS.

ADD THE FOLLOWING UL DESIGNS:
- **TOP OF WALL**
- **FLOOR / CEILING ASSEMBLY (metal deck and concrete)**

FOR BIDS
NOT FOR CONSTRUCTION

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Planning, Design & Construction, Inc.
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CONSULTANT:

MANAWA

MANAWA ELEMENTARY SCHOOL - ALTERATIONS
MANAWA MIDDLE/HIGH SCHOOL - ADDITIONS & ALTERATIONS
PART 2 - MANAWA MIDDLE / HIGH SCHOOL
515 E. 4th STREET
MANAWA, WI 54949

MARK	DATE

ISSUED: 6 JUN 2019

PROJECT NO: 18268

CAD DWG FILE:

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CHECKED BY: Checker

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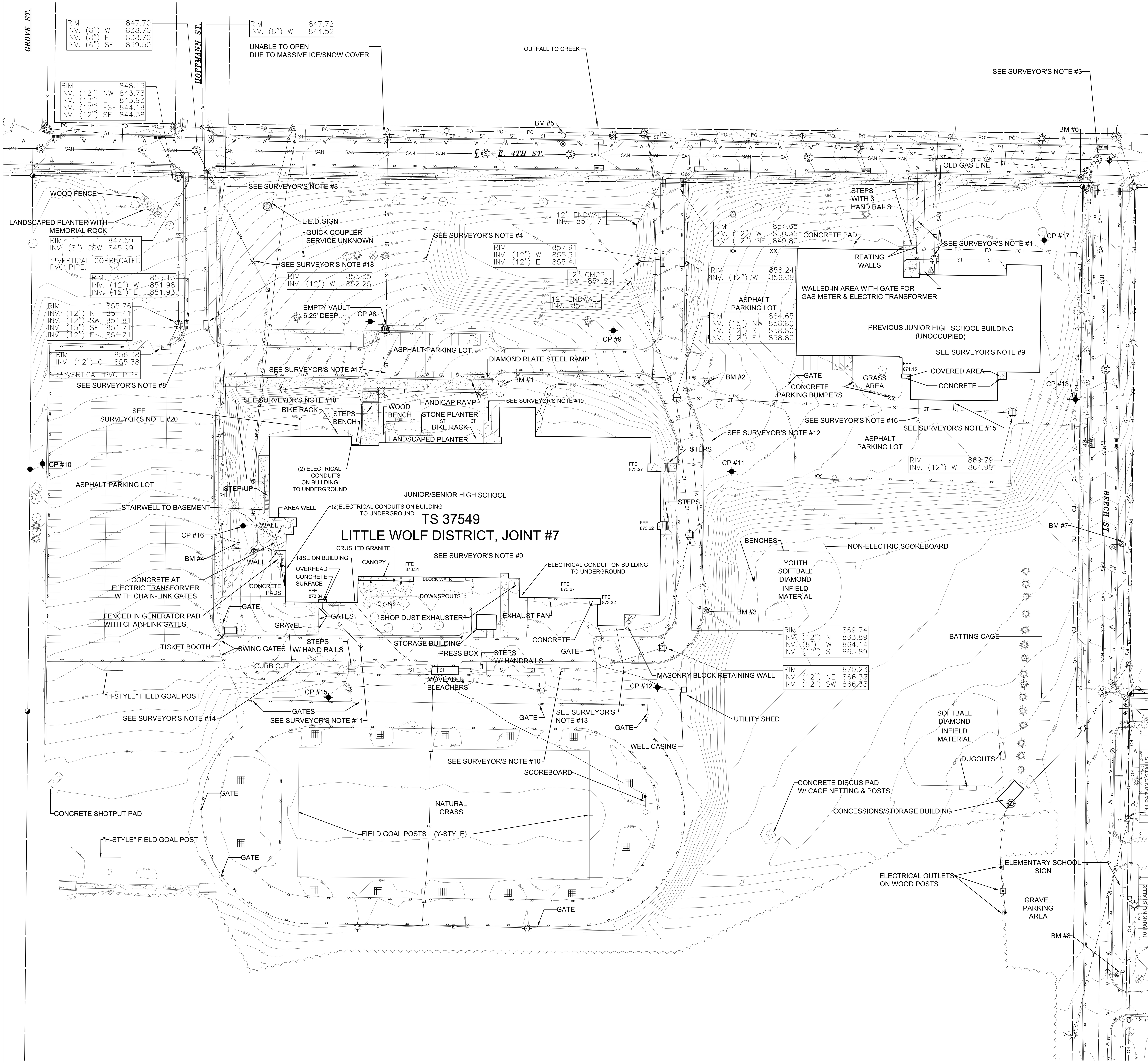
SHEET TITLE:

FIRE RATING ASSEMBLIES

SHEET NUMBER:

2-GI-501



LEGEND

- LIGHT POLE
- POWER POLE
- GUY
- TELEPHONE PEDESTAL
- ELECTRICAL BOX
- TELEPHONE MANHOLE
- SANITARY MANHOLE
- WATER MANHOLE
- STORM MANHOLE
- UTILITY MANHOLE
- TRACK DRAINS
- CATCH BASIN
- CATCH BASIN
- WATER VALVE
- HYDRANT
- FENCE
- POWER OVERHEAD
- BURIED ELECTRIC
- BURIED GAS
- BURIED TELEPHONE
- WATERMAIN
- FIBER OPTICS
- EDGE OF BITUMINOUS
- FLAG POLE
- TREE
- CONIFEROUS TREE
- BUSH/SHRUB
- ELECTRIC METER
- GAS METER
- GAS VALVE
- 3/4" IRON BAR FOUND
- 1" IRON PIPE FOUND
- 1 1/4" IRON PIPE FOUND
- 1 1/2" IRON PIPE FOUND
- 2" IRON PIPE FOUND
- SECTION CORNER FOUND
- SANITARY SEWER
- STORM SEWER
- CONTOUR LINE
- 100.00 SPOT ELEVATION
- SIGN
- CONTROL POINT
- ELECTRIC OUTLETS
- DISC GOLF BASKET
- PLAY EQUIPMENT
- BOLLARD (UNLESS NOTED)
- BENCH
- ROCKS
- SANITARY CLEANOUT
- BASKETBALL HOOP
- SWING
- IRRIGATION BOX
- WOODLINE
- CONCRETE SURFACE

SURVEYOR'S NOTES

1. 3" WATER MAIN, 6" SANITARY AND 12" STORM PER ELEMENTARY SITE PLAN DRAWING A-1 FROM THEO UTSCHIG & SON DATED JANUARY 30, 1973.
2. NATURAL GAS PER BRAY ASSOCIATES DRAWING SP1 PROJECT #2029 DATED MARCH 29, 1995.
3. STORM LATERAL PER BRAY ASSOCIATES DRAWING SP4 PROJECT #2029 DATED MARCH 29, 1995.
4. 6" WATER MAIN PER BRAY ASSOCIATES DRAWING SP4 PROJECT #2029 DATED MARCH 29, 1995.
5. 6" SANITARY STUBBED AND CAPPED. RUNS SOUTHEAST THROUGH THREE SEPTIC CLEANOUTS, WHICH ARE EACH COVERED BY A SOLID MANHOLE COVER ON ASPHALT SURFACE.
6. 12" STORM SEWER PER BRAY ASSOCIATES DRAWING SP2 PROJECT #2028 DATED OCTOBER 30, 1995.
7. 18" STORM SEWER PER R.H. RETTLER & ASSOCIATES, INC. DRAWING ST-1, DATED SEPTEMBER 10, 1998.
8. 6" SANITARY SEWER BASED FROM PLOT PLAN BY LAWRENCE BRAY & ASSOCIATES, JOB NO. 225, SHEET NO. P-1, DATED MARCH 28, 1968
9. CURRENT H.S. BUILDING: SANITARY AND WATER SERVICES TO BUILDING NOT LOCATED IN FIELD OR SHOWN ON AVAILABLE MAPPING. PREVIOUS H.S. BUILDING: ELECTRIC AND SANITARY SERVICES TO BUILDING NOT LOCATED IN FIELD OR SHOWN ON AVAILABLE MAPPING.
10. PROPOSED 10" STORM SEWER PER BRAY ASSOCIATES DRAWING SP4 PROJECT #2029 DATED MARCH 29, 1995.
11. PROPOSED 8" STORM SEWER PER BRAY ASSOCIATES DRAWING SP4 PROJECT #2029 DATED MARCH 29, 1995.
12. TWO 1" ELECTRICAL LINES UNDER BLACKTOP FOR FUTURE PER BRAY ASSOCIATES DRAWING SP4 PROJECT #2029 DATED MARCH 29, 1995.
13. TWO 1" AND ONE 3" CONDUIT STUBBED PAST BLACKTOP FOR FUTURE TELEPHONE AND LIGHTING PER BRAY ASSOCIATES DRAWING SP4 PROJECT #2029 DATED MARCH 29, 1995.
14. ABANDONED 4" ELECTRICAL LINE PER BRAY ASSOCIATES DRAWING SP4 PROJECT #2029 DATED MARCH 29, 1995.
15. 8" ROOF DRAIN. ACCORDING TO BRAY ASSOCIATES DRAWING SP4 PROJECT #2029 DATED MARCH 29, 1995, 8" X 12" X 12" FITTING WAS TO BE PROVIDED TO CONNECT FROM 12" STORM SEWER TO 8" ROOF DRAIN.
16. ONE 2" CONDUIT STUBBED PAST BLACKTOP FOR FUTURE CATV OR TELEPHONE PER BRAY ASSOCIATES DRAWING SP4 PROJECT #2029 DATED MARCH 29, 1995.
17. EXISTING 15" STORM SEWER PER BRAY ASSOCIATES DRAWING P1 PROJECT #2027 DATED APRIL 1, 1995. SHOWN ON PER PLOT PLAN BY LAWRENCE BRAY & ASSOCIATES, JOB NO. 225, SHEET NO. P-1,DATED MARCH 28, 1968.
18. EXISTING 6" SANITARY SEWER PER PER BRAY ASSOCIATES DRAWING P1 PROJECT #2027 DATED APRIL 1, 1995. STRUCTURE SHOWN ON PLANS NOT LOCATED IN FIELD.
19. 10" STORM LATERAL PER PLOT PLAN BY LAWRENCE BRAY & ASSOCIATES, JOB NO. 225, SHEET NO. P-1 DATED MARCH 28, 1968.
20. 4" WATERMAIN SERVICE PER PLOT PLAN BY LAWRENCE BRAY & ASSOCIATES, JOB NO. 225, SHEET NO. P-1 DATED MARCH 28, 1968.

SURVEY CONTROL POINTS

COORDINATE SYSTEM BASED ON: NAD83 (2011) WITH WAUPACA COUNTY COORDINATES USING WISCORS

CP #8 - CP SPIKE N: 379180.313 E: 581787.843 Z: 865.026	CP #11 - CP SPIKE N: 378994.460 E: 582235.884 Z: 868.820	CP #15 - CP SPIKE N: 378714.600 E: 581736.206 Z: 875.117	CP #18 - CP SPIKE N: 378390.120 E: 582797.579 Z: 885.879	CP #21 - CP SPIKE N: 378252.479 E: 583331.659 Z: 891.878
CP #9 - CP SPIKE N: 379169.026 E: 582088.972 Z: 864.664	CP #12 - CP SPIKE N: 378727.081 E: 582143.708 Z: 873.817	CP #16 - CP SPIKE N: 378927.144 E: 581630.457 Z: 870.343	CP #19 - CP SPIKE N: 378689.730 E: 583049.114 Z: 897.276	CP #22 - CP SPIKE N: 378138.212 E: 582979.949 Z: 887.414
CP #10 - CP SPIKE N: 379003.98 E: 581382.071 Z: 860.830	CP #13 - CP MAG N: 379083.665 E: 582661.619 Z: 876.813	CP #17 - CP SPIKE N: 379281.123 E: 582622.985 Z: 869.597	CP #20 - CP SPIKE N: 378437.435 E: 583343.286 Z: 892.780	CP #23 - CP SPIKE N: 378310.495 E: 582777.641 Z: 886.383

BENCH MARK

ELEVATIONS BASED ON NAVD 88 USING WISGEOID 12A:

BENCHMARK #1
BURY BOLT ON HYDRANT LOCATED NORTH OF JUNIOR/SENIOR HIGH SCHOOL BUILDING AND SOUTH OF SOUTH BACK OF CURB BY ADMINISTRATION PARKING LOT
ELEVATION: 871.95'

BENCHMARK #2
BURY BOLT ON HYDRANT LOCATED SOUTHWESTERLY OF THE FAR SOUTHWEST UNOCCUPIED BUILDING CORNER.
ELEVATION: 867.99'

BENCHMARK #3
BURY BOLT ON HYDRANT LOCATED BY EAST BACK OF CURB OF SCHOOL DRIVEWAY AND THE WEST DOWNSLOPE FROM YOUTH SOFTBALL DIAMOND.
ELEVATION: 873.11'

BENCHMARK #4
NORTH BOLT ARROWHEAD ON HYDRANT LOCATED SOUTHWEST OF STAIRWELL TO JUNIOR/SENIOR HIGH SCHOOL BUILDING BASEMENT.
ELEVATION: 870.53'

BENCHMARK #5
BURY BOLT ON HYDRANT LOCATED OFF NORTH BACK OF CURB OF 4TH STREET AND NORTH OF RETENTION POND IN FRONT OF JUNIOR/SENIOR HIGH SCHOOL BUILDING.
ELEVATION: 853.02'

BENCHMARK #6
BURY BOLT ON HYDRANT LOCATED BY NORTHWEST CORNER OF SIDEWALK RAMP AND SOUTHWEST CORNER OF 4TH AND BEECH STREET INTERSECTION.
ELEVATION: 871.75'

ELEVATIONS BASED ON NAVD 88 USING WISGEOID 12A:

BENCHMARK #7
BURY BOLT ON HYDRANT LOCATED OFF EAST BACK OF CURB OF BEECH STREET AND NORTH OF NORTHERNMOST ELEMENTARY SCHOOL ASPHALT DRIVEWAY.
ELEVATION: 884.80'

BENCHMARK #8
BURY BOLT ON HYDRANT LOCATED OFF EAST BACK OF CURB OF BEECH STREET AND SOUTHWEST OF MAIN ELEMENTARY SCHOOL ASPHALT PARKING LOT.
ELEVATION: 887.46'

BENCHMARK #9
BURY BOLT ON HYDRANT LOCATED OFF NORTH EDGE OF ASPHALT SURFACE AND NORTHERLY OF NORTH ELEMENTARY SCHOOL BUILDING FACE.
ELEVATION: 887.08'

BENCHMARK #10
BURY BOLT ON HYDRANT LOCATED NORTHERLY OF ELEMENTARY SCHOOL PLAYGROUND AREA.
ELEVATION: 887.80'

BENCHMARK #11
BURY BOLT ON HYDRANT LOCATED SOUTH OF GRAVEL WALKING PATH AND SOUTH OF ELEMENTARY SCHOOL OFF EAST BACK OF CURB OF BEECH STREET.
ELEVATION: 884.77'

UNDERGROUND UTILITIES

THESE RECORD DRAWINGS HAVE BEEN PREPARED IN PART, ON THE BASIS OF INFORMATION COMPILED AND FURNISHED BY OTHERS. THE SURVEYOR AND ARCHITECT WILL NOT BE HELD RESPONSIBLE FOR ANY ERRORS OR OMISSIONS WHICH HAVE BEEN INCORPORATED INTO THIS DOCUMENT AS A RESULT.

PRIVATE UTILITIES HAVE BEEN LOCATED BY PRIVATE LINES, INC.

FIELD VERIFY SANITARY AND STORM SEWER PIPE SIZES AND THEIR LOCATIONS.

UNDERGROUND UTILITIES SHOWN ON THIS MAP ARE BASED IN PART ON MARKINGS BY DIGGERS HOTLINE. (TICKET #20184501004, #20184501027, #20184501073, #20184501110, #20184501134, #20184501187, #20184501200.)

DESCRIPTION

PART OF THE NORTHEAST QUARTER OF THE NORTHWEST QUARTER AND PART OF THE NORTHWEST QUARTER OF THE NORTHEAST QUARTER OF SECTION 22, TOWNSHIP 23 NORTH, RANGE 13 EAST, CITY OF MANAWA, WAUPACA COUNTY, WISCONSIN.

N

0' 50' 100' 150'

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RETTLER corporation
3317 Business Park Drive, Stevens Point, WI 54482
Telephone: 715 - 341 - 2633, Fax: 715 - 341 - 0431
email: info @ rettler.com, website: www.rettler.com

MANAWA

MANAWA SCHOOL DISTRICT
MANAWA HIGH / MIDDLE SCHOOL
SITE ALTERATIONS
515 East 4th Street
Manawa, WI 54949-8664

MARK	DATE

ISSUED: 6-10-19
PROJECT NO: XXXXX
CAD DWG FILE:
DRAWN BY: RETTLER
CHECKED BY: RETTLER

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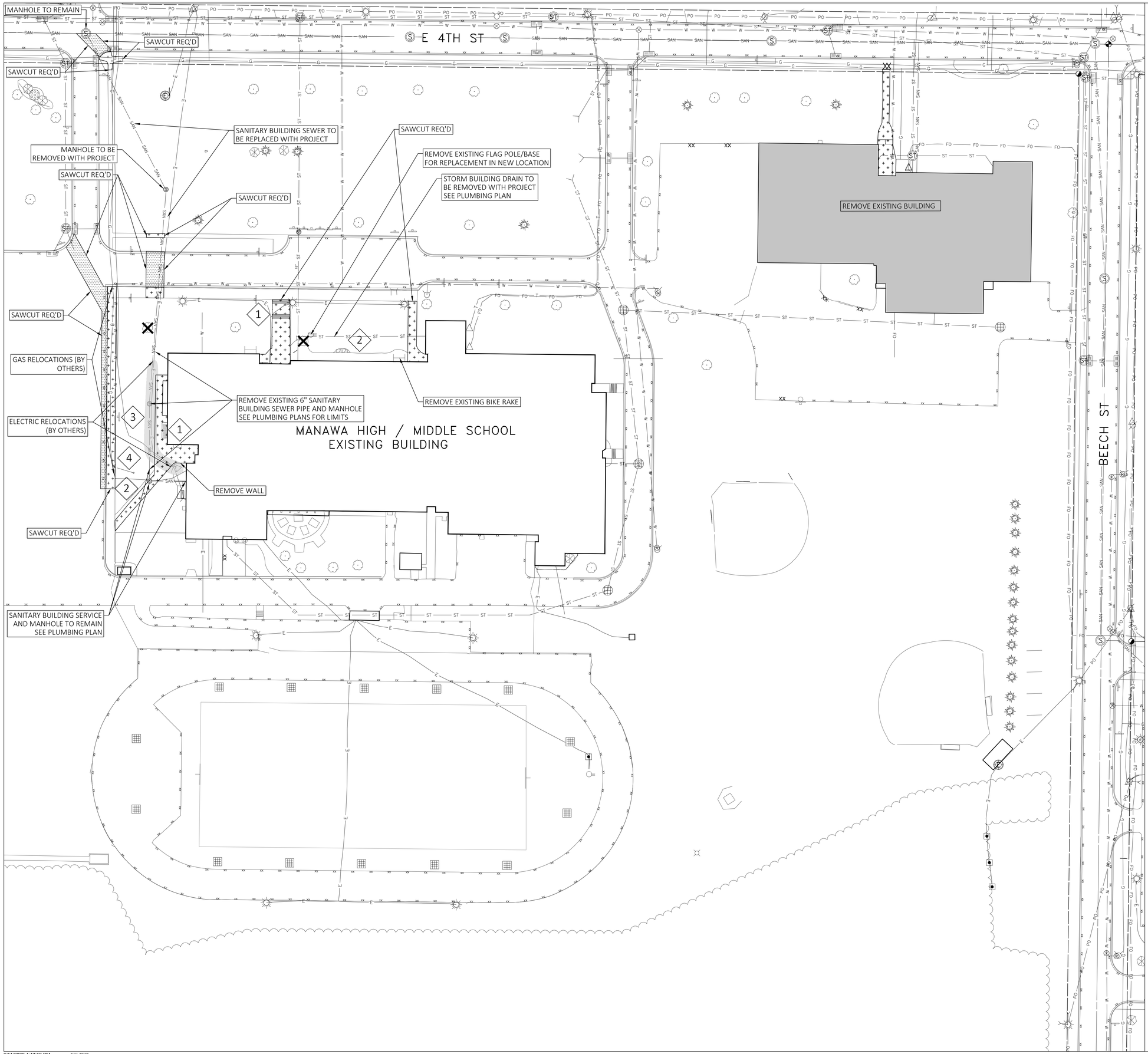
SHEET TITLE:
EXISTING CONDITIONS SURVEY

SHEET NUMBER:
2-C-100



DEMOLITION NOTES:

A. ALL FIELD SURVEY, UTILITY, AND BASEMAPPING DATA PROVIDED BY OTHERS. GREMMER & ASSOCIATES IS NOT RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF THIS DATA. SEE EXISTING CONDITIONS SURVEY FOR MORE INFORMATION.

B. CLEARING AND GRUBBING TO BE APPROVED BY HOFFMAN PRIOR TO REMOVAL.

C. SIDEWALK REMOVALS IN AREAS WHERE ADJACENT SIDEWALK WILL REMAIN SHALL BE TO THE NEAREST APPROPRIATE EXISTING JOINT. EXISTING CONCRETE SIDEWALK REMOVAL LIMITS SHALL BE REVIEWED AND APPROVED BY HOFFMAN PRIOR TO ANY REMOVALS. CONTRACTOR SHALL PROTECT AND PRESERVE ALL CONCRETE AREAS REMAINING.

D. PROTECT AND PRESERVE EXISTING TREES TO REMAIN.

E. SEE GEOTECHNICAL ENGINEERING SERVICES REPORT FOR EXISTING PAVEMENT AND BASE THICKNESSES.

F. FLAG POLE WILL BE SALVAGED FOR NEW LOCATION, PROTECT AND PRESERVE.

LEGEND (DEMO PLAN):

- REMOVE ASPHALT PAVEMENT AND CONCRETE CURB AND GUTTER
- REMOVE BUILDING STRUCTURE
- REMOVE CONCRETE PAVEMENT
- CLEARING AND GRUBBING

KEYNOTES (DEMO PLAN):

1. REMOVE CONCRETE STEPS AND RAILING
2. REMOVE PLANTER / LANDSCAPING
3. REMOVE SIGN
4. ADJUST HYDRANT ELEVATION, IF REQUIRED, TO MATCH PROPOSED GRASS SLOPE

0 40 80
SCALE: 1" = 40'
(30"x42" SHEET)

N

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WI
PROFESSIONAL ENGINEER

6/10/2019

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MANAWA SCHOOL DISTRICT
MANAWA HIGH / MIDDLE SCHOOL
SITE ALTERATIONS
515 East 4th Street
Manawa, WI 54949-9864

MARK	DATE

ISSUED: 6-10-19
PROJECT NO: XXXXX
CAD DWG FILE:
DRAWN BY: DLG
CHECKED BY: DDK

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SHEET TITLE:
SITE DEMOLITION PLAN

SHEET NUMBER:
2-C-101

CONNECT TO EXISTING MANHOLE.
MATCH EXISTING INV = 839.50 (FIELD VERIFY)

24" CONCRETE CURB AND GUTTER TYPE D

INLETS TO REMAIN FIELD VERIFY

SANITARY CLEAN OUT

45° BEND

SANITARY CLEAN OUT

ABANDON EXISTING SANITARY BUILDING SERVICE. PLUG ALL ENDS

405 LF 6" SAN BS
1.05% SLOPE MIN.
7.5' COVER MIN.
(FIELD FIT)

CONCRETE SIDEWALK / STEPS ENTRANCE
(NORTH BUILDING ADDITION)
SEE DETAILS

SANITARY CLEAN OUT

MATCH EX

30" CONCRETE CURB AND GUTTER TYPE D

MATCH EXISTING

MATCH EXISTING

SANITARY CLEAN OUT

PROPOSED FLAG POLE / BASE

CONCRETE SIDEWALK/RAMP

30" CONCRETE CURB AND GUTTER TYPE D

INV = SEE PLUMBING PLAN

CONCRETE STOOP

CONCRETE SIDEWALK / STEPS ENTRANCE
(WEST BUILDING ADDITION - NORTH)
SEE DETAILS

CONCRETE STOOP

PROPOSED BUILDING ADDITION

PROPOSED BUILDING ADDITION

MANAWA HIGH/MIDDLE SCHOOL
EXISTING BUILDING

CONCRETE SIDEWALK/ RAMP

MATCH EX

18" MOW STRIP

CONCRETE SIDEWALK / RAMP / STEPS / WALLS ENTRANCE
(WEST BUILDING ADDITION - SOUTH)
SEE DETAILS

15 100 46 98 37 20 4.5 15 35.0 33 20 4' 9.75' 196.4 12.0 27.3 10 27.3 9.3 6.0 6.3 13.6 7:0

SITE NOTES:

A. ALL FIELD SURVEY, UTILITY, AND BASEMAPPING DATA PROVIDED BY OTHERS. GREMMER & ASSOCIATES IS NOT RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF THIS DATA. SEE EXISTING CONDITIONS SURVEY FOR MORE INFORMATION.

B. SEE ARCHITECTURAL PLANS FOR MORE INFORMATION AND DETAILS ON CONCRETE STEPS, RAILING AND CONCRETE WALLS.

C. SEE PLUMBING PLAN FOR MORE INFORMATION AND DETAILS ON SANITARY BUILDING SERVICE AND STORM SEWER BUILDING DRAINS.

D. ALL WORK PERFORMED WITHIN THE RIGHT-OF-WAY SHALL CONFORM TO CITY OF MANAWA REQUIREMENTS

E. SEE ARCHITECTURAL PLANS FOR FLAG POLE BASE AND ELECTRICAL PLAN FOR LIGHTING.

LEGEND (SITE PLAN):

BUILDING ADDITION

4" CONCRETE SIDEWALK
(UNLESS NOTED OTHERWISE)

PAVEMENT RESTORATION
3.5" HMA PAVEMENT
- 1.75" UPPER LAYER 4LT58-28S (12.5MM)
- 1.75" LOWER LAYER 4LT58-28S (12.5MM)
10" BASE AGGREGATE DENSE 1 1/4-INCH

SCALE: 1" = 20'
(30"x42" SHEET)

N

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6/10/2019

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MANAWA

MANAWA SCHOOL DISTRICT
MANAWA HIGH / MIDDLE SCHOOL
SITE ALTERATIONS
515 East 4th Street
Manawa, WI 54949-8664

MARK	DATE
ISSUED:	6-10-19

PROJECT NO: XXXXX
CAD DWG FILE:
DRAWN BY: DLG
CHECKED BY: DDK

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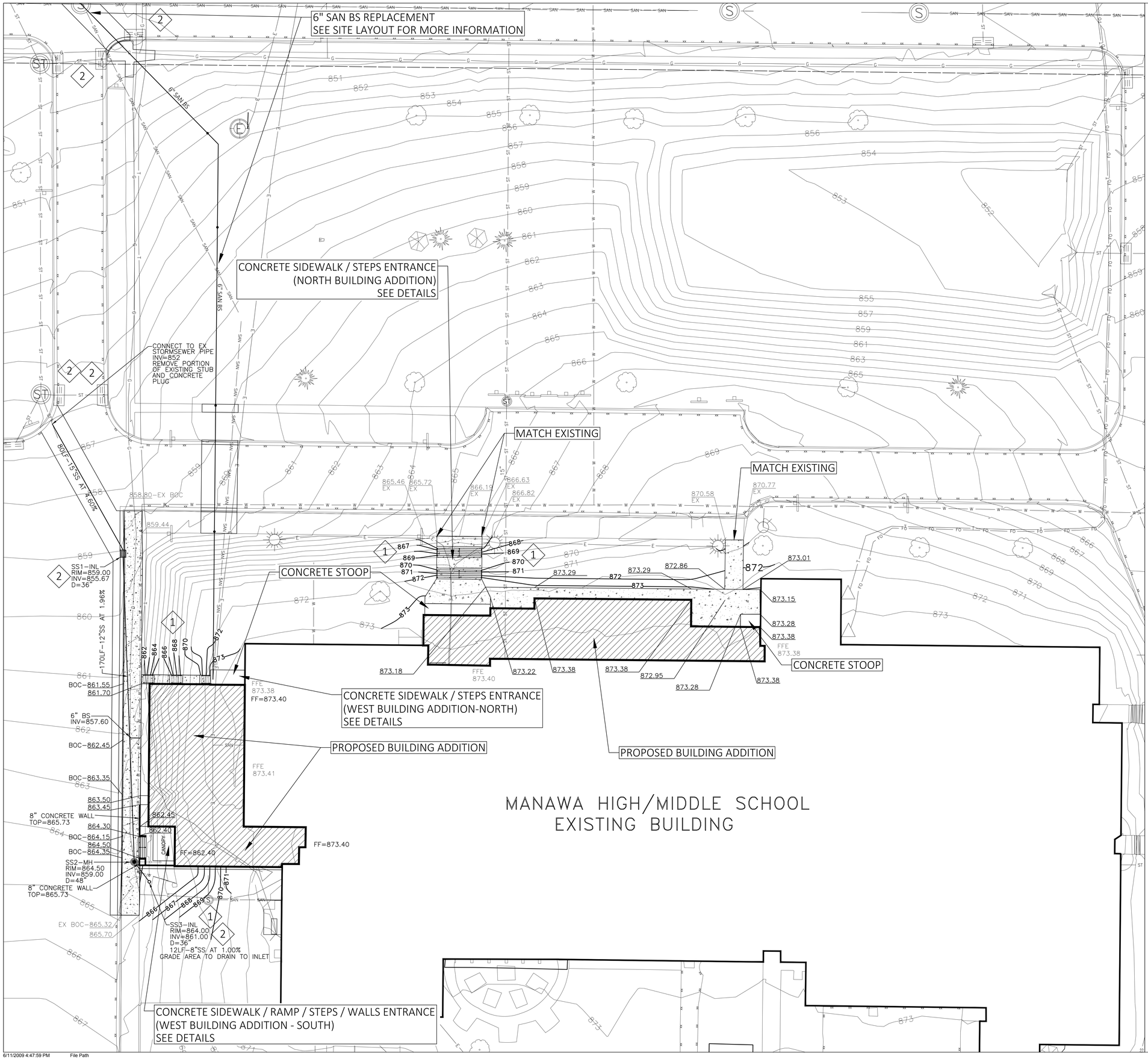
SHEET TITLE:
SITE LAYOUT

SHEET NUMBER:
2-C-102



GRADING NOTES:

A. ALL FIELD SURVEY, UTILITY, AND BASEMAPPING DATA PROVIDED BY OTHERS. GREMMER & ASSOCIATES IS NOT RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF THIS DATA. SEE EXISTING CONDITIONS SURVEY FOR MORE INFORMATION.

B. ALL GRASS SLOPES ARE 4:1 OR FLATTER, UNLESS NOTED.

C. CONTACT DIGGERS BEFORE EXCAVATING (811 OR 1-800-242-8511).

D. ALL SPOT ELEVATIONS ARE TO FINISHED GRADE

E. ALL PROPOSED SIDEWALK SHALL HAVE A 1.5% CROSS SLOPE, TYP.

F. SEE ARCHITECTURAL PLANS FOR MORE INFORMATION AND DETAILS ON CONCRETE STEPS, RAILING AND CONCRETE WALLS.

G. SEE PLUMBING PLAN FOR BUILDING STORM SEWER DRAINAGE AND STORM SEWER DRAINAGE IN THE WEST ADDITION STEPS / CANOPY AREA.

H. ALL WORK PERFORMED WITHIN THE RIGHT-OF-WAY SHALL CONFORM TO CITY OF MANAWA REQUIREMENTS

LEGEND (GRADING PLAN):

889.60 PROPOSED SPOT ELEVATION

890 PROPOSED CONTOUR

PROPOSED 2X3-FT INLET

PROPOSED 3-FT MANHOLE

EROSION CONTROL NOTES:

A. ALL EROSION CONTROL ITEMS SHALL BE INSTALLED IN ACCORDANCE WITH WDNR - TECHNICAL STANDARDS. ALL EROSION CONTROL MATERIALS SHALL BE ON WDOT PAL LIST.

B. ALL AREAS DISTURBED BY CONSTRUCTION AND OUTSIDE PROPOSED PAVEMENT AREAS SHALL RECEIVE 6" TOPSOIL, SEED, FERTILIZER, AND MULCH (UNLESS NOTED AS EROSION MAT)

C. ANY SEDIMENTS FROM EROSION OR TRACKING THAT ENTERS PROPERTY NOT OWNED BY THE PROJECT OWNER SHALL BE COMPLETELY REMOVED/CLEANED UP WITHIN 24 HOURS OF THE OCCURRENCE.

D. STOCKPILES SHALL BE LOCATED WITHIN THE SITE TO PREVENT ANY EROSION OR SEDIMENTS LEAVING THE PROPERTY.

EROSION CONTROL KEYNOTES:

1 EROSION MAT CLASS I TYPE B

2 INLET PROTECTION TYPE C, SEE DETAIL

0 20 40

SCALE: 1" = 20'
(30"x42" SHEET)

N

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MANAWA

MANAWA SCHOOL DISTRICT
MANAWA HIGH / MIDDLE SCHOOL
SITE ALTERATIONS
515 East 4th Street
Manawa, WI 54949-8664

MARK	DATE

ISSUED: 6-10-19
PROJECT NO: XXXXX
CAD DWG FILE:
DRAWN BY: DLG
CHECKED BY: DDK

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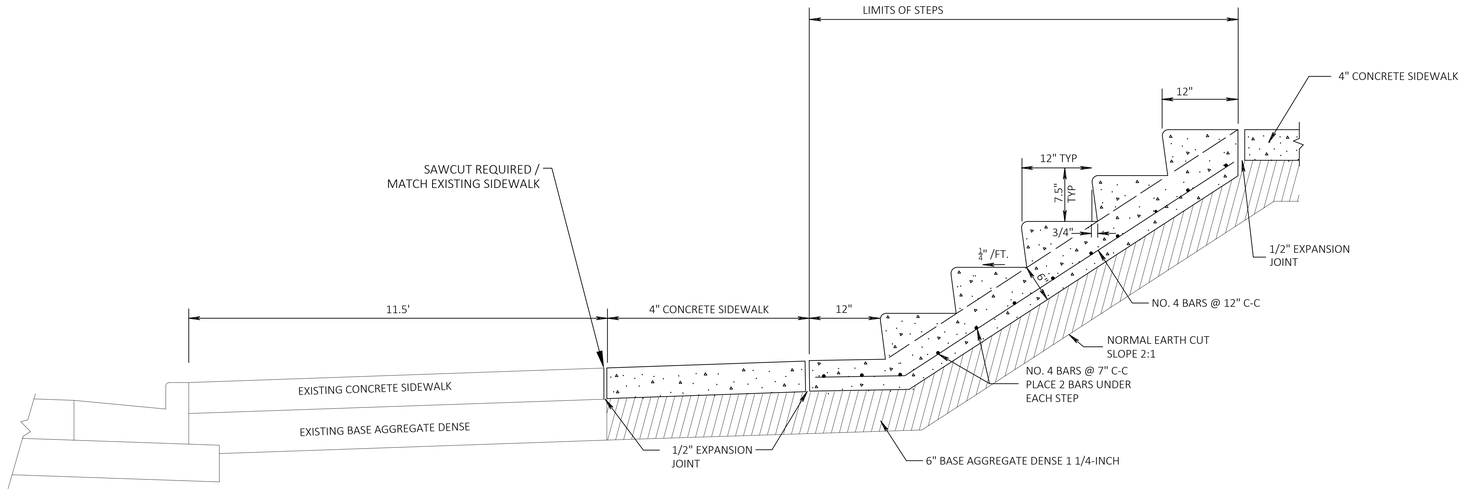
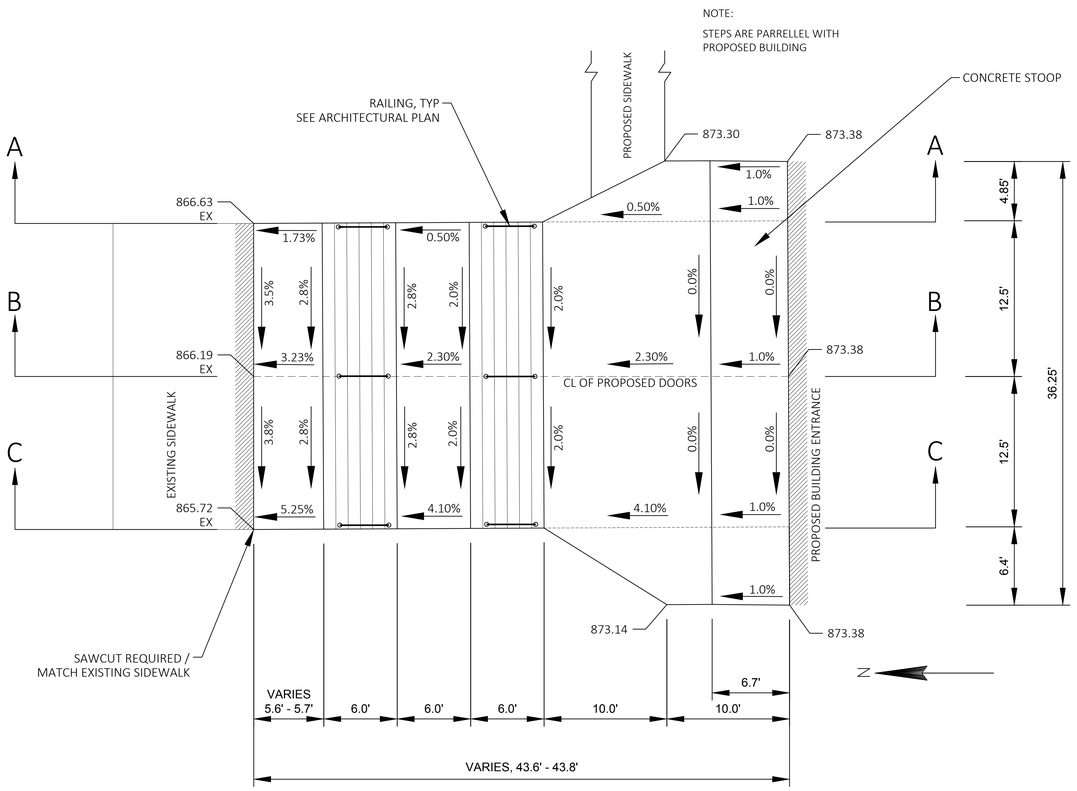
SHEET TITLE:
SITE GRADING / DRAINAGE / EROSION CONTROL PLAN

SHEET NUMBER:
2-C-103

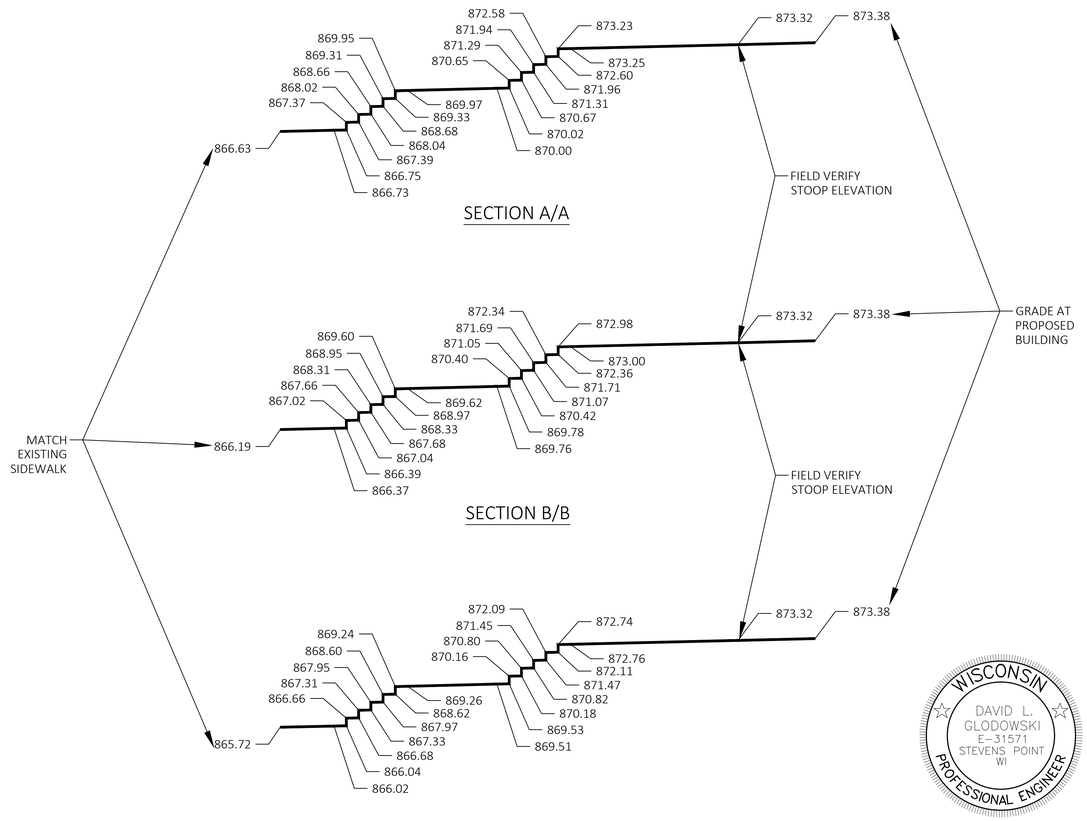
SEE ARCHITECTURAL PLAN FOR RAILING DETAIL



CONCRETE STEPS DETAIL
(NUMBER OF STEPS VARIES)



PLAN VIEW
CONCRETE SIDEWALK / STEPS ENTRANCE DETAIL (NORTH BUILDING ADDITION)



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MANAWA SCHOOL DISTRICT
MANAWA HIGH / MIDDLE SCHOOL
SITE ALTERATIONS
515 East 4th Street
Manawa, WI 54949-8664

MARK	
ISSUED:	6-10-19
PROJECT NO:	XXXXX
CAD DWG FILE:	
DRAWN BY:	DLG
CHECKED BY:	DDK

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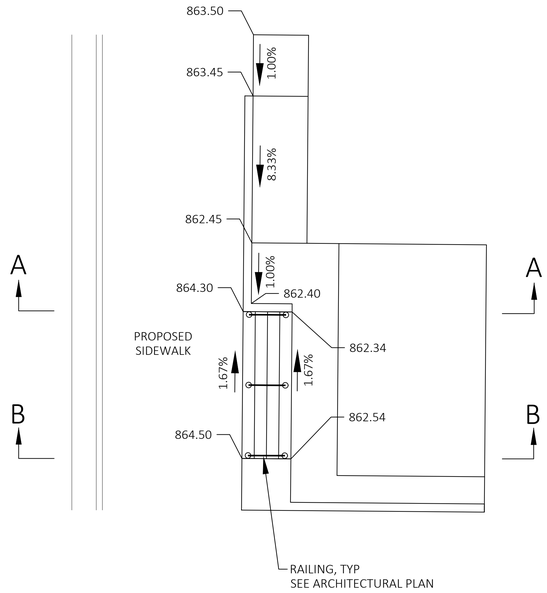
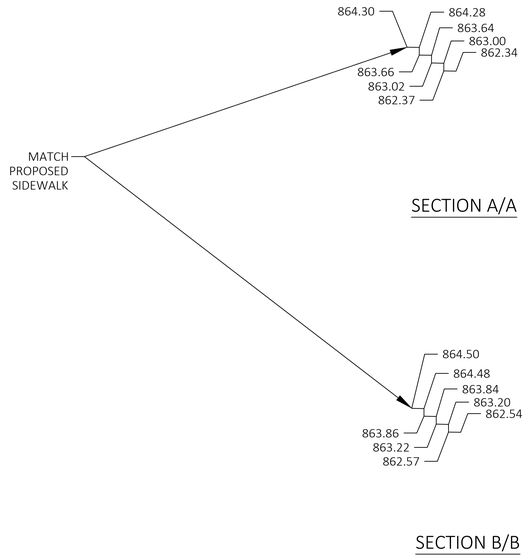
SHEET TITLE:
SITE DETAILS

SHEET NUMBER:
2-C-104



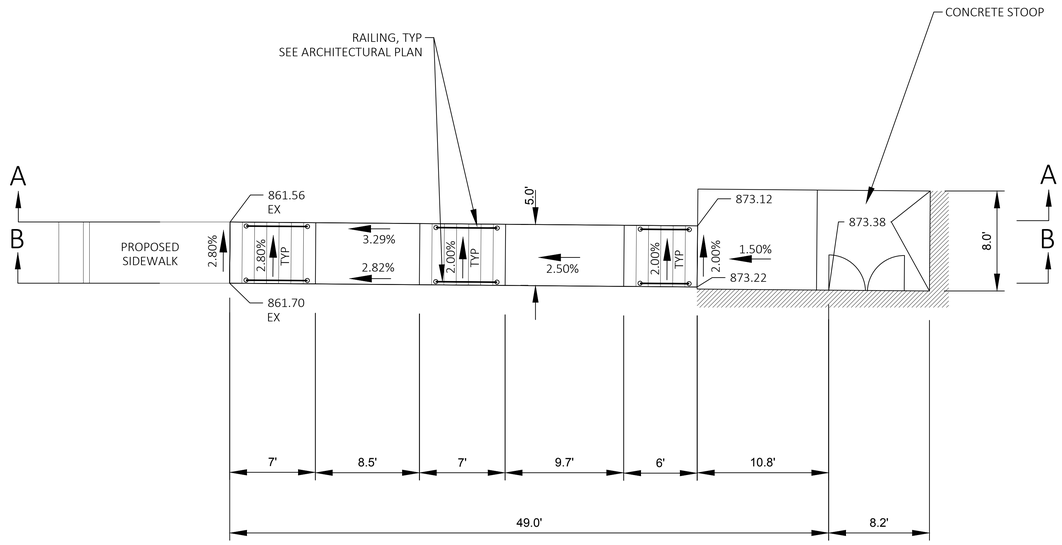
PLAN VIEW

CONCRETE SIDEWALK / STEPS / WALLS ENTRANCE DETAIL (WEST BUILDING ADDITION - SOUTH)



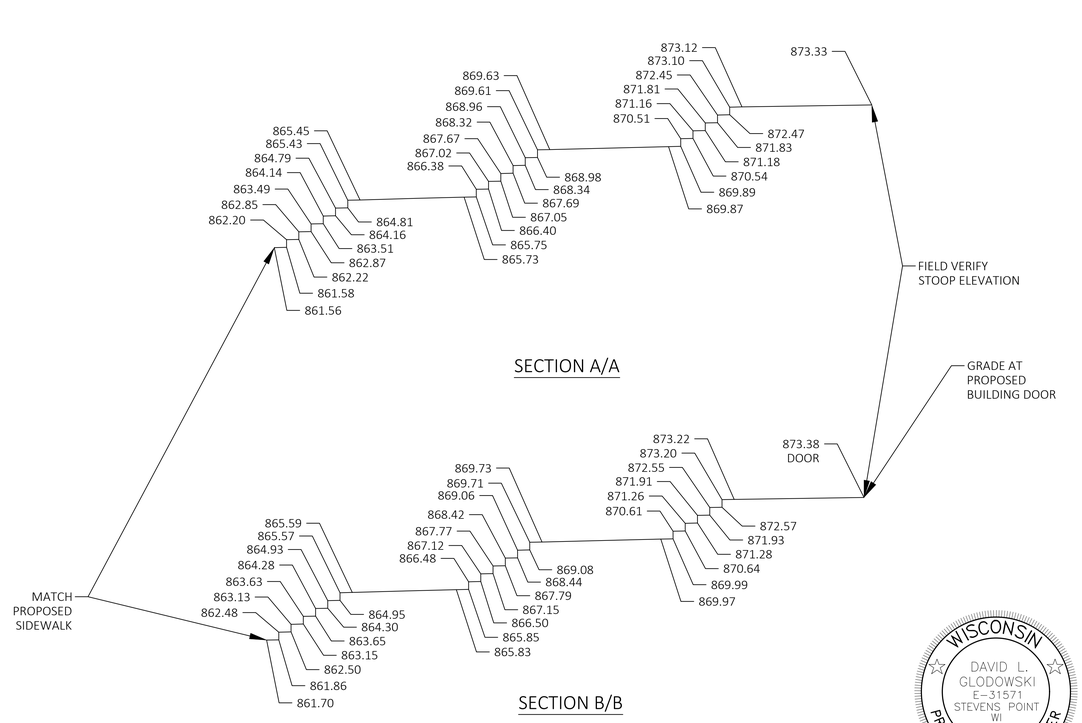
NOTE:

STEPS ARE PARRELLEL WITH
PROPOSED BUILDING



PLAN VIEW

CONCRETE SIDEWALK / STEPS ENTRANCE DETAIL (WEST BUILDING ADDITION - NORTH)



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MANAWA SCHOOL DISTRICT
MANAWA HIGH / MIDDLE SCHOOL
SITE ALTERATIONS
515 East 4th Street
Manawa, WI 54949-8664

MARK	
ISSUED:	6-10-19

PROJECT NO: XXXXX

CAD DWG FILE:

DRAWN BY: DLG

CHECKED BY: DDK

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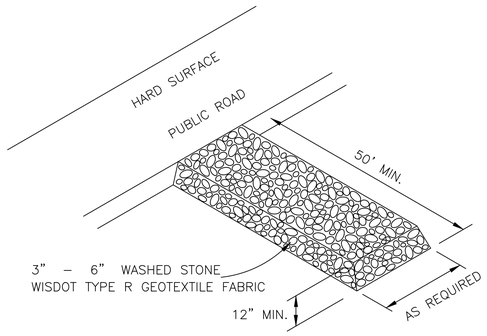
SHEET TITLE:
SITE DETAILS

SHEET NUMBER:
2-C-105

NOTES:

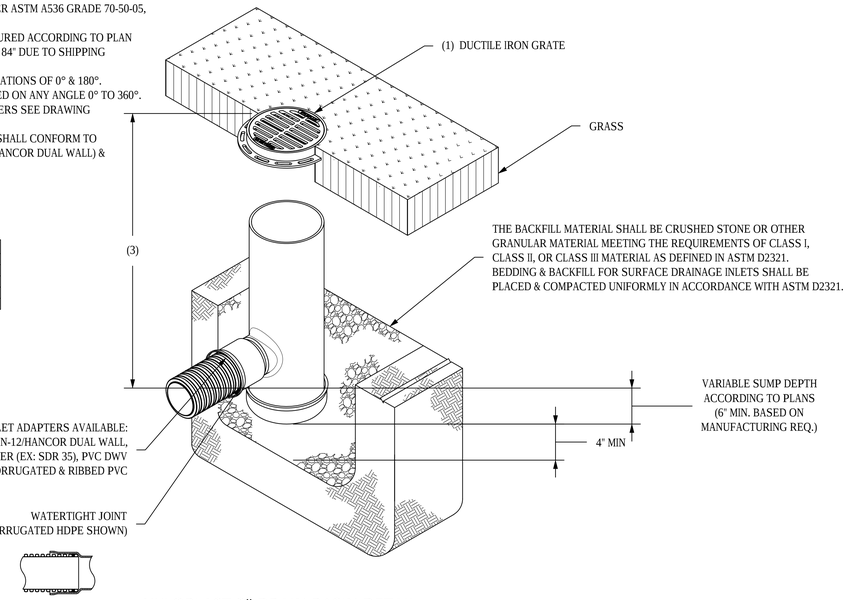
1. VEHICLE TRACKING PAD SHALL BE LOCATED AT EVERY ENTRANCE/EXIT TO THE CONSTRUCTION SITE.
2. VEHICLE TRACKING MAT SHALL BE MAINTAINED AS NEEDED TO PREVENT ANY MATERIAL FROM BEING TRACKED ONTO CITY STREET.
3. SEDIMENT AND OTHER MATERIAL SPILLED, DROPPED OR TRACKED ONTO CITY STREET SHALL BE IMMEDIATELY REMOVED.



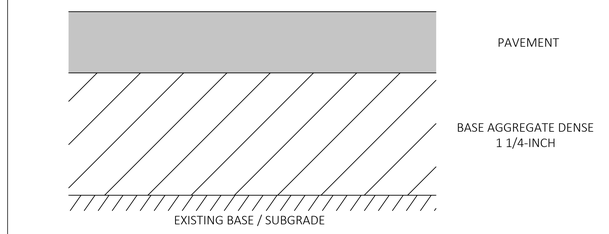
TRACKING PAD DETAIL

1 - GRATES/SOLID COVER SHALL BE DUCTILE IRON PER ASTM A536 GRADE 70-50-05, WITH THE EXCEPTION OF THE BRONZE GRATE.
2 - CUSTOM DRAIN BASIN TO BE CUSTOM MANUFACTURED ACCORDING TO PLAN DETAILS. RISERS ARE NEEDED FOR BASINS OVER 84" DUE TO SHIPPING RESTRICTIONS. SEE DRAWING NO. 7001-110-065.
3 - STANDARD DRAIN BASIN HAS FIXED ADAPTER LOCATIONS OF 0° & 180°. CUSTOM DRAIN BASIN ADAPTERS CAN BE MOUNTED ON ANY ANGLE 0° TO 360°. TO DETERMINE MINIMUM ANGLE BETWEEN ADAPTERS SEE DRAWING NO. 7001-110-012.
4 - DRAINAGE CONNECTION STUB JOINT TIGHTNESS SHALL CONFORM TO ASTM D3212 FOR CORRUGATED HDPE (ADS N-12/HANCOR DUAL WALL) & PVC SEWER (4" - 24").

GRATE OPTIONS	LOAD RATING	PART #
STANDARD	LIGHT DUTY	0899CGSF
SOLID COVER	LIGHT DUTY	0899CGCF
BRONZE	N/A	0899CGBF
DOME	N/A	0899CGDF
DROP IN GRATE	LIGHT DUTY	0801DI

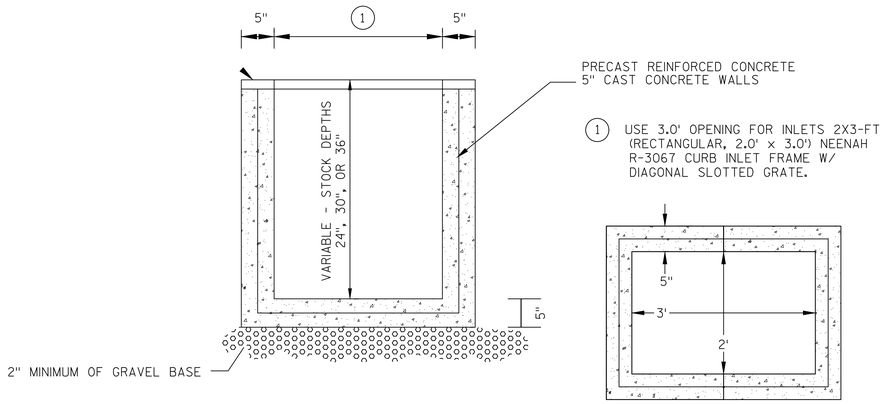


NYLOPLAST 8" DRAIN BASIN DETAIL

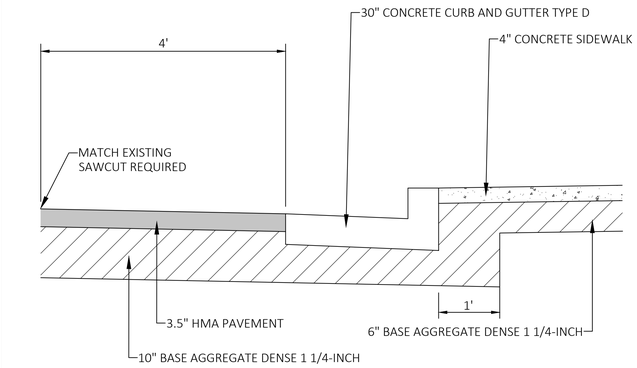


PAVEMENT AREA	PAVEMENT STRUCTURE*
PARKING / PARENT DROP-OFF LOOP	3.5" HMA PAVEMENT - 1.75" UPPER LAYER 4LT58-28S (12.5 MM) - 1.75" LOWER LAYER 4LT58-28S (12.5MM) 10" BASE AGGREGATE DENSE 1 1/4-INCH
CONCRETE SIDEWALK	4" OR 6" CONCRETE SIDEWALK 6" BASE AGGREGATE DENSE 1 1/4-INCH

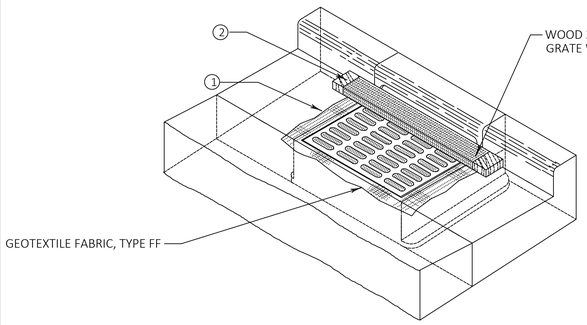
PAVEMENT STRUCTURES DETAIL



STORM SEWER INLET 2X3-FT DETAIL



PAVEMENT / CURB AND GUTTER RESTORATION DETAIL



GENERAL NOTES

FABRIC SHALL BE REPLACED AT THE ENGINEERS DISCRETION.

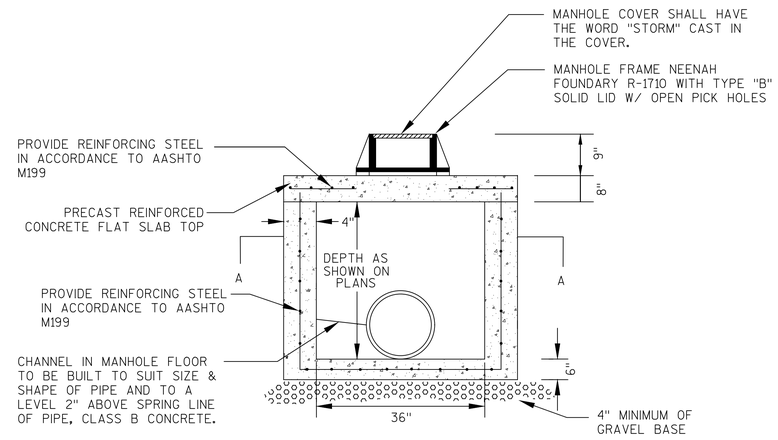
MANUFACTURED ALTERNATIVES APPROVED AND LISTED ON THE DEPARTMENT'S EROSION CONTROL PRODUCT ACCEPTIBILITY LIST MAY BE SUBSTITUTED FOR THE INLET PROTECTION TYPE SPECIFIED.

WHEN REMOVING OR MAINTAINING INLET PROTECTION, CARE SHALL BE TAKEN SO THAT THE SEDIMENT TRAPPED ON THE GEOTEXTILE FABRIC DOES NOT FALL INTO THE INLET. ANY MATERIAL FALLING INTO THE INLET SHALL BE REMOVED IMMEDIATELY.

(1) FABRIC SIZE SHALL BE 8" (MIN) GREATER ON ALL SIDES OF THE INLET COVER TO PROVIDE A HAND HOLD WHEN MAINTENANCE OR REMOVAL IS REQUIRED.

(2) FOR INLET PROTECTION, TYPE C, WITH A CURB BOX, AN ADDITIONAL 18" OF FABRIC IS WRAPPED AROUND THE WOOD AND SECURED WITH STAPLES. THE WOOD SHALL NOT BLOCK THE ENTIRE HEIGHT OF THE CURB BOX.

INLET PROTECTION TYPE C DETAIL



STORM SEWER MANHOLE 3-FT DIAMETER DETAIL

WISCONSIN
DAVID L. GLODOWSKI
E-31571
STEVENS POINT
WI
PROFESSIONAL ENGINEER

6/10/2019

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MANAWA SCHOOL DISTRICT
MANAWA HIGH / MIDDLE SCHOOL
SITE ALTERATIONS
515 East 4th Street
Manawa, WI 54949-8664

MARK	
ISSUED:	6-10-19
PROJECT NO:	XXXXX
CAD DWG FILE:	
DRAWN BY:	DLG
CHECKED BY:	DDK

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SHEET TITLE: SITE DETAILS

SHEET NUMBER: 2-C-106

MANAWA MIDDLE & HIGH SCHOOL
LARSON ENGINEERING, INC.
31180284.000

GENERAL

1. NO PROVISION OF ANY REFERENCED STANDARD SPECIFICATION OR CODE, WHETHER OR NOT SPECIFICALLY INCORPORATED BY REFERENCE IN THE CONTRACT DOCUMENTS, SHALL BE EFFECTIVE TO CHANGE THE DUTIES AND RESPONSIBILITIES OF THE OWNER, **ARCHITECT**, STRUCTURAL ENGINEER, CONTRACTOR OR ANY OF THEIR CONSULTANTS, AGENTS, OR EMPLOYEES FROM THOSE SET FORTH IN THE CONTRACT DOCUMENTS, NOR SHALL IT BE EFFECTIVE TO ASSIGN TO STRUCTURAL ENGINEER OR ANY OF STRUCTURAL ENGINEER'S CONSULTANTS, AGENTS, OR EMPLOYEES ANY DUTY OR AUTHORITY TO SUPERVISE OR DIRECT THE FURNISHING OR PERFORMANCE OF THE WORK OR ANY DUTY OR AUTHORITY TO UNDERTAKE RESPONSIBILITIES CONTRARY TO THE PROVISIONS OF THE CONTRACT DOCUMENTS.

2. REFERENCE TO STANDARD SPECIFICATIONS OR CODES OF ANY TECHNICAL SOCIETY, ORGANIZATION, OR ASSOCIATION OR TO CODES OF LOCAL OR STATE AUTHORITIES SHALL MEAN THE STANDARDS IN EFFECT AS OF THE DATE OF THE CONTRACT DOCUMENTS, UNLESS OTHERWISE NOTED.

3. CONTRACT DOCUMENTS INCLUDE, BUT ARE NOT LIMITED TO, THE STRUCTURAL DOCUMENTS (DRAWINGS AND SPECIFICATIONS), BUT DO NOT INCLUDE SHOP DRAWINGS, VENDOR DRAWINGS, OR MATERIAL PREPARED AND SUBMITTED BY THE CONTRACTOR.

4. CONTRACT DOCUMENTS SHALL GOVERN IN THE EVENT OF A CONFLICT WITH STANDARD SPECIFICATIONS OF ANY TECHNICAL SOCIETY, ORGANIZATION, OR ASSOCIATION. WHERE A CONFLICT OCCURS WITHIN THE CONTRACT DOCUMENTS, THE STRICTEST REQUIREMENT SHALL GOVERN.

5. ALL OMISSIONS AND CONFLICTS WITHIN THE CONTRACT DOCUMENTS SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER OF RECORD PRIOR TO PROCEEDING WITH THE WORK. WHEN THIS PROCEDURE IS NOT FOLLOWED, THE CONTRACTOR WILL BE RESPONSIBLE FOR CORRECTING IN-PLACE WORK WHEN THE ENGINEER DETERMINES THAT WORK TO BE INADEQUATE.

6. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL COORDINATION RELATED TO ALL CONTRACTOR FURNISHED EQUIPMENT AND/OR COMPONENTS.

7. **SEE DOCUMENTS FROM OTHER DISCIPLINES FOR FLOOR, WALL, AND ROOF OPENINGS, TRENCHES, PITS, PIPE SLEEVES, EQUIPMENT PADS, METAL PAN STAIRS, AND MISCELLANEOUS IRON, ETC.**

8. LARSON ENGINEERING, INC. SHALL NOT BE RESPONSIBLE FOR CONTRACTOR'S SCHEDULE OR FAILURES TO CARRY OUT ANY CONSTRUCTION ACTIVITIES IN ACCORDANCE WITH THE CONTRACT DOCUMENTS. LARSON ENGINEERING, INC. SHALL NOT HAVE CONTROL OVER OR CHARGE OF ACTIONS OF CONTRACTOR, SUB-CONTRACTOR, OR ANY OF THEIR AGENTS, OR EMPLOYEES, OR ANY OTHER PERSONS PERFORMING PORTIONS OF ANY CONSTRUCTION ACTIVITIES.

9. CONTRACTOR AGREES THAT CONTRACTOR SHALL ASSUME SOLE AND COMPLETE RESPONSIBILITY FOR THE JOB SITE CONDITIONS DURING THE COURSE OF THE WORK, INCLUDING SAFETY OF ALL PERSONS AND PROPERTY; THAT THIS REQUIREMENT SHALL APPLY CONTINUOUSLY AND NOT BE LIMITED TO NORMAL WORKING HOURS; AND THAT CONTRACTOR SHALL DEFEND, INDEMNIFY AND HOLD OWNER AND STRUCTURAL ENGINEER HARMLESS FROM ANY AND ALL LIABILITY, REAL OR ALLEGED,IN CONNECTION WITH THE PERFORMANCE OF THE WORK ON THIS PROJECT, EXCEPTING FOR LIABILITY ARISING FROM THE SOLE NEGLIGENCE OF OWNER OR STRUCTURAL ENGINEER.

10. CONTRACTOR SHALL VERIFY DIMENSIONS AND CONDITIONS AT THE JOB SITE. ANY DISCREPANCIES BETWEEN THE CONDITIONS FOUND AND THOSE INDICATED IN THE CONTRACT DOCUMENTS SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER OF RECORD PRIOR TO PROCEEDING WITH THE WORK.

11. THE STRUCTURE IS STABLE ONLY IN ITS COMPLETED FORM. TEMPORARY SUPPORTS REQUIRED FOR STABILITY OF THE STRUCTURE DURING ALL INTERMEDIATE STAGES OF CONSTRUCTION SHALL BE DESIGNED AND PROVIDED BY THE CONTRACTOR.

12. CONTRACTOR HAS SOLE RESPONSIBILITY FOR MEANS, METHODS, TECHNIQUES, SEQUENCES, AND PROCEDURES OF CONSTRUCTION. CONTRACTOR SHALL PROVIDE ALL MEASURES NECESSARY TO ADEQUATELY PROTECT THE STRUCTURE DURING CONSTRUCTION. SUCH MEASURES SHALL INCLUDE, BUT NOT BE LIMITED TO: BRACING, SHORING FOR LOADS DUE TO CONSTRUCTION EQUIPMENT, TEMPORARY STRUCTURES, AND PARTIALLY COMPLETED WORK. OBSERVATION VISITS TO THE SITE BY STRUCTURAL ENGINEER SHALL NOT INCLUDE INSPECTION OF THE ABOVE ITEMS.

13. DETAILS LABELED "TYPICAL" ON THE STRUCTURAL DRAWINGS APPLY TO ALL SITUATIONS OCCURRING ON PROJECT THAT ARE THE SAME OR SIMILAR TO THOSE LOCATIONS SPECIFICALLY INDICATED. WHERE A DETAIL IS NOT INDICATED, THE DETAIL SHALL BE THE SAME AS FOR OTHER SIMILAR CONDITIONS.

14. DO NOT PLACE PIPES, DUCTS, CHASES, ETC. IN STRUCTURAL BEAM AND COLUMN MEMBERS. DO NOT CUT ANY STRUCTURAL MEMBER FOR PIPES, DUCTS, ETC., UNLESS NOTED OTHERWISE. NOTIFY STRUCTURAL ENGINEER WHEN DOCUMENTS BY OTHER DISCIPLINES SHOW OPENINGS, POCKETS, ETC. NOT INDICATED IN THE STRUCTURAL DRAWINGS BUT ARE LOCATED IN THE STRUCTURAL MEMBERS. CONTRACTOR SHALL OBTAIN PRIOR APPROVAL FROM STRUCTURAL ENGINEER FOR INSTALLATION OF SUCH PIPES, DUCTS, CHASES, ETC.

SUBMITTALS

1. REVIEW OF SUBMITTALS OR SHOP DRAWINGS BY THE ARCHITECT/STRUCTURAL ENGINEER DOES NOT RELIEVE THE CONTRACTOR OF THE SOLE RESPONSIBILITY TO REVIEW AND CHECK ALL SUBMITTALS AND SHOP DRAWINGS BEFORE SUBMITTING TO THE STRUCTURAL ENGINEER. CONTRACTOR REMAINS SOLELY RESPONSIBLE FOR ERRORS AND OMISSIONS ASSOCIATED WITH THE PREPARATION OF SHOP DRAWINGS AS THEY PERTAIN TO MEMBER SIZES, DETAILS, AND DIMENSIONS SPECIFIED IN THE CONTRACT DOCUMENTS.

2. ALL SUBMITTALS REVIEWED BY STRUCTURAL ENGINEER ARE REVIEWED FOR GENERAL CONFORMANCE WITH THE DESIGN CONCEPT OF THE PROJECT AND GENERAL COMPLIANCE WITH THE INFORMATION INCLUDED IN THE CONTRACT DOCUMENTS. ANY ACTION INDICATED IS SUBJECT TO THE REQUIREMENTS OF THE CONTRACT DOCUMENTS. CONTRACTOR IS RESPONSIBLE FOR CORRELATING PROCESSES AND TECHNIQUES OF CONSTRUCTION, AND COORDINATION OF THE WORK WITH THAT OF OTHER TRADES.

3. LARSON ENGINEERING, INC. ASSUMES NO RESPONSIBILITY FOR ANY MISUSE, MODIFICATION, OR MISREPRESENTATION OF ANY INFORMATION CONTAINED IN ANY ELECTRONIC MEDIA TRANSFERRED. LARSON ENGINEERING, INC. SHALL BE HELD HARMLESS FROM ANY AND ALL CLAIMS, SUITS, LIABILITY, DEMANDS, OR COSTS ARISING OUT OF, OR RESULTING FROM THE USE OF SAID DOCUMENT(S). UTILIZATION OF THE ELECTRONIC DOCUMENTS IS AT RECIPIENT'S OWN RISK.

4. CONTRACTOR SHALL VERIFY THE STRUCTURALLY SUPPORTED EQUIPMENT WEIGHTS, OPENING SIZES, AND LOCATIONS INDICATED ON THE STRUCTURAL DRAWINGS WITH DRAWINGS FROM OTHER DISCIPLINES AND NOTIFY STRUCTURAL ENGINEER OF ANY DISCREPANCIES.

5. CONTRACTOR SHALL SUBMIT SHOP DRAWINGS SHOWING SIZE, METHOD OF ANCHORAGE, WEIGHT, OPENINGS, AND LOCATIONS OF EQUIPMENT NOT INDICATED ON THE STRUCTURAL DRAWINGS PRIOR TO ORDERING FOR REVIEW BY STRUCTURAL ENGINEER TO DETERMINE ADEQUACY OF THE STRUCTURE.

6. CONTRACTOR DESIGNED ELEMENTS SHALL BE DESIGNED BY LICENSED PROFESSIONAL ENGINEERS REGISTERED IN THE STATE WHERE THE PROJECT IS LOCATED. CONTRACTOR SHALL SUBMIT SHOP DRAWINGS, DESIGN LOAD DATA, SUPPORT REACTIONS, AND CERTIFICATION THAT ELEMENTS WERE DESIGNED FOR LOADS SPECIFIED IN THE CONTRACT DOCUMENTS OR IN THE BUILDING CODE. ALL DOCUMENTS NOTED SHALL BE SEALED BY THE LICENSED ENGINEER. IF CRITERIA INDICATED ARE NOT SUFFICIENT, SUBMIT A WRITTEN REQUEST FOR ADDITIONAL INFORMATION TO THE ARCHITECT. THE FOLLOWING ELEMENTS AND THEIR CONNECTIONS SHALL BE CONTRACTOR DESIGNED:

- **TRUSSES; (COLD FORMED & WOOD)**
- **STRUCTURAL STEEL CONNECTIONS NOT DETAILED OR SHOWN ON THE DRAWINGS.**
- **STEEL JOIST & JOIST GIRDERS**
- **PRECAST ELEMENTS INCLUDING FLOOR PLANKS, WALL PANELS, AND COLUMNS**
- **STRUCTURAL COLD FORMED FRAMING INCLUDING EXTERIOR WALLS**

7. SUBMITTALS SHALL BE REVIEWED AND RETURNED WITHIN THE FOLLOWING PERIOD AFTER BEING RECEIVED BY THE ENGINEER:

- **STRUCTURAL STEEL** — **7 WORKING DAYS**
- **STEEL JOISTS** — **7 WORKING DAYS**
- **METAL DECK** — **7 WORKING DAYS**
- **REBAR** — **7 WORKING DAYS**
- **CONCRETE MIX DESIGNS** — **7 WORKING DAY**

DESIGN CRITERIA

1. CODE: **INTERNATIONAL BUILDING CODE 2015 WITH AMENDMENTS**

2. ROOF LIVE LOAD: (REDUCED AS ALLOWED BY THE BUILDING CODE) = **20** PSF

3. SNOW LOADS:

GROUND SNOW LOAD, Pg	= **##** PSF
EXPOSURE FACTOR, Ce	= **1.0**
THERMAL FACTOR, Ct	= **1.0**
IMPORTANCE FACTOR, Is	= **1.0**
FLAT ROOF SNOW LOAD, Pf	= **##** PSF

DRIFTING: PER ASCE 7, AS REQUIRED, SEE PLANS AND/OR CALCULATIONS

4. WIND LOADS:

BASIC WIND SPEED, Vult	= **115** MPH
RISK CATEGORY	= **II**
EXPOSURE CATEGORY:	= **C**
INTERNAL PRESSURE COEFFICIENT, Gcpi	= **± 0.18**

COMPONENTS AND CLADDING NOT DESIGNED BY THE ENGINEER OF RECORD SHALL BE DESIGNED FOR THE WIND PRESSURES LISTED BELOW. PRESSURES ARE BASED ON A TRIBUTARY AREA OF 10 SQUARE FEET. WIND PRESSURES FOR LARGER TRIBUTARY AREAS MAY BE USED BASED ON DELEGATED DESIGN CALCULATIONS.

WALLS:

MAIN AREA:		
	POSITIVE	= **##** PSF
	NEGATIVE	= **##** PSF
CORNERS:		
	POSITIVE	= **##** PSF
	NEGATIVE	= **##** PSF

ROOF:

MAIN AREA:		
	POSITIVE	= **##** PSF
	NEGATIVE	= **##** PSF
EDGES:		
	POSITIVE	= **##** PSF
	NEGATIVE	= **##** PSF
CORNERS:		
	POSITIVE	= **##** PSF
	NEGATIVE	= **##** PSF

6. SEISMIC LOADS:

RISK CATEGORY:	= **II**
IMPORTANCE FACTOR, Ie	= **1.0**
SITE CLASS:	= **D**
MAPPED SPECTRAL RESPONSE ACCELERATIONS	
Ss:	= **#.###**
S1:	= **#.###**
DESIGN SPECTRAL RESPONSE ACCELERATIONS	
SDS:	= **#.###**
SD1:	= **#.###**

SEISMIC DESIGN CATEGORY	= **D**
BASIC SEISMIC FORCE RESISTING SYSTEM:	**XXXXXXXXXXXXXXXXXX**
RESPONSE MODIFICATION FACTOR, R	= **#.#**
RESPONSE COEFFICIENT, Cs	= **#.#**
DESIGN BASE SHEAR	= **##** KIPS
ANALYSIS PROCEDURE:	EQUIVALENT LATERAL FORCE

FOUNDATIONS

1. ALL FOUNDATIONS SHALL BE SUPPORTED ON APPROVED EXISTING SUBGRADE OR APPROVED COMPACTED STRUCTURAL FILL HAVING A MINIMUM ALLOWABLE BEARING CAPACITY OF **2500 PSF** AS INDICATED IN THE **(GEOTECHNICAL ENGINEERING SERVICES REPORT)** AS PREPARED BY **(INTERTEK PSI)** DATED **MARCH 20, 2019**.

2. THE GEOTECHNICAL ENGINEER OR TESTING AGENCY SHALL CERTIFY THE BEARING CAPACITY AT THE TIME OF EXCAVATION PRIOR TO INSTALLATION OF FOUNDATIONS AND/OR BACKFILLING.

3. THE ENGINEER ASSUMES NO RESPONSIBILITY FOR THE VALIDITY OF THE SUBSURFACE CONDITIONS DESCRIBED IN THE DRAWINGS, SPECIFICATIONS, TEST BORINGS OR GEOTECHNICAL REPORTS. THIS DATA IS INCLUDED TO ASSIST THE CONTRACTOR DURING BIDDING AND SUBSEQUENT CONSTRUCTION, AND TO REPRESENT CONDITIONS ONLY AT SPECIFIC LOCATIONS AT THE PARTICULAR TIME THE OBSERVATIONS WERE MADE.

4. ALL EXTERIOR FOUNDATIONS SHALL BEAR ON APPROVED SUBGRADE AT MINIMUM DEPTH OF **4'-0"** BELOW ADJACENT FINISH EXTERIOR GRADE.

5. FOOTING ELEVATIONS SHOWN ON THE DRAWINGS REPRESENT ESTIMATED DEPTHS AND ARE NOT TO BE CONSTRUED AS LIMITING THE AMOUNT OF EXCAVATION REQUIRED TO REACH SUITABLE BEARING MATERIAL.

6. FOOTING ELEVATION CHANGES SHALL BE STEPPED AT A RATIO OF 1 VERTICAL TO 2 HORIZONTAL. MAXIMUM VERTICAL STEP SHALL BE **2'-0"** UNLESS NOTED OTHERWISE.

7. THE CONTRACTOR SHALL PROVIDE TEMPORARY SUPPORTS IN ALL EXCAVATIONS AS REQUIRED TO PREVENT HORIZONTAL MOVEMENT OR VERTICAL SETTLEMENT OF SURROUNDING SOIL AND/OR PROPERTY WHICH WILL ENDANGER LIVES OR PROPERTY.

8. THE CONTRACTOR SHALL PROVIDE CONTROL OF SURFACE AND SUBSURFACE WATER PROMPTLY TO INSURE THAT ALL FOUNDATION WORK IS PERFORMED IN A DRY CONDITION.

9. FOUNDATIONS SHALL NOT BE PLACED ON FROZEN SUBGRADE.

10. THE CONTRACTOR SHALL PROTECT IN-PLACE FOUNDATIONS AND SLABS-ON-GRADE FROM FROST PENETRATION UNTIL THE PROJECT IS COMPLETE.

11. WHERE FOUNDATION WALLS HAVE FILL ON BOTH SIDES, BACKFILLING SHALL BE DONE SIMULTANEOUSLY ON BOTH SIDES OF THE WALL.

CONCRETE REINFORCEMENT

1. ALL REINFORCING STEEL SHALL CONFORM TO THE LATEST EDITIONS OF THE FOLLOWING:

A. ACI 315 – "MANUAL OF STANDARD PRACTICE FOR DETAILING REINFORCED CONCRETE STRUCTURES"

B. ACI 315 - "DETAILS AND DETAILING OF CONCRETE REINFORCEMENT"

C. ACI 318 – "BUILDING CODE REQUIREMENTS FOR STRUCTURAL CONCRETE"

D. MSP2 – "CRSI MANUAL OF STANDARD PRACTICE".

E. AWS D1.4 – "STRUCTURAL WELDING CODE – REINFORCING STEEL".

F. WRI – "WELDED WIRE FABRIC MANUAL OF STANDARD PRACTICE".

2. STEEL REINFORCING BARS SHALL CONFORM TO ASTM 615 (GRADE 60), 60 KSI YIELD POINT DEFORMED BARS IN ACCORDANCE WITH LATEST ASTM SPECIFICATIONS UNLESS NOTED OTHERWISE.

3. WELDED WIRE REINFORCING SHALL BE SUPPLIED IN FLAT SHEETS AND SHALL CONFORM TO ASTM A185.

4. ONLY REBAR CONFORMING TO ASTM A706 REBAR MAY BE WELDED.

5. ALL REINFORCING STEEL (#3 AND GREATER) IN EXTERIOR FLATWORK, STAIRS, AREA WAY WALLS AND AT OTHER LOCATIONS EXPOSED TO DEICING SALTS TO BE EPOXY COATED.

6. PROVIDE (2) #5 DIAGONALS FOR EACH LAYER AT EACH CORNER OF OPENINGS AND AT INTERSECTIONS.

7. PROVIDE CORNER BARS IN THE OUTSIDE FACE AND AT WALL JUNCTURES MATCHING HORIZONTAL WALL BARS.

8. CONTINUOUS BARS TO BE LAPPED. LAP SPLICES SHALL BE IN ACCORDANCE WITH SPLICE SCHEDULE LOCATED ON THE SCHEDULES SHEET UNLESS NOTED OTHERWISE.

CAST-IN-PLACE CONCRETE

1. ALL CONCRETE WORK SHALL CONFORM TO THE LATEST EDITIONS OF THE FOLLOWING STANDARDS:

A. ACI 301 – "SPECIFICATIONS FOR STRUCTURAL CONCRETE".

B. ACI MCP – "MANUAL OF CONCRETE PRACTICE".

C. ACI 318 – "BUILDING CODE REQUIREMENTS FOR REINFORCED CONCRETE".

D. ACI 318.1 – "BUILDING CODE REQUIREMENTS FOR STRUCTURAL PLAIN CONCRETE".

2. CONCRETE SHALL HAVE A MINIMUM 28-DAY ULTIMATE COMPRESSIVE STRENGTH f'c AS FOLLOWS WHEN TESTING IN ACCORDANCE WITH ASTM C39:

A.	SLABS-ON-GRADE	**4000 PSI**
B.	FOOTINGS	**3500 PSI**
C.	EXTERIOR EXPOSED CONCRETE	**4500 PSI**
D.	PIERS & FROST WALLS	**4500 PSI**

3. ALL CONCRETE EXPOSED TO WEATHER TO BE AIR ENTRAINED WITH **4%- 6%** AIR ENTRAINMENT.

4. ALL CONCRETE IS TO BE NORMAL WEIGHT CONCRETE UNLESS NOTED OTHERWISE.

5. ALL CONCRETE FLATWORK EXPOSED TO WEATHER TO BE FREE OF LIGNITE AND OTHER DELETERIOUS MATERIALS.

6. AGGREGATE SIZES SHALL BE IN ACCORDANCE TO ASTM C33 "STANDARD SPECIFICATION FOR CONCRETE AGGREGATION". THE COARSE AGGREGATE SHALL BE WELL GRADED #57 STONE WITH A MAXIMUM AGGREGATE SIZE OF 3/4". AGGREGATE FOR SLAB ON GRADE MAY HAVE A MAXIMUM AGGREGATE SIZE OF **1"**.

7. THE SLUMP OF THE CONCRETE SHALL BE 4" MAXIMUM. IF A HIGH RANGE WATER REDUCER IS USED THEN THE SLUMP PRIOR TO THE ADDITION OF THE WATER REDUCER SHALL BE 4" MAXIMUM. THE SLUMP SHALL NOT EXCEED 10" AFTER THE ADDITION OF A HIGH RANGE WATER REDUCER.

8. MINIMUM CEMENTITIOUS REQUIREMENTS:

A. 3000 PSI CONCRETE: 517 LBS/CU. YD.

B. 4000 PSI CONCRETE: 564 LBS/CU. YD.

9. MAXIMUM FLYASH CONTENT: 15% OF CEMENTITIOUS MATERIALS BY WEIGHT

10. MAXIMUM WATER-CEMENT RATIO:

A.	AIR ENTRAINED CONCRETE:	**0.45**
B.	NON-AIR ENTRAINED CONCRETE:	**0.50**

11. CONCRETE DESIGN SUBMITTALS SHALL INCLUDE A HISTORY OF BREAKS ACCORDING TO ACI 318.

12. PROTECTION FOR REINFORCING BARS:

UNFORMED SURFACES IN CONTACT WITH SOIL	3"
FORMED SURFACES EXPOSED TO SOIL OR WEATHER	
#6 BARS AND LARGER	2"
#5 BARS AND SMALLER	1 1/2"
FORMED SURFACES NOT EXPOSED TO SOIL OR WEATHER	
BEAMS AND COLUMNS	1 1/2"
SLABS, WALLS AND JOISTS	
#14 BARS AND LARGER	1 1/2"
#11 BARS AND SMALLER	3/4"

13. CONSTRUCTION JOINTS IN WALLS TO BE KEYED AND PLACED AT APPROVED LOCATIONS.

14. ALL COLUMN POCKETS TO BE FILLED WITH CONCRETE AFTER COLUMN IS ERECTED.

15. SLEEVES AND OPENINGS IN BEAMS, JOISTS AND SLABS NOT SHOWN ON STRUCTURAL DRAWINGS ARE NOT PERMITTED, UNLESS APPROVED BY THE ENGINEER.

16. SLAB ON GRADE TO BE A MINIMUM **4"** THICK UNDERLAIN BY **MINIMUM 10 MIL VAPOR BARRIER** ON 6" CLEAN COMPACTED GRANULAR FILL UNLESS NOTED OTHERWISE.

17. SLABS ON GRADE SHALL BE PLACED IN CONTINUOUS STRIPS PER ACI RECOMMENDATIONS.

CONCRETE JOINTS

1. MAXIMUM SPACING OF CONSTRUCTION AND/OR CONTRACTION JOINTS IN SLAB-ON-GRADE CONSTRUCTION SHALL BE **12'-0" O.C.** JOINTS SHALL BE PLACED TO PRODUCE PANELS THAT ARE AS SQUARE AS POSSIBLE AND NEVER EXCEEDING A LENGTH TO WIDTH RATIO OF 1.5 TO 1.

2. CONSTRUCTION AND/OR CONTRACTION JOINTS FOR SLAB-ON-GRADE CONSTRUCTION SHALL BE LOCATED ON COLUMN LINES.

REINFORCED MASONRY

1. ALL REINFORCED CONCRETE MASONRY MATERIALS AND CONSTRUCTION SHALL CONFORM TO THE LATEST EDITION OF THE FOLLOWING:

A. ACI 530.1/ASCE 6/TMS 602 "SPECIFICATION FOR MASONRY STRUCTURES".

B. ACI 530/ASCE 5/TMS 402 "BUILDING CODE REQUIREMENTS FOR MASONRY STRUCTURES".

2. NOTES APPLY TO MASONRY SHOWN ON STRUCTURAL DRAWINGS AND SHALL BE THE MINIMUM REQUIREMENTS FOR MASONRY SHOWN ON THE ARCHITECTURAL DRAWINGS.

3. CONCRETE MASONRY:

A. COMPRESSIVE STRENGTH OF MASONRY, PRISM STRENGTH F'm = **1830 PSI.**

B. CONCRETE MASONRY UNITS: ASTM C90 MEDIUM WEIGHT. **2500 PSI**

C. GROUT: **3000 PSI**. CONCRETE WITH A SLUMP OF 8" TO 10", USING 3/8" PEA GRAVEL AND CONFORMING TO ASTM C476.

D. MORTAR: ASTM C270

TYPE- M, BELOW GRADE.
TYPE - S, TYPICAL.
TYPE- N, INTERIOR NON-LOAD BEARING WALLS.

4. ALL CONCRETE BLOCK MASONRY UNITS SHALL BE LAID IN RUNNING BOND, UNLESS NOTED OTHERWISE ON DRAWINGS.

5. REINFORCING: BARS SHALL CONFORM TO ASTM A615, GRADE 60, UNLESS NOTED OTHERWISE ON DRAWINGS.

6. CONTINUOUS WIRE REINFORCING (JOINT REINFORCING) SHALL BE GALVANIZED FABRICATED UNITS WITH A SINGLE PAIR OF 9 GAUGE SIDE RODS AND 9 GAUGE CROSS RODS FABRICATED FROM COLD-DRAWN STEEL WIRE COMPLYING WITH ASTM A82, JOINT REINFORCING SHALL BE SPACED AT 16" O.C. VERTICALLY IN ALL MASONRY WALLS AND AT 8" O.C VERTICALLY AT PARAPETS.

7. DOWELS FROM CAST IN PLACE CONCRETE SHALL MATCH THE VERTICAL REINFORCEMENT IN THE WALL ABOVE UNLESS OTHERWISE NOTED. SUCH DOWELS SHALL BE FURNISHED BY THE CONCRETE CONTRACTOR.

8. WHEN A FOUNDATION DOWEL DOES NOT LINE UP WITH A VERTICAL BLOCK CORE, IT SHALL NOT BE SLOPED MORE THAN ONE HORIZONTAL IN 6 VERTICAL. DOWELS MAY BE GROUTED INTO A CELL IN VERTICAL ALIGNMENT, EVEN THOUGH IT IS IN AN ADJACENT CELL TO THE VERTICAL WALL REINFORCING.

9. SPLICING REINFORCING SHALL BE LAPPED 48 BAR DIAMETERS OR 24", WHICHEVER IS GREATER. MECHANICAL SPLICES MAY BE USED IN LIEU OF LAP SPLICES.

10. VERTICAL BARS SHALL BE HELD IN POSITION, USING BAR POSITIONERS AT INTERVALS NOT EXCEEDING 200 DIAMETERS OF THE REINFORCING, AND AT TOP OF WALL.

11. VERTICAL REINFORCING BARS SHALL HAVE A MINIMUM CLEARANCE OF 3/4" FROM THE MASONRY OR ADJACENT BARS AND NOT LESS THAN ONE BAR DIAMETER BETWEEN BARS NOT SPLICED. HORIZONTAL STEEL SHALL MAINTAIN 1" MINIMUM CLEARANCE FROM THE MASONRY.

12. VERTICAL GROUTING MAY BE EITHER "LOW LIFT" OR "HIGH LIFT" AT THE CONTRACTOR'S OPTION.

13. VERTICAL CELLS THAT WILL BE GROUTED SHALL HAVE VERTICAL ALIGNMENT TO MAINTAIN A CONTINUOUS UNOBSTRUCTED CELL AREA NOT LESS THAN 2"x3".

14. GROUTING SHALL BE STOPPED 1-1/2" BELOW THE TOP OF A COURSE SO AS TO FORM A KEY AT THE POUR JOINT.

15. GROUTING OF MASONRY BEAMS OVER OPENINGS SHALL BE DONE IN ONE CONTINUOUS OPERATION.

16. ALL STEEL BEAMS BEARING ON MASONRY WALLS SHALL HAVE 3 COURSES MINIMUM FILLED WITH GROUT DIRECTLY BELOW THE BEARING POINT UNLESS NOTED OTHERWISE.

17. ALL BOLTS, ANCHORS, ETC., INSERTED IN THE WALLS, SHALL BE GROUTED SOLID INTO POSITION.

18. ALL HORIZONTAL REINFORCING (JOINT REINFORCING AND REBAR) SHALL STOP AT CONTROL JOINTS EXCEPT BOND BEAMS CONTINUOUS AT FLOORS AND ROOFS.

19. REFER TO ARCHITECTURAL DRAWINGS FOR LOCATIONS AND DETAILS OF DOOR AND WINDOW OPENINGS FOR SPECIAL COURSING AND OTHER MASONRY DETAILS. THE INFORMATION SHOWN ON THE STRUCTURAL DRAWINGS IS INTENDED TO DEFINE THE STRUCTURAL REQUIREMENTS ONLY.

20. PROVIDE BOND BEAMS AT: TOP AND BOTTOM OF OPENINGS (EXTEND MINIMUM OF 2'-0" PAST OPENING), TOP OF WALLS, FLOOR LINES, ROOF LINES, TOP OF PARAPETS, BELOW JOIST AND TRUSS BEARING, AND AT FLOOR AND ROOF DECK CONNECTIONS TO WALLS. WHERE JOIST, TRUSS, DECK, ETC. HAVE SLOPED BEARING ELEVATIONS, PROVIDE MULTIPLE BOND BEAMS AND STEP AS REQUIRED. BOND BEAMS SHALL BE CONTINUOUS UNLESS NOTED OTHERWISE.

21. CONTINUE VERTICAL REINFORCING FLOOR TO FLOOR (OR ROOF) AND EXTEND TO TOP OF PARAPET.

22. COORDINATE BLOCKOUTS, REVEALS, HOLES, OPENINGS, AND BUILT IN ITEMS WITH ALL CONTRACT DOCUMENTS AND TRADES.

23. GROUT SOLID MASONRY AT BOND BEAMS, CELLS CONTAINING VERTICAL REINFORCING, PARTIAL HEIGHT COURSES BETWEEN BOND BEAMS AND JOIST, TRUSS, DECK, BEARING, BELOW BEAMS AND LINTELS FOR FULL HEIGHT OF WALLx24" WIDE, COLUMNS & PILASTERS **AND MASONRY BELOW FINISHED GRADE OR FINISHED FLOOR**.

24. CONTRACTOR TO PROVIDE A 1'-4" X 8" STRIP FOOTING OR THICKENED SLAB WITH (2) #5 BAR CONTINUOUS UNDER ALL NON-BEARING MASONRY WALLS UNLESS NOTED OTHERWISE.

25. SEE ARCHITECTURAL DRAWINGS FOR MOVEMENT JOINT LOCATIONS, UNLESS NOTED OTHERWISE. MAXIMUM JOINT SPACING SHALL NOT EXCEED 24'-0" O.C.

STRUCTURAL STEEL

1. STRUCTURAL STEEL WORK SHALL CONFORM TO THE LATEST EDITIONS OF THE FOLLOWING:

A. AISC – "SPECIFICATION FOR DESIGN, FABRICATION AND ERECTION OF STEEL FOR BUILDINGS"

B. AISC – "CODE OF STANDARD PRACTICE FOR STEEL BUILDINGS AND BRIDGES"

C. AWS D1.1 – "STRUCTURAL WELDING CODE – STEEL"

D. AISC – "STRUCTURAL STEEL DETAILING MANUAL"

2. STRUCTURAL STEEL MATERIALS SHALL CONFORM TO THE FOLLOWING UNLESS NOTED OTHERWISE.

HOT ROLLED WF AND WT SHAPES	ASTM A992	(FY = 50 KSI)
PLATES, CHANNELS, & ANGLES	ASTM A36	(FY = 36 KSI)
S, M, AND HP SHAPES	ASTM A36	(FY = 36 KSI)
STEEL PIPE	ASTM A53 TYPE E OR S GR B	(FY = 35 KSI)
RECTANGULAR HSS	ASTM A500 GR B	(FY = 46 KSI)
ROUND HSS	ASTM A500 GR B	(FY = 42 KSI)
HIGH STRENGTH BOLTS	ASTM A325 3/4" DIAMETER (MIN.)	
ANCHOR RODS	ASTM F1554 GR 36	(FY = 36 KSI)
THREADED ROD	ASTM A36	(FY = 36 KSI)
WELDING ELECTRODES	CONFORM TO AWS D1.1 SPECS FOR WELD METAL	

3. DETAIL STEEL BEAM CONNECTIONS AS SIMPLE SPAN BEAMS, UNLESS NOTED OTHERWISE.

4. SUBMIT SHOP DRAWINGS WHICH ADEQUATELY DEPICT THE STRUCTURAL ELEMENTS AND CONNECTIONS SHOWN IN THE CONTRACT DOCUMENTS. CONNECTIONS SHALL BE DETAILED BASED ON THE DESIGN INFORMATION PROVIDED IN THE CONTRACT DOCUMENTS. CONNECTIONS SHALL BE DESIGNED FOR THE SERVICE LOAD REACTION VALUES SHOWN ON THE STRUCTURAL DRAWINGS. FOR STEEL MEMBERS WHOSE REACTIONS ARE NOT SHOWN, THE DESIGN REACTION SHALL BE OBTAINED FROM THE TABLES ENTITLED "MAXIMUM TOTAL UNIFORM LOAD" IN THE AISC "STEEL CONSTRUCTION MANUAL", LATEST EDITION. THE DESIGN REACTION IS EQUAL TO HALF THE TABULATED VALUE FOR NON-COMPOSITE BEAMS AND EQUAL TO THE TABULATED VALUE FOR COMPOSITE BEAMS. DEVIATION FROM THE CONNECTION DETAILS DEPICTED IN THE CONTRACT DOCUMENTS SHALL NOT BE PERMITTED WITHOUT WRITTEN PERMISSION FROM THE STRUCTURAL ENGINEER. REVIEW DOES NOT RELIEVE THE CONTRACTOR OF THE FULL RESPONSIBILITY FOR THE DESIGN AND ADEQUACY OF SUCH CONNECTIONS. STRUCTURAL ENGINEER SHALL BE COMPENSATED BY THE CONTRACTOR FOR THE COST INVOLVED IN THE REDESIGN OF CONNECTIONS FOR THE CONVENIENCE OF THE CONTRACTOR.

5. BOLT TIGHTENING

A. ALL BOLTED CONNECTIONS TO BE DESIGNED AS SNUG-TIGHT BEARING CONNECTIONS WITH THREADS INCLUDED IN THE SHEAR PLANE, UNLESS NOTED OTHERWISE.

B. ALL BOLTS IN MOMENT CONNECTIONS TO BE SLIP-CRITICAL.

C. ALL BOLTS IN HANGER CONNECTIONS TO BE SLIP-CRITICAL.

D. ALL BOLTED CONNECTIONS DESIGNATED AS PRE-TENSIONED PER ASTM F1852 OR SLIP-CRITICAL (FRICTION) SHALL BE INSTALLED WITH LOAD INDICATOR WASHERS OR TENSION CONTROLLED BOLTS.

6. ALL WELDS SHALL BE MADE BY WELDERS, CERTIFIED ACCORDING TO AWS PROCEDURES.

7. ALL FILLER METAL USED IN WELDING SHALL BE 70 KSI YIELD LOW-HYDROGEN.

8. ALL WELDS TO BE VISUALLY INSPECTED.

A. 15% OF FIELD & SHOP GROOVE WELDS TO BE TESTED BY NON-DESTRUCTIVE TESTING.

B. 20% OF FIELD & SHOP FILLET WELDS TO BE TESTED BY NON-DESTRUCTIVE TESTING.

9. UNLESS NOTED OTHERWISE, STRUCTURAL STEEL SUPPLIER IS TO FURNISH SHOP WELDED ANGLE FRAMES AT ALL FLOOR AND ROOF OPENINGS. VERIFY SIZE AND LOCATION WITH MECHANICAL (M/E/P/FP) CONTRACTOR. NOT ALL OPENINGS REQUIRING FRAMES ARE SHOWN ON DRAWINGS. GENERAL CONTRACTOR/CONSTRUCTION MANAGER TO COORDINATE OPENINGS WITH ALL TRADES.

10. ALL STRUCTURAL STEEL AND MISCELLANEOUS METALS SHALL BE PRIME PAINTED WITH ONE COAT OF FABRICATOR'S STANDARD RUST-INHIBITIVE PRIMER OR AS INDICATED IN THE PROJECT SPECIFICATION. TOUCH UP ALL DISTURBED AREAS AFTER ERECTION. STEEL TO BE FIREPROOFED SHALL RECEIVE PAINT/FINISH PROCESS COMPATIBLE WITH FIREPROOFING.

11. CUTS, HOLES (OPENINGS), ETC. REQUIRED IN STRUCTURAL STEEL MEMBERS FOR THE WORK OF OTHER TRADES SHALL NOT BE ALLOWED, EXCEPT BY WRITTEN PERMISSION FROM THE ENGINEER.

12. ADJUSTABLE MASONRY TIES SHALL BE FURNISHED AT 16" O.C. VERTICALLY AND 24" O.C. HORIZONTALLY ON ALL STEEL MEMBERS ENCASED IN OR ADJACENT TO MASONRY WALLS WHETHER OR NOT SUCH ANCHORS ARE SHOWN ON THE DRAWINGS. TIES SHALL BE CAPABLE OF TRANSMITTING FORCES PERPENDICULAR TO THE PLANE OF THE WALL.

13. STEEL COLUMN BASE PLATES SHALL BE SIZE SHOWN ON PLAN WITH NON-METALLIC NON-SHRINK GROUT FOR UNIFORM BEARING.

STEEL JOIST AND JOIST GIRDER

1. STEEL JOIST MATERIALS, FABRICATION, AND CONSTRUCTION SHALL CONFORM TO THE APPLICABLE BUILDING CODE AND TO LATEST EDITIONS OF THE FOLLOWING STANDARDS:

A. SJI - "STANDARD SPECIFICATION FOR OPEN WEB STEEL JOISTS, K-SERIES.

B. SJI - "STANDARD SPECIFICATION FOR LONG SPAN STEEL JOIST, LH-SERIES AND DEEP SPAN LONG SPAN STEEL JOIST, DLH-SERIES.

C. SJI - "STANDARD SPECIFICATION FOR JOIST GIRDERS"

D. SJI - "CODE OF STANDARD PRACTICE FOR STEEL JOISTS AND JOIST GIRDERS".

2. THE STEEL JOIST / JOIST GIRDER MANUFACTURER SHALL BE A MEMBER OF SJI AND SHALL BE RESPONSIBLE FOR THE COMPLETE DESIGN, FABRICATION, AND ERECTION PROCEDURES FOR ALL JOISTS, JOIST GIRDERS, INCIDENTAL FRAMING, TEMPORARY/PERMANENT BRACING, AND BRIDGING.

3. REFER TO SJI SPECIFICATIONS FOR ERECTION PROCEDURES CONCERNING STABILITY, HANDLING, END CONNECTIONS, AND TIMING OF LOAD PLACEMENT.

4. CONTRACTOR SHALL SUBMIT COMPLETE AND DETAILED SHOP DRAWINGS TO THE ENGINEER OF RECORD FOR APPROVAL BEFORE PROCEEDING WITH FABRICATION. SHOP DRAWINGS SHALL INDICATE SPANS AND LOADS USED. THEY SHALL ALSO INCLUDE METHODS OF FASTENING, BRIDGING LAYOUT, OPTIONAL FIELD SPLICES, AND IF HIGH STRENGTH BOLTS OR FULL PENETRATION WELDS ARE REQUIRED. THE SHOP DRAWINGS MUST BE STAMPED BY A LICENSED PROFESSIONAL ENGINEER REGISTERED IN THE PROJECT STATE.

5. THE STEEL JOIST / JOIST GIRDER MANUFACTURER SHALL SUBMIT CALCULATIONS TO THE ARCHITECT/ENGINEER FOR REVIEW AND APPROVAL PRIOR TO INSTALLATION. THE CALCULATIONS MUST BE STAMPED BY A LICENSED PROFESSIONAL ENGINEER REGISTERED IN THE PROJECT STATE.

6. STEEL JOISTS, JOIST GIRDERS, BRIDGING, AND END ANCHORAGE SHALL BE DESIGNED FOR THE SUPERIMPOSED DEAD, LIVE, UPLIFT, LATERAL, AND MECHANICAL LOADS AS INDICATED ON THE PLANS.

7. SUSPENDED AND CONCENTRATED LOADS SHALL BE LOCATED WITHIN 6" OF A PANEL POINT OF JOISTS OR JOIST GIRDERS. THE JOIST / JOIST GIRDER MANUFACTURER SHALL ADD ADDITIONAL WEB MEMBERS AND ADJUST CHORD MEMBERS AS REQUIRED AT CONCENTRATED LOADS, BUT THE DEPTH OF MEMBERS MAY NOT BE ADJUSTED WITHOUT WRITTEN PERMISSION FROM THE ARCHITECT AND ENGINEER OF RECORD.

8. VERIFY MECHANICAL LOADS AND LOCATIONS WITH MECHANICAL CONTRACTOR PRIOR TO DESIGN AND FABRICATION.

9. STEEL JOISTS WITH EXTENDED ENDS SHALL BE DESIGNED BY MANUFACTURER FOR LOADS AS SHOWN ON THE PLANS.

10. STEEL JOIST/JOIST GIRDERS SHALL MEET THE MINIMUM SIZE, BEARING, AND ATTACHMENT REQUIREMENTS AS SPECIFIED BY SJI, UNLESS NOTED OTHERWISE.

11. STEEL JOIST BEARING ON MASONRY AND CONCRETE WALLS SHALL EXTEND JOIST SEAT PAST CENTERLINE OF WALL.

12. FIELD BOLT AND PROVIDE BOTTOM CHORD EXTENSIONS FOR JOISTS LOCATED AT COLUMNS PER SJI RECOMMENDATIONS.

13. STEEL JOIST GIRDERS SHALL BE ATTACHED AT ENDS WITH A MINIMUM OF 2-3/4" DIAMETER BOLTS IN 13/16" SLOTTED HOLES IN GIRDER BEARING SEAT UNLESS NOTED OTHERWISE ON PLANS.

14. STEEL JOISTS GREATER THAN 40'-0" IN LENGTH MUST BE DESIGNED TO ALLOW FOR BOLTED CONNECTIONS AT ALL SUPPORTS.

15. SPLICES IN LONG SPAN JOISTS MAY BE BOLTED. INCREASE SIZE OF CONNECTED PARTS TO ACCOUNT FOR LOSS OF AREA, IF REQUIRED.

16. SPLICE PLATES SHALL HAVE THE SAME NET AREA AND CENTROID AS THE CONNECTED PARTS.

17. STEEL JOISTS DETAILED WITH SLOTTED HOLES AT BEARING ENDS ARE TO BE WELDED AFTER ALL DEAD LOAD HAS BEEN APPLIED.

18. STEEL JOISTS AT COLUMN CENTER LINES SHALL BE BOLTED TO STRUCTURAL STEEL WITH (2)-1/2" DIAMETER BOLTS OR (2)-3/4" DIAMETER BOLTS FOR LH-SERIES. WHERE STEEL JOISTS DO NOT SPACE TO COLUMN CENTER LINES, USE BOLTED CONNECTIONS FOR THE STEEL JOIST CLOSEST TO THE CENTER LINE. JOISTS ON COLUMN CENTER LINES SHALL BE DESIGNED FOR OSHA STABILITY REQUIREMENTS.

19. STEEL JOIST BRIDGING SHALL BE PROVIDED IN ACCORDANCE WITH THE SJI SPECIFICATION. ALL BRIDGING AND BRIDGING ANCHORS SHALL BE PLACED AND STEEL JOIST ENDS FIXED PRIOR TO THE APPLICATION OF ANY LOADS. BRIDGING THAT TERMINATES AT, OR IS INTERRUPTED BY, STRUCTURAL STEEL BEAMS, MASONRY WALLS OR CONCRETE WALLS SHALL BE ATTACHED THERETO. COORDINATE BRIDGING LOCATIONS TO AVOID INTERFERENCE WITH ALL MECHANICAL, ELECTRICAL AND FIRE PROTECTION EQUIPMENT. **BRIDGING SHOWN ON PLANS IS APPROXIMATE AND FOR REFERENCE ONLY.**

20. JOISTS SHALL RECEIVE ONE COAT OF SHOP APPLIED PAINT CONFORMING TO THE MINIMUM REQUIREMENTS OF THE "STEEL STRUCTURES PAINTING COUNCIL SPECIFICATIONS".

21. JOIST ENDS AT THE BUILDING PERIMETER SHALL BE DESIGNED TO TRANSFER AN ADDITIONAL HORIZONTAL FORCE OF **800 LBS** TO THE SUPPORTING MEMBER. THIS LOAD SHALL BE APPLIED TO THE TOP OF THE TOP CHORD, ABOVE THE BEARING SEAT AND PERPENDICULAR TO THE JOIST SPAN.

STEEL ROOF DECK

1. ALL STEEL ROOF DECK WORK SHALL CONFORM TO THE LATEST EDITION OF THE FOLLOWING:

A. AISI – "NORTH AMERICAN SPECIFICATION FOR THE DESIGN OF COLD-FORMED STEEL STRUCTURAL MEMBERS".

B. AISC – "SPECIFICATION FOR STRUCTURAL STEEL BUILDINGS".

C. AWS D1.3 – "STRUCTURAL WELDING CODE – SHEET METAL".

D. ANSI/SDI QA/QC – "QUALITY CONTROL AND QUALITY ASSURANCE FOR INSTALLATION OF STEEL DECK".

E. SDI – "SHORT FORM SPECIFICATIONS".

F. ANSI/SDI RD – "STANDARD FOR STEEL ROOF DECK".

2. ALL STEEL ROOF DECK SHALL BE **MECHANICALLY** FASTENED AS TO SUPPORTING BEAMS AND JOISTS AND ERECTED IN ACCORDANCE WITH MANUFACTURER'S LATEST RECOMMENDATIONS.

3. STEEL ROOF DECK SHALL BE CONTINUOUS OVER 3 SPANS UNLESS SHOWN OTHERWISE ON THE DRAWINGS WITH A MINIMUM BEARING AT ENDS TO BE 1 1/2".

4. STEEL ROOF DECK SHALL BE CONFIGURATION, DEPTH AND MINIMUM GAUGE AS SHOWN ON THE DRAWINGS, CONFORMING TO **ASTM A611 GRADE C (PAINTED) OR ASTM A446 GRADE A (GALVANIZED)** WITH A MINIMUM YIELD STRENGTH OF 33 KSI.

5. GALVANIZING SHALL CONFORM TO ASTM A525 COATING CLASS G60 OR G90.

6. STEEL ROOF DECK SHALL BE FASTENED AS FOLLOWS UNLESS NOTED OTHERWISE.

A. STEEL ROOF DECK SHALL BE FASTENED AT 12" O.C. OVER ALL INTERIOR SUPPORTS AND 6" O.C. OVER ALL EXTERIOR SUPPORTS,

B. FASTENERS SHALL BE HILTI X-HSN24 PAF.

C. PROVIDE (1) #10 SIDELAP SCREW PER SPAN, MINIMUM, OR AS REQUIRED TO MEET MINIMUM SIDELAP ATTACHMENTS BY THE STEEL DECK INSTITUTE.

STRUCTURAL DRAWING INDEX

SHEET NUMBER	DRAWING NAME
2-SI-100	GENERAL NOTES
2-SI-101	SCHEDULES
2-SB-101	FOUNDATION PLAN- AREA A
2-SB-102	FOUNDATION PLAN- AREAS C & D
2-SB-501	FOUNDATION DETAILS
2-SB-502	FOUNDATION DETAILS
2-SF-200	OVERALL ROOF FRAMING PLAN
2-SF-201	FRAMING PLANS- AREA A
2-SF-202	FRAMING PLANS- AREA C
2-SF-501	FRAMING DETAILS
2-SF-502	FRAMING DETAILS
2-SF-503	FRAMING DETAILS

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MANAWA

ADDITIONS AND REMODELING FOR:
MANAWA MIDDLE & HIGH SCHOOL
2101 SCHAEFER CIRCLE, APPLTON, WI 54915

MARK	DATE
ISSUED:	06-06-19
PROJECT NO:	18268
CAD DWG FILE:	
DRAWN BY:	BJR
CHECKED BY:	LAW

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SHEET TITLE:
GENERAL NOTES

SHEET NUMBER:
2-SI-100

MASONRY BEARING PLATES

MARK	AREA	L	W	T	STUDS
BP1	48 SQ IN	8"	6"	1/2"	(2) 1/2" X 4"
BP2	56.25 SQ IN	7 1/2"	7 1/2"	1/2"	(2) 1/2" X 4"
BP3	80 SQ IN	10"	8"	3/4"	(2) 1/2" X 4"
BP4	156 SQ IN	16"	16"	3/8"	(5) 1/2" X 4"
BP5	300 SQ IN	40"	7 1/2"	3/8"	(5) 1/2" X 4" SEE DETAIL 19/ 2-SF-502
BP6	180 SQ IN	24"	7 1/2"	1/2"	(3) 1/2" X 4"

STEEL LINTELS FOR MASONRY VENEER

CLEAR SPAN	EXTERIOR ANGLES FOR BRICK
4'-0" (OR LESS)	L3 1/2" X 3 1/2" X 5/16"
5'-0"	L3 1/2" X 3 1/2" X 5/16"
6'-0"	L4" X 3 1/2" X 5/16"
7'-0"	L4" X 3 1/2" X 5/16"
8'-0"	L5" X 3 1/2" X 5/16"
9'-0"	L5" X 3 1/2" X 3/8"
10'-0"	L6" X 3 1/2" X 3/8"

NOTES
1. LINTELS SHALL BEAR A MINIMUM OF 8" EACH SIDE OF OPENING.
2. LONG LEG OF ANGLE SHALL BE VERTICAL.

REINFORCEMENT DEVELOPMENT AND SPLICE LENGTH SCHEDULE

Fy = 60 KSI f'c = 3000 PSI

BAR SIZE		#3	#4	#5	#6	#7	#8	#9	#10	#11
CLASS A SPLICE LENGTH	TOP BARS	22	29	36	43	63	72	81	91	101
	OTHERS	17	22	28	33	48	55	62	70	78
CLASS B SPLICE LENGTH	TOP BARS	28	37	47	56	81	93	105	118	131
	OTHERS	22	29	36	43	63	72	81	91	101

REINFORCEMENT DEVELOPMENT AND SPLICE LENGTH SCHEDULE

Fy = 60 KSI f'c = 4000 PSI

BAR SIZE		#3	#4	#5	#6	#7	#8	#9	#10	#11
CLASS A SPLICE LENGTH	TOP BARS	19	25	31	37	54	62	70	79	87
	OTHERS	15	19	24	29	42	48	54	61	67
CLASS B SPLICE LENGTH	TOP BARS	24	32	40	48	70	80	91	102	113
	OTHERS	19	25	31	37	54	62	70	79	87

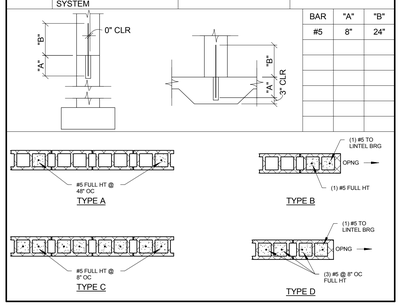
NOTES: (APPLY TO BOTH 3000 PSI & 4000 PSI CONCRETE

1. ALL SPLICE LENGTHS SHALL BE CLASS B UNLESS NOTED OTHERWISE.
2. TABULATED VALUES ARE BASED ON GRADE 60 REINFORCING BARS AND NORMAL WEIGHT CONCRETE.
3. TENSION DEVELOPMENT LENGTHS AND TENSION LAP SPLICE LENGTHS ARE CALCULATED
PER ACI 318-05, SECTIONS 12.2.2 AND 12.15, RESPECTIVELY. TABULATED VALUES FOR BEAMS AND COLUMNS ARE BASED ON TRANSVERSE REINFORCEMENT AND CONCRETE COVER MEETING MINIMUM CODE REQUIREMENTS. LENGTHS ARE IN INCHES.
4. TOP BARS ARE HORIZONTAL BARS WITH MORE THAN 12" OF CONCRETE CAST BELOW THE BARS.
5. SPLICE AND DEVELOPMENT LENGTHS IN THIS SCHEDULE ARE BASED ON CASE 1 PER CRSI (1996):
BEAMS OR COLUMNS: COVER AT LEAST 1.0 BAR DIA
AND C-C SPACING AT LEAST 2.0 BAR DIA
ALL OTHERS: COVER AT LEAST 1.0 BAR DIA
AND C-C SPACING AT LEAST 3.0 BAR DIA

DOWEL/GROUTING REINFORCING SCHEDULE

MARK	DOWELS	CMU WALL REINFORCING	TYPE
D1	#5's @ 48" OC, DRILL & EPOXY W/ HILTI HIT-HY 200 SAFE SET SYSTEM	#5's @ 48" OC	TYPE A
D2	#5's @ 48" OC, DRILL & EPOXY W/ HILTI HIT-HY 200 SAFE SET SYSTEM	#5's @ 8" OC	TYPE C

BAR	"A"	"B"
#5	8"	24"



ISOLATED FOOTING SCHEDULE

MARK	SIZE	REINFORCING	DETAIL
F1	3'-0"x3'-0"x12"	(3) #5's EACH WAY BOTTOM BARS	10/2-SB-501
F2	4'-0"x4'-0"x12"	(4) #5's EACH WAY BOTTOM BARS	10/2-SB-501
F3	5'-0"x5'-0"x12"	(5) #5's EACH WAY BOTTOM BARS	10/2-SB-501
F4	6'-0"x6'-0"x12"	(6) #5's EACH WAY BOTTOM BARS	10/2-SB-501
F5	8'-0"x8'-0"x12"	(8) #5's EACH WAY TOP & BOTTOM BARS	10/2-SB-501
F6	4'-0"x4'-0"x19 1/2"	(4) #5's EACH WAY TOP & BOTTOM BARS	14/2-SB-501
F7	5'-0"x5'-0"x19 1/2"	(5) #5's EACH WAY TOP & BOTTOM BARS	14/2-SB-501

CONCRETE PIER SCHEDULE

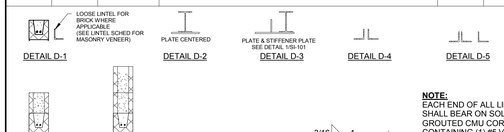
MARK	SIZE	REINFORCING	DETAIL
P1	1'-8"x1'-8"	(8) #6 VERTICAL & #4 TIES, BUNDLE TOP 3 REMAINDER @ 12" OC	10/2-SB-501
P2	1'-8"x2'-0"	(8) #6 VERTICAL & #4 TIES, BUNDLE TOP 3 REMAINDER @ 12" OC	10/2-SB-501
P3	2'-0"x2'-0"	(8) #6 VERTICAL & #3 TIES, BUNDLE TOP 3 REMAINDER @ 12" OC	10/2-SB-501
P4	2'-6"x3'-0"	(12) #6 VERTICAL & #4 TIES, BUNDLE TOP 3 REMAINDER @ 12" OC	10/2-SB-501
P5	2'-0"x4'-6"	(16) #6 VERTICAL & #4 TIES, BUNDLE TOP 3 REMAINDER @ 12" OC	10/2-SB-501

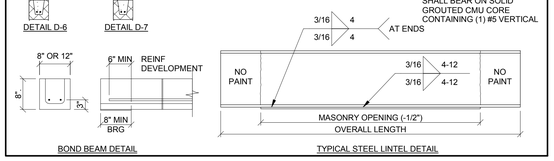
STEEL COLUMN SCHEDULE

		BASE PLATES						
MARK	SIZE	SIZE (txBxN)	"A"	"C"	ANCHOR BOLTS	T/CONC	DETAIL	
SC1	HSS4X4X5/16	3/4"X10"X10"	3 1/2"	3 1/2"	(4) 3/4"X1'-2"	SEE PLAN	1/2-SI-101	2/2-SI-101 3/2-SI-101
SC2	HSS6X6X3/8	1"X12"X12"	4 1/2"	4 1/2"	(4) 3/4"X1'-2"	SEE PLAN	1/2-SI-101	2/2-SI-101 3/2-SI-101
SC3	HSS6X6X1/2	1"X12"x12"	4 1/2"	4 1/2"	(4) 3/4"X1'-2"	SEE PLAN	1/2-SI-101	2/2-SI-101 3/2-SI-101
SC4	HSS8X8X1/2	1 1/4"X14"X14"	5 1/2"	5 1/2"	(4) 3/4"X1'-2"	SEE PLAN	1/2-SI-101	2/2-SI-101 3/2-SI-101
SC5	HSS12X6X1/2	1 1/4"X12"X18"	4 1/2"	7 1/2"	(4) 3/4"X1'-2"	SEE PLAN	1/2-SI-101	2/2-SI-101 3/2-SI-101

MASONRY LINTEL SCHEDULE

MARK	TYPE	WALL WIDTH	SIZE	BEARING	DETAIL
L1	MASONRY	8" MAS	8" DEEP CMU BOND BEAM LINTEL w/(2) # 5 CONT	8" BRG	D-1
L2	MASONRY	8" MAS	16" DEEP CMU BOND BEAM LINTEL w/(2) # 5 CONT	8" BRG	D-6
L3	STEEL	8" MAS	W8x13 W/ 5/16"X7 1/2" BOTTOM PLATE	8" BRG	D-2
L4	STEEL	12" MAS	W8x31 W/ 5/16"X11 1/2" BOTTOM PLATE	8" BRG	D-2
L5	MASONRY	8" MAS	24" DEEP CMU BOND BEAM LINTEL w/(2) # 5 CONT	8" BRG	D-7
L6	STEEL	16" CONC	W16x67 W/ 1/2"X15 1/2" TOP & BOTTOM PLATE	16" BRG	11 / 2-SF-503





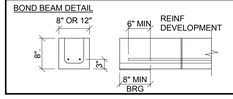
NOTE:
EACH END OF ALL LINTELS SHALL BEAR ON SOLID GROUTED CMU CORE CONTAINING (1) #5 VERTICAL

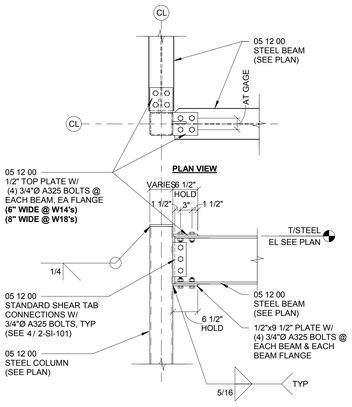
LINTEL SCHEDULE FOR NON-LOAD BEARING MASONRY WALLS

CLEAR SPAN	8" CMU WALL		12" CMU WALL	
	CMU LINTEL	STEEL LINTEL	CMU LINTEL	STEEL LINTEL
3'-0" OR LESS	(2) #4	(2) L3 1/2"x3 1/2"x5/16"	(2) #5	(3) L3 1/2"x3 1/2"x5/16"
3'-0" TO 5'-0"	(2) #5	(2) L4x3 1/2"x5/16"	(2) #5	(3) L4x3 1/2"x5/16"
5'-0" TO 6'-0"	(2) #5	(2) L5x3 1/2"x5/16"	(2) #5	(3) L5x3 1/2"x5/16"
6'-0" TO 8'-0"	N.A.	(2) L6"x3 1/2"x5/16"	N.A.	W8x10 w/ 5/16"x11 1/2" CONT PLATE
8'-0" TO 10"-0"	N.A.	W8x10 w/ 5/16"x 7 1/2" CONT. PL.	N.A.	W8x10 w/ 5/16"x11 1/2" CONT PLATE
10'-0" OR MORE	SEE DRAWINGS			

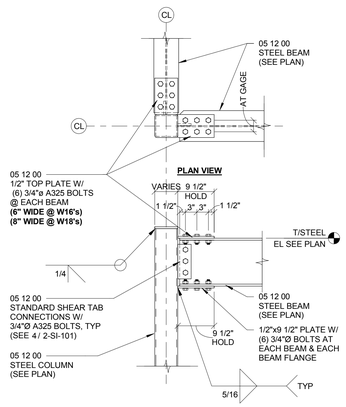
NOTES
1. OPENINGS 6'-4" OR LESS SHALL BE BOND BEAMS. LONGER OPENINGS SHALL BE STEEL.
2. LONG LEG OF ANGLE SHALL BE VERTICAL.
3. LINTELS SHALL BEAR A MIN OF 8" ON EACH SIDE OF OPENING.
4. CMU LINTEL REINFORCING SHALL HAVE 2 1/2" COVER TO THE BOTTOM OF THE BLOCK AND THE BLOCK SHALL BE GROUTED SOLID
5. ALL BEARING PLATES FOR W8x10 TO BE WIDTH OF BLOCK x 8" x5/16".

BOND BEAM DETAIL

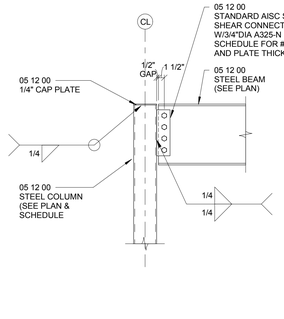




6 2-SI-101 TYPICAL MOMENT FRAME CONNECTION- AREA C
3/4" = 1'-0"



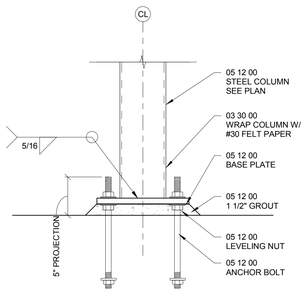
5 2-SI-101 TYPICAL MOMENT FRAME CONNECTION- AREA A
3/4" = 1'-0"



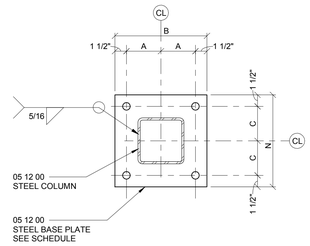
BEAM SIZE	ROWS OF BOLTS	PLATE THICKNESS
W8,W10	2	5/16"
W12, W14	3	5/16"
W16	4	5/16"
W18	5	3/8"
W21	5	3/8"
W24	6	3/8"

PROVIDE 1/2" CAP PLATE, EXTEND 3" BEYOND FACE OF COLUMN W/(2) BOLTS 1 1/2" FROM FACE OF COLUMN AT COLUMNS ALIGNED W/ROOF JOISTS.
(2) 1/2" DIA BOLTS 3 1/4" GAGE AT K-JOISTS
(2) 3/4" DIA BOLTS 4" GAGE AT LH-JOISTS

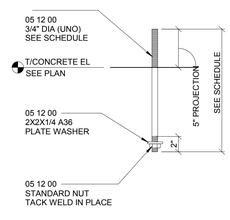
4 2-SI-101 TYPICAL SHEAR TAB CONNECTION
3/4" = 1'-0"



3 2-SI-101 TYP COLUMN BEARING
1 1/2" = 1'-0"



2 2-SI-101 TYP COLUMN BASE PLATE
1 1/2" = 1'-0"



1 2-SI-101 TYP ANCHOR BOLT DETAIL
1 1/2" = 1'-0"

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www.larsonengr.com © 2019 LEI
Project Number: 31180284.000 R18

MANAWA

ADDITIONS AND REMODELING FOR:
MANAWA MIDDLE & HIGH SCHOOL
2101 SCHAEFER CIRCLE, APPLTON, WI 54915

MARK	DATE
ISSUED:	06-06-19
PROJECT NO:	18268
CAD DWG FILE:	
DRAWN BY:	BJR
CHECKED BY:	LAW

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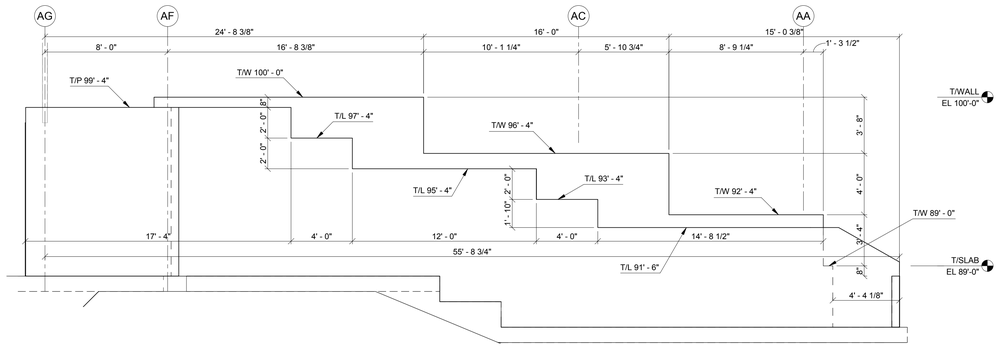
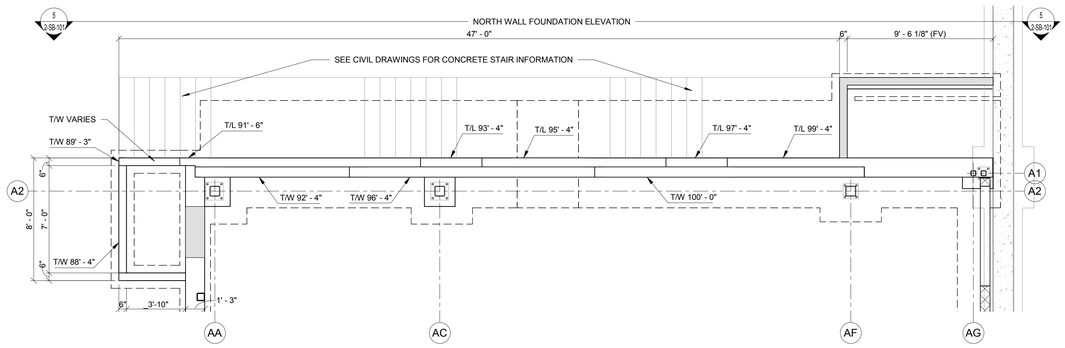
SHEET TITLE:
SCHEDULES

SHEET NUMBER:
2-SI-101



5 2-SB-101 AREA A- NORTH WALL FND ELEVATION
1/4" = 1'-0"



4 2-SB-101 AREA A- NORTH STAIRS FOUNDATION PLAN
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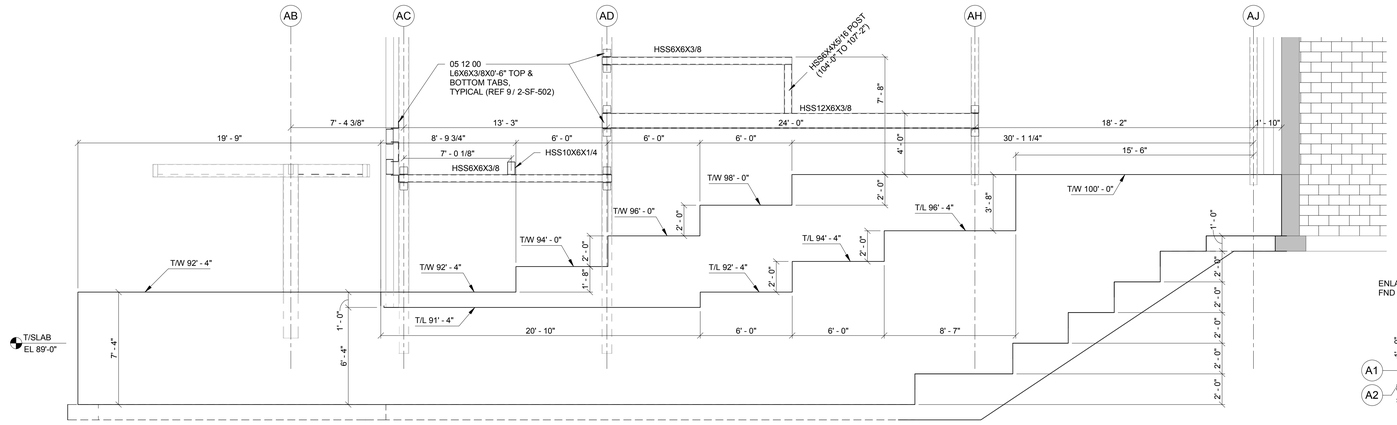
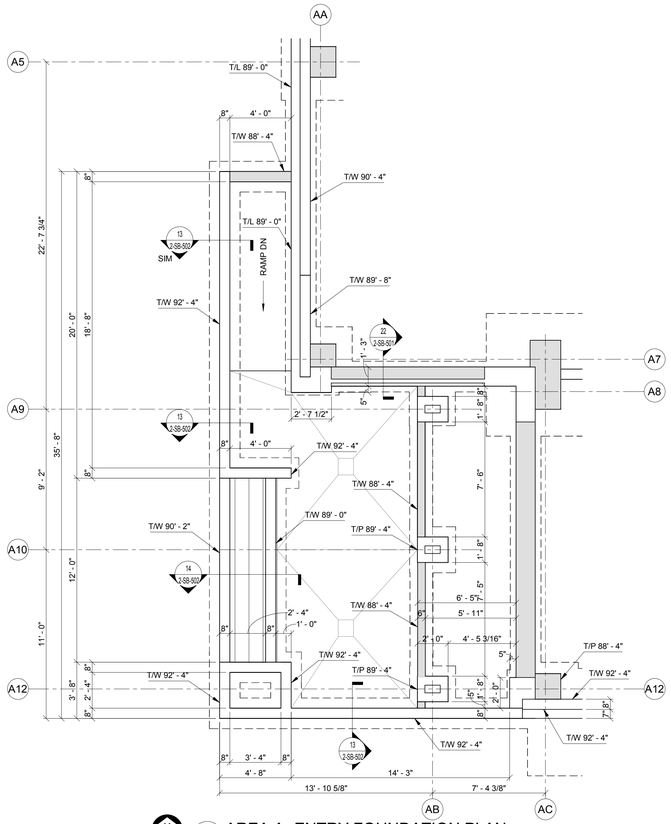


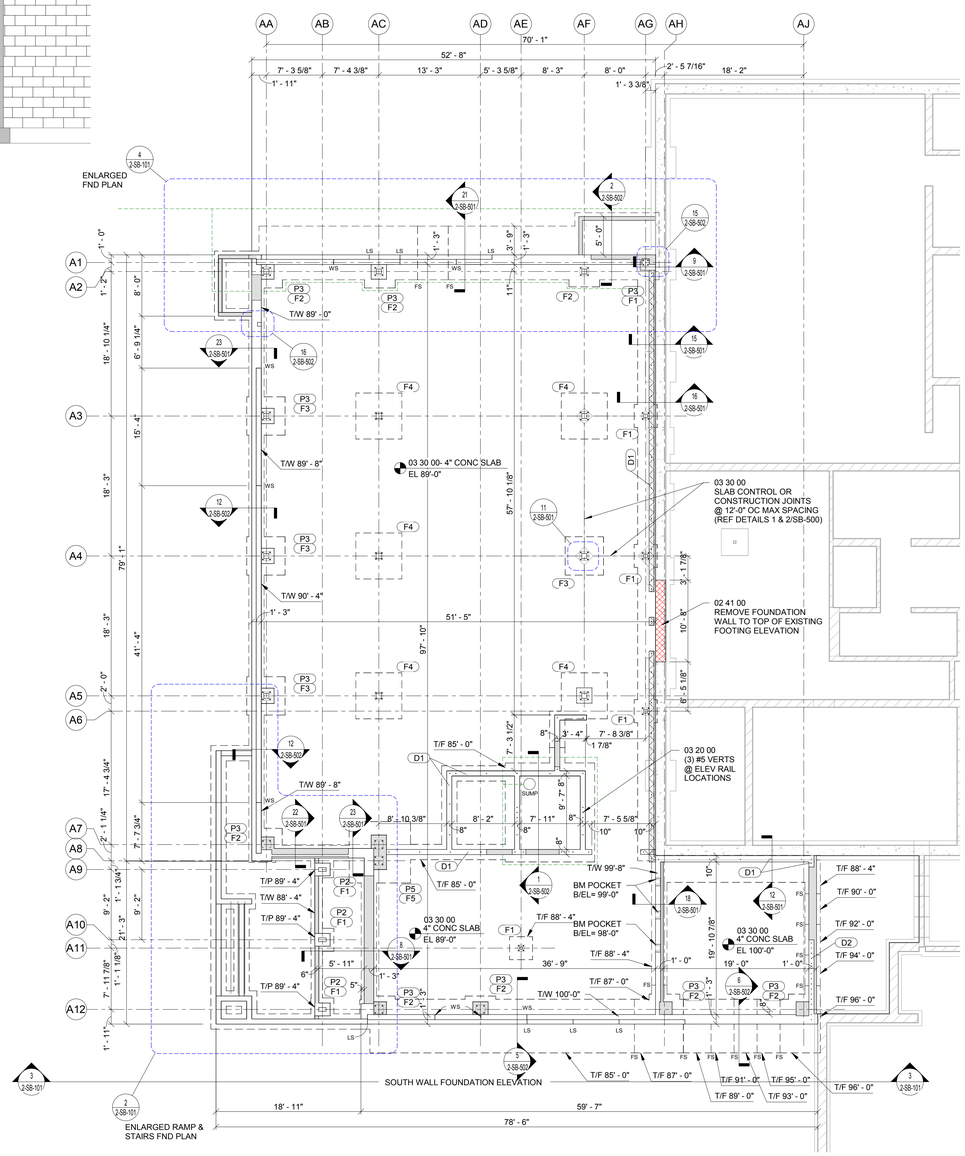
3 2-SB-101 AREA A- SOUTH WALL FND & FRAMING ELEV
1/4" = 1'-0"



2 2-SB-101 AREA A- ENTRY FOUNDATION PLAN
1/4" = 1'-0"
NORTH

NOTES:

1. SEE SHEET 2-SI-100 FOR GENERAL NOTES
2. SEE SHEET 2-SI-101 FOR SCHEDULES
3. TOP OF FOUNDATION WALL ELEVATION= 100'-0" (UNO)
4. INTERIOR FLOOR SLABS= 4" CONCRETE SLAB ON GRADE - UNREINFORCED (ELEV. 89'-0")
5. TOP OF FOOTING ELEVATION= 88'-4" (UNO)
6. INDICATES TOP OF FOUNDATION WALL OR PIER ELEVATION IS 8" BELOW FINISHED FLOOR ELEVATION
7. FS = FOOTING STEP (SEE DETAIL 7 / 2-SB-501
8. MASONRY WALLS TO HAVE (D1) VERTICAL REINFORCING UNO. SEE DOWEL/GROUTING REINFORCING SCHEDULE ON 2-SI-101



1 2-SB-101 FOUNDATION PLAN- AREA A
1/8" = 1'-0"
NORTH

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www.larsonengr.com © 2019 LEI
Project Number: 31180284.000

MANAWA

ADDITIONS AND REMODELING FOR:

MANAWA MIDDLE & HIGH SCHOOL

2101 SCHAEFER CIRCLE, APPLTON, WI 54915

MARK	DATE
ISSUED:	06-06-19
PROJECT NO:	18268
CAD DWG FILE:	
DRAWN BY:	BJR
CHECKED BY:	LAW

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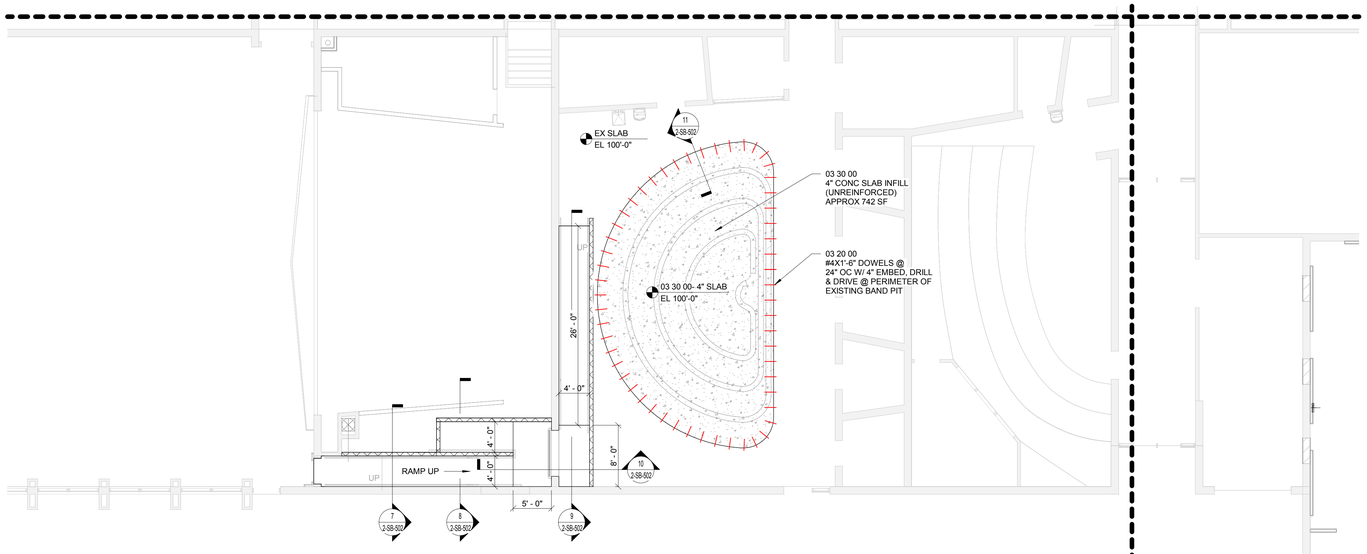
SHEET TITLE:

FOUNDATION PLAN- AREA A

SHEET NUMBER:

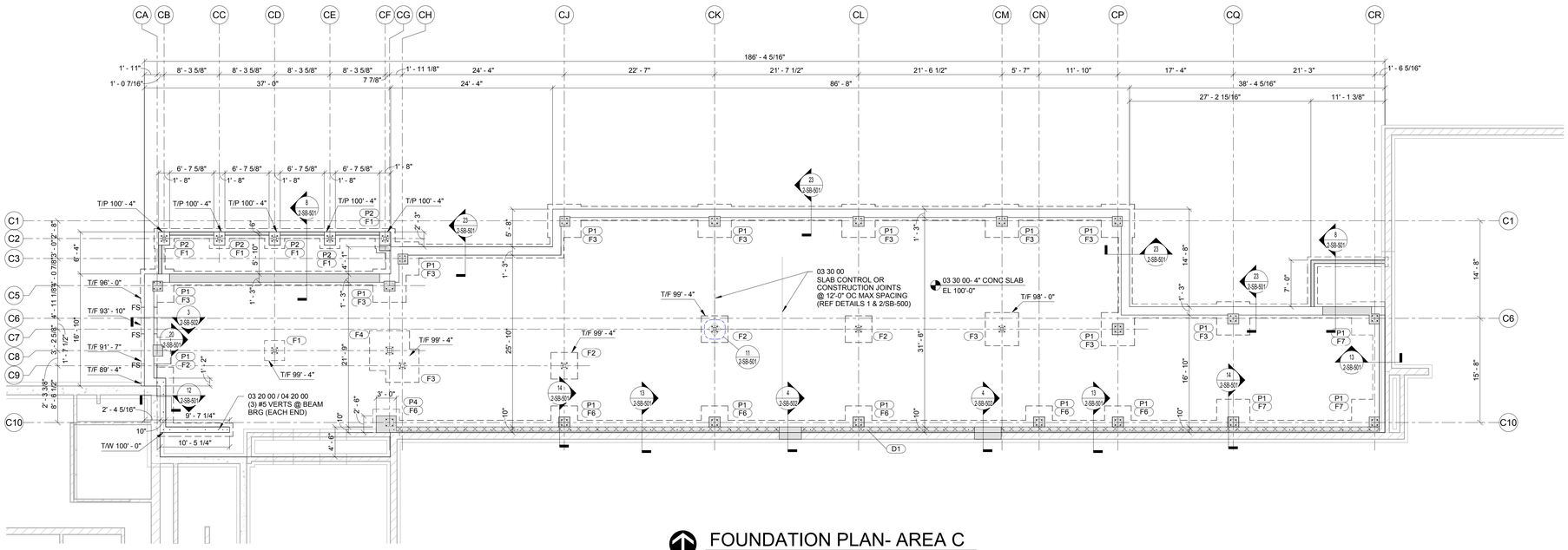
2-SB-101



NORTH

FOUNDATION PLAN- AREA D

1/8" = 1'-0"



NORTH

FOUNDATION PLAN- AREA C

1/8" = 1'-0"

NOTES:

1. SEE SHEET 2-SI-100 FOR GENERAL NOTES
2. SEE SHEET 2-SI-101 FOR SCHEDULES
3. TOP OF FOUNDATION WALL ELEVATION= 100'-0" (UNO)
4. INTERIOR FLOOR SLABS= 4" CONCRETE SLAB ON GRADE - UNREINFORCED (ELEV. 100'-0")
5. TOP OF FOOTING ELEVATION= 96'-0" (UNO)
6. INDICATES TOP OF FOUNDATION WALL OR PIER ELEVATION IS 8" BELOW FINISHED FLOOR ELEVATION
7. FS = FOOTING STEP (SEE DETAIL 7 / 2-SB-501)
8. MASONRY WALLS TO HAVE (D1) VERTICAL REINFORCING UNO. SEE DOWEL/GROUTING REINFORCING SCHEDULE ON 2-SI-101

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MANAWA

ADDITIONS AND REMODELING FOR:
MANAWA MIDDLE & HIGH SCHOOL
2101 SCHAEFER CIRCLE, APPLTON, WI 54915

MARK	DATE
ISSUED:	06-06-19
PROJECT NO:	18268
CAD DWG FILE:	
DRAWN BY:	BJR
CHECKED BY:	LAW

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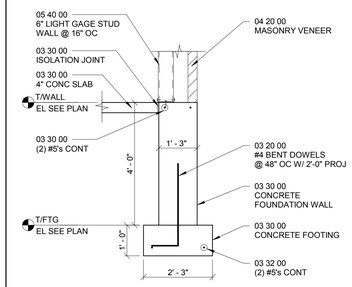
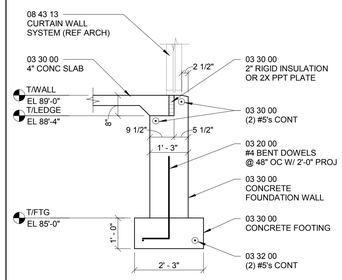
SHEET TITLE:
FOUNDATION PLAN- AREAS C & D

SHEET NUMBER:
2-SB-102



23 SECTION
2-SB-501 1/2" = 1'-0"



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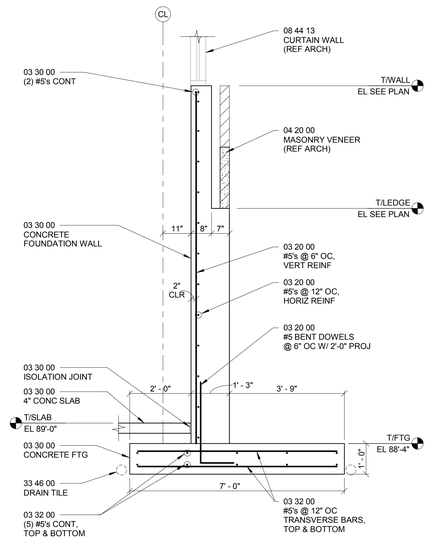

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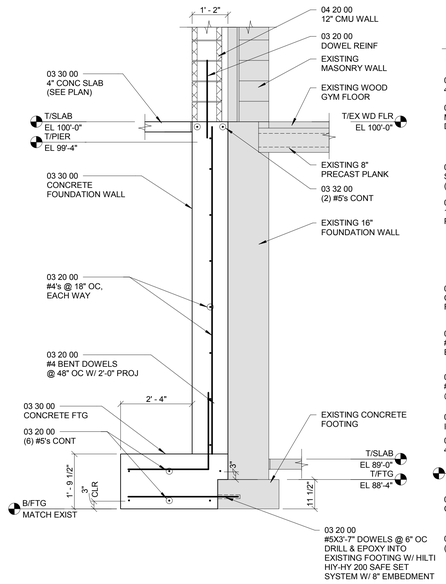

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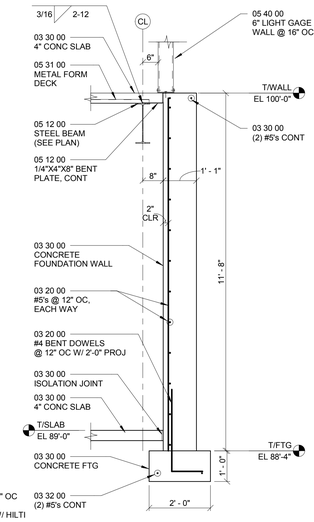

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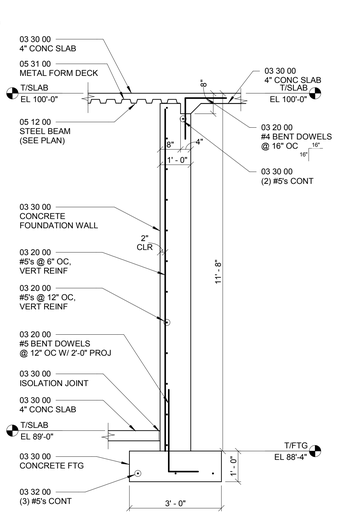

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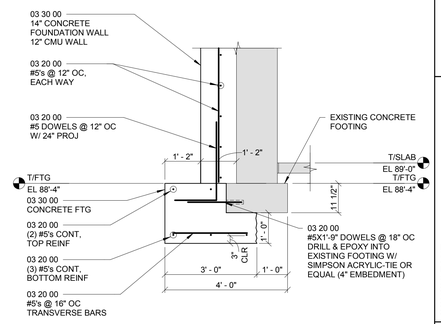

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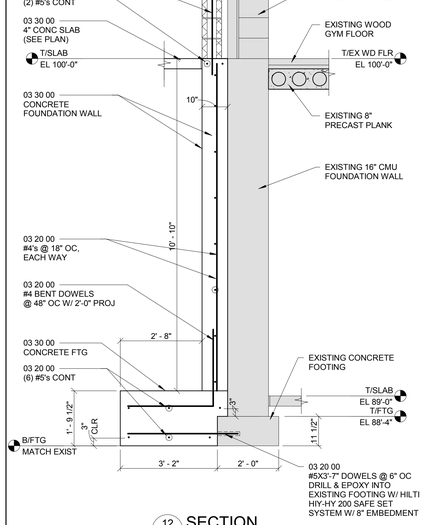

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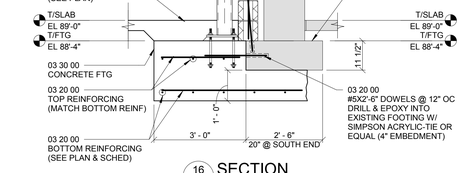

16 SECTION
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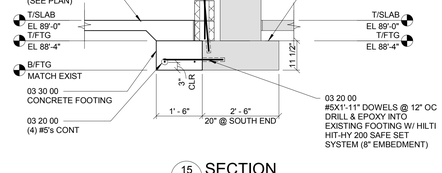

15 SECTION
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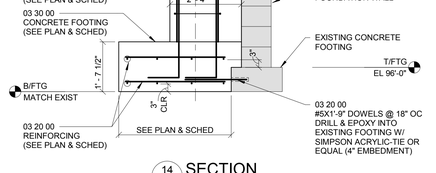
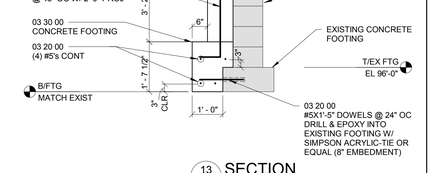
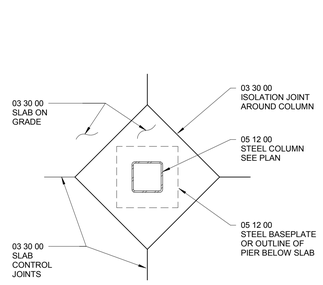


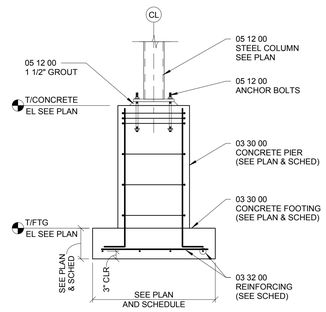
14 SECTION
2-SB-501 1/2" = 1'-0"



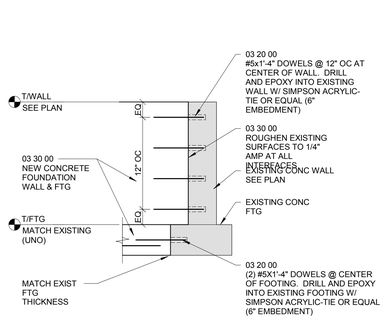
13 SECTION
2-SB-501 1/2" = 1'-0"



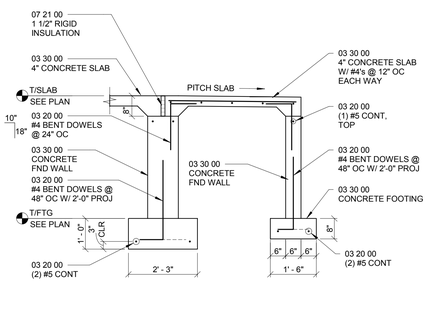
11 TYPIAL COLUMN ISOLATION JOINT
2-SB-501 1" = 1'-0"



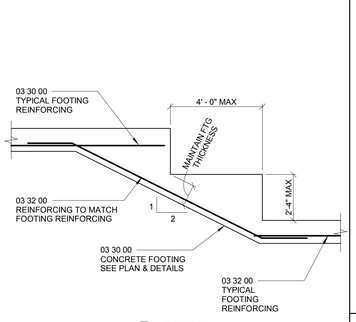
10 DETAIL
2-SB-501 1/2" = 1'-0"



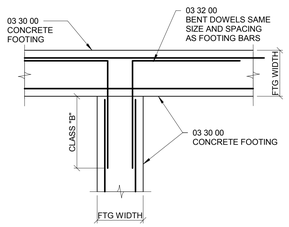
9 SECTION
2-SB-501 1/2" = 1'-0"

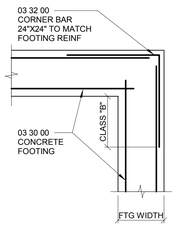


8 SECTION
2-SB-501 1/2" = 1'-0"

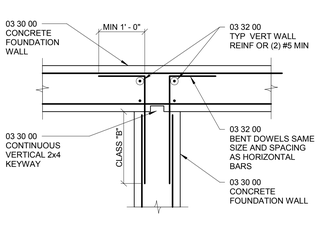


7 DETAIL
2-SB-501 3/8" = 1'-0"

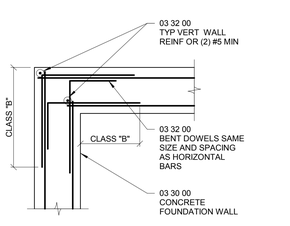




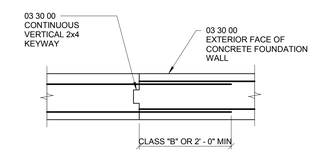
6 TYP FOOTING REINFORCING
2-SB-501 3/4" = 1'-0"



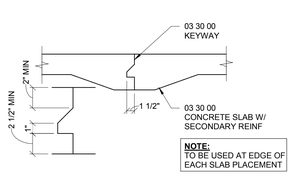
5 TYP FND WALL INTERSECTION REINF
2-SB-501 3/4" = 1'-0"



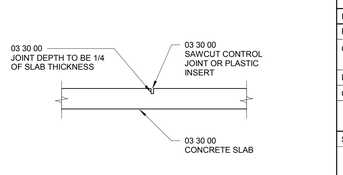
4 TYP FND WALL CORNER REINF
2-SB-501 3/4" = 1'-0"



3 TYP FND WALL CONSTRUCTION JOINT
2-SB-501 3/4" = 1'-0"



2 TYP CONC SLAB CONSTRUCTION JOINT
2-SB-501 1" = 1'-0"



1 TYP CONC SLAB CONTROL JOINT
2-SB-501 1" = 1'-0"

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ADDITIONS AND REMODELING FOR:
MANAWA MIDDLE & HIGH SCHOOL
2101 SCHAEFER CIRCLE, APPLTON, WI 54915

MARK	DATE
ISSUED:	06-06-19
PROJECT NO:	18268
CAD DWG FILE:	
DRAWN BY:	BJR
CHECKED BY:	LAW

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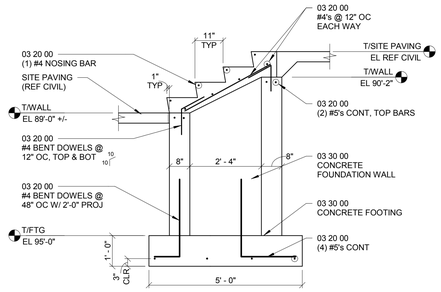
SHEET TITLE:
FOUNDATION DETAILS

SHEET NUMBER:
2-SB-501



14 SECTION
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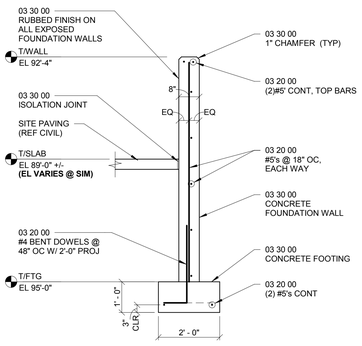
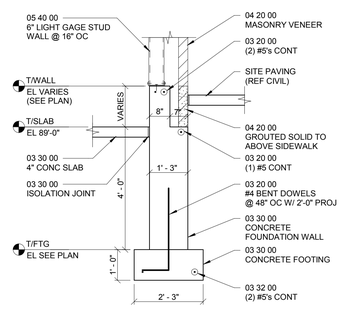
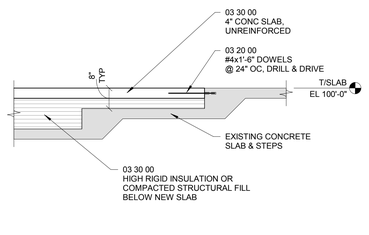


13 SECTION
2-SB-502 1/2" = 1'-0"



12 SECTION
2-SB-502 1/2" = 1'-0"



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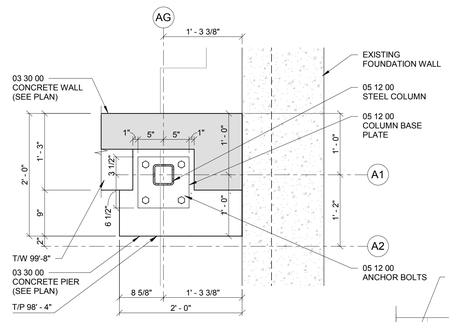
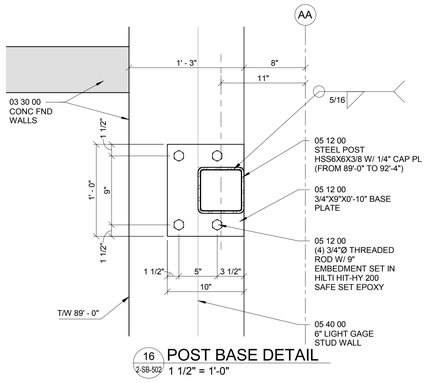
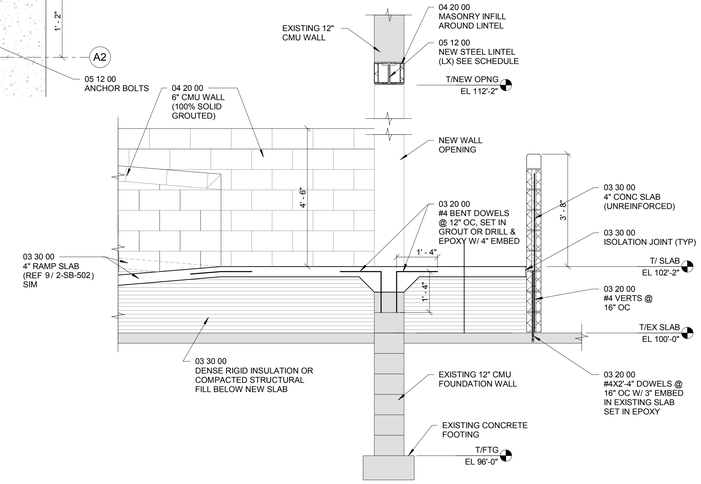


15 PIER DETAIL
2-SB-502 1" = 1'-0"



16 POST BASE DETAIL
2-SB-502 1 1/2" = 1'-0"



10 SECTION
2-SB-502 1/2" = 1'-0"

9 SECTION
2-SB-502 1/2" = 1'-0"

8 SECTION
2-SB-502 1/2" = 1'-0"

7 SECTION
2-SB-502 1/2" = 1'-0"

6 SECTION
2-SB-502 1/2" = 1'-0"

5 SECTION
2-SB-502 1/2" = 1'-0"

4 SECTION
2-SB-502 1/2" = 1'-0"

3 SECTION
2-SB-502 1/2" = 1'-0"

2 SECTION
2-SB-502 1/2" = 1'-0"

1 SECTION
2-SB-502 1/2" = 1'-0"

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6/6/2019 3:27:50 PM BIM 360://Manawa Schools/31180284- Manawa HS- R18.rvt

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MANAWA

ADDITIONS AND REMODELING FOR:
MANAWA MIDDLE & HIGH SCHOOL
2101 SCHAEFER CIRCLE, APPLTON, WI 54915

MARK	DATE
ISSUED:	06-06-19
PROJECT NO:	18268
CAD DWG FILE:	
DRAWN BY:	BJR
CHECKED BY:	LAW

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SHEET TITLE:
FOUNDATION DETAILS

SHEET NUMBER:
2-SB-502

NORTH

OVERALL ROOF FRAMING PLAN

1/16" = 1'-0"

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6/6/2019 3:28:00 PM BIM 360://Manawa Schools/31180284- Manawa HS- R18.rvt

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MANAWA

ADDITIONS AND REMODELING FOR:
MANAWA MIDDLE & HIGH SCHOOL
2101 SCHAEFER CIRCLE, APPLTON, WI 54915

MARK	DATE
ISSUED:	06-06-19
PROJECT NO:	18268
CAD DWG FILE:	
DRAWN BY:	Author
CHECKED BY:	Checker

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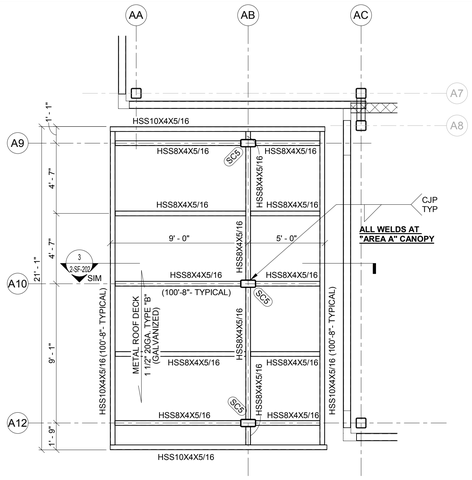
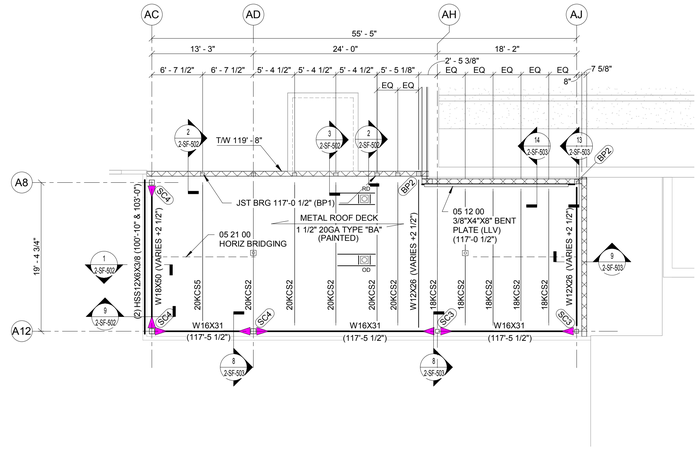
SHEET TITLE:
OVERALL ROOF FRAMING PLAN

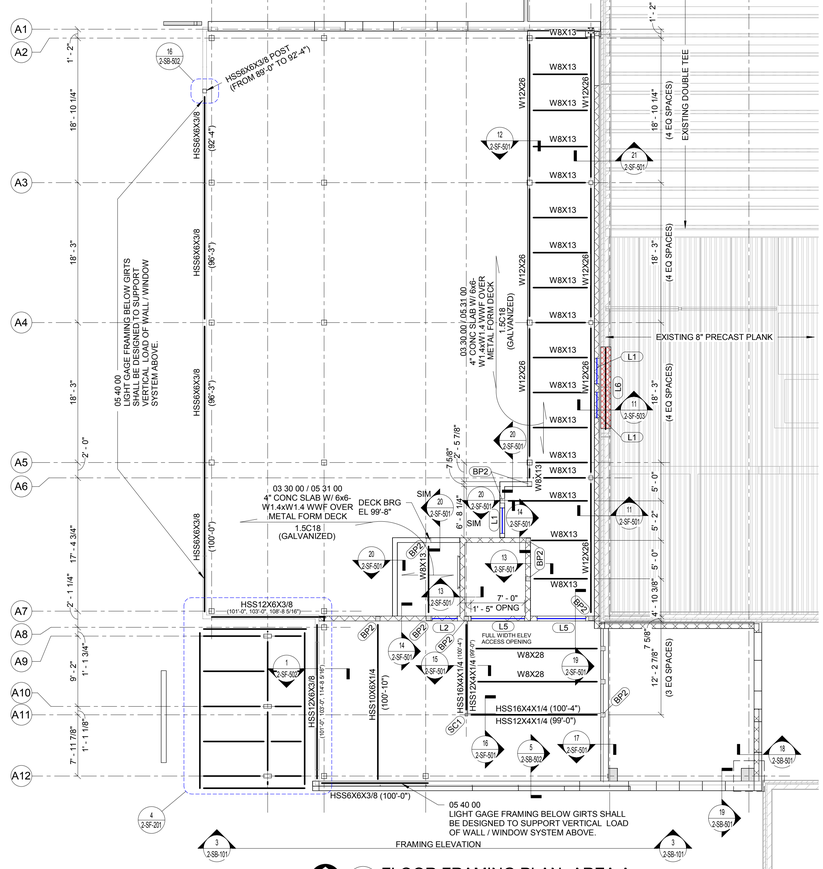
SHEET NUMBER:
2-SF-200



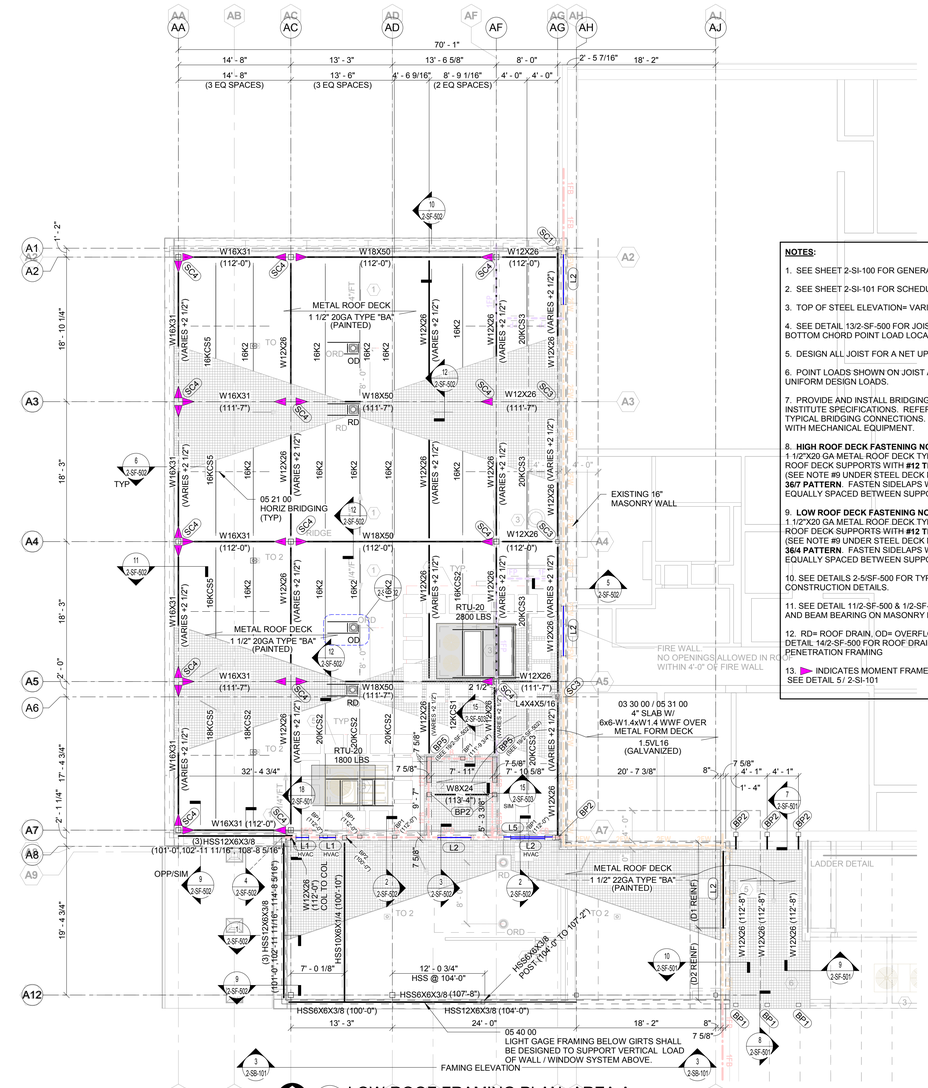
4 2-SF-201 NORTH — CANOPY FRAMING PLAN- AREA A
1/4" = 1'-0"



3 2-SF-201 NORTH — HIGH ROOF FRAMING PLAN- AREA A
1/8" = 1'-0"



2 2-SF-201 NORTH — FLOOR FRAMING PLAN- AREA A
1/8" = 1'-0"



1 2-SF-201 NORTH — LOW ROOF FRAMING PLAN- AREA A
1/8" = 1'-0"

NOTES:

1. SEE SHEET 2-SI-100 FOR GENERAL NOTES.
2. SEE SHEET 2-SI-101 FOR SCHEDULES.
3. TOP OF STEEL ELEVATION= VARIES- XXX'-X" (SEE PLAN)
4. SEE DETAIL 13/2-SF-500 FOR JOIST REINFORCING AT TOP OR BOTTOM CHORD POINT LOAD LOCATIONS.
5. DESIGN ALL JOIST FOR A NET UPLIFT OF 10 PSF.
6. POINT LOADS SHOWN ON JOIST ARE IN ADDITION TO UNIFORM DESIGN LOADS.
7. PROVIDE AND INSTALL BRIDGING PER STEEL JOIST INSTITUTE SPECIFICATIONS. REFERENCE DETAIL 9/SF-500 FOR TYPICAL BRIDGING CONNECTIONS. COORDINATE LOCATIONS WITH MECHANICAL EQUIPMENT.
8. **HIGH ROOF DECK FASTENING NOTE:** 1 1/2"X20 GA METAL ROOF DECK TYPE "B" WIDE RIB. FASTEN TO ROOF DECK SUPPORTS WITH **#12 TEK** SCREWS OR HILTI PAF'S (SEE NOTE #9 UNDER STEEL DECK NOTES ON SI-100) WITH A **36/7 PATTERN**. FASTEN SIDELAPS W/ **(6) #10** TEK SCREWS EQUALLY SPACED BETWEEN SUPPORTS.
9. **LOW ROOF DECK FASTENING NOTE:** 1 1/2"X20 GA METAL ROOF DECK TYPE "B" WIDE RIB. FASTEN TO ROOF DECK SUPPORTS WITH **#12 TEK** SCREWS OR HILTI PAF'S (SEE NOTE #9 UNDER STEEL DECK NOTES ON SI-100) WITH A **36/4 PATTERN**. FASTEN SIDELAPS W/ **(4) #10** TEK SCREWS EQUALLY SPACED BETWEEN SUPPORTS.
10. SEE DETAILS 2-S/SF-500 FOR TYPICAL MASONRY WALL CONSTRUCTION DETAILS.
11. SEE DETAIL 11/2-SF-500 & 1/2-SF-500 FOR TYPICAL LINTEL AND BEAM BEARING ON MASONRY DETAILS.
12. RD= ROOF DRAIN, OD= OVERFLOW DRAIN. REFERENCE DETAIL 14/2-SF-500 FOR ROOF DRAIN AND MECHANICAL ROOF PENETRATION FRAMING
13. ▶ INDICATES MOMENT FRAME CONNECTIONS. SEE DETAIL 5/ 2-SI-101

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Project Number: 31180284.000

MANAWA

ADDITIONS AND REMODELING FOR:
MANAWA MIDDLE & HIGH SCHOOL
2101 SCHAEFER CIRCLE, APPLTON, WI 54915

MARK	DATE
ISSUED:	06-06-19
PROJECT NO:	18268
CAD DWG FILE:	
DRAWN BY:	BJR
CHECKED BY:	LAW

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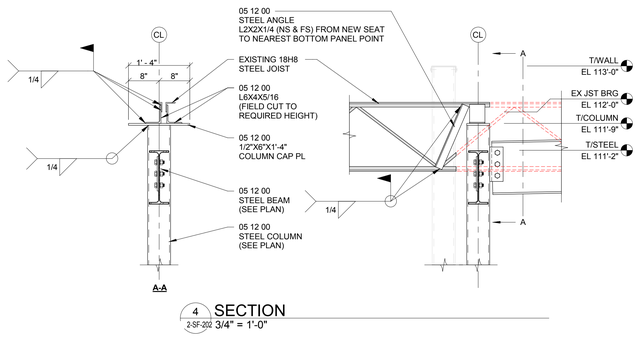
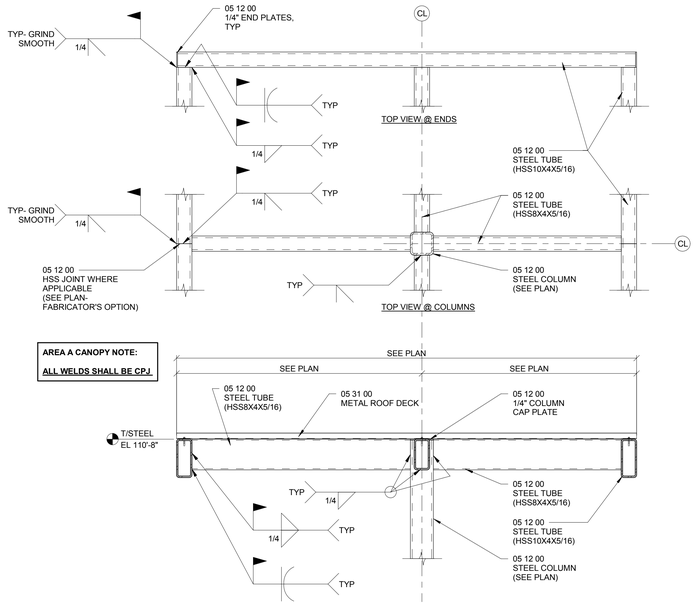
SHEET TITLE:
FRAMING PLANS- AREA A

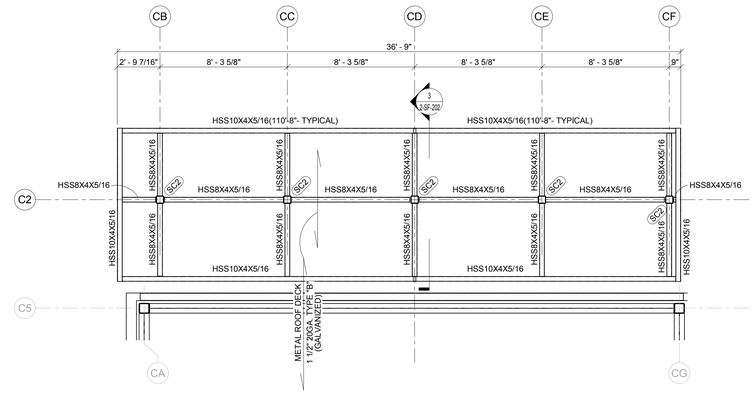
SHEET NUMBER:
2-SF-201



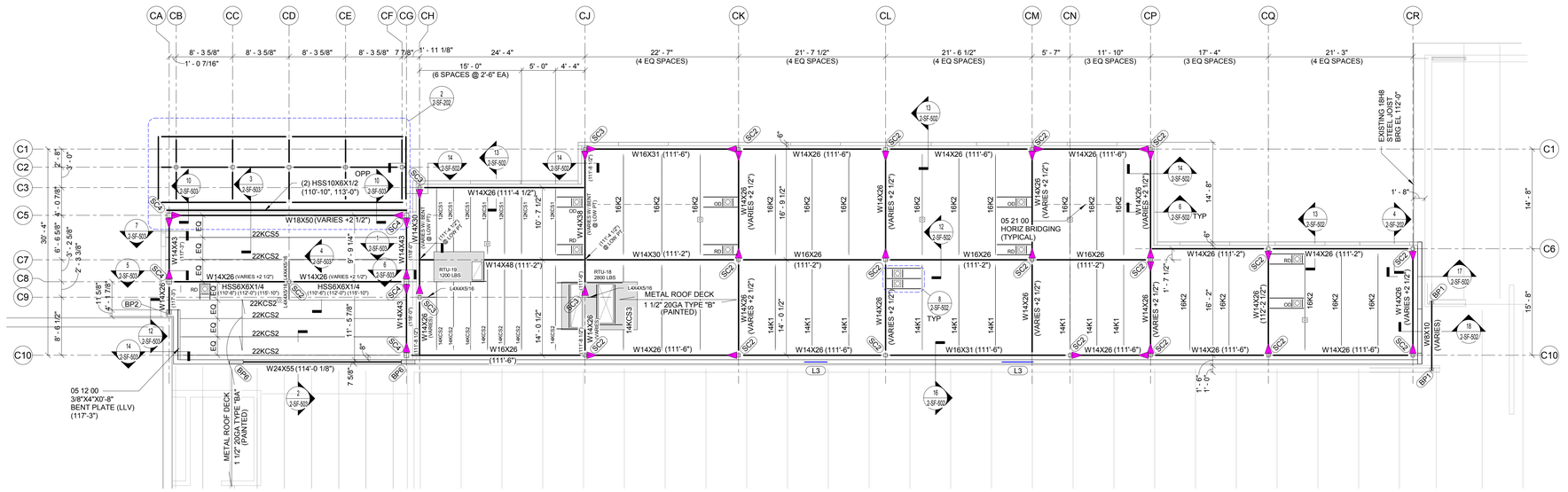
4 SECTION
2-SF-202 3/4" = 1'-0"



3 SECTION
2-SF-202 3/4" = 1'-0"



2 CANOPY FRAMING- AREA C
2-SF-202 1/4" = 1'-0"



1 ROOF FRAMING PLAN- AREA C
2-SF-202 1/8" = 1'-0"

NORTH

NOTES:

1. SEE SHEET 2-SI-100 FOR GENERAL NOTES.
2. SEE SHEET 2-SI-101 FOR SCHEDULES.
3. TOP OF STEEL ELEVATION= VARIES- XXX'-X" (SEE PLAN)
4. SEE DETAIL 13/2-SF-500 FOR JOIST REINFORCING AT TOP OR BOTTOM CHORD POINT LOAD LOCATIONS.
5. DESIGN ALL JOIST FOR A NET UPLIFT OF 10 PSF.
6. POINT LOADS SHOWN ON JOIST ARE IN ADDITION TO UNIFORM DESIGN LOADS.
7. PROVIDE AND INSTALL BRIDGING PER STEEL JOIST INSTITUTE SPECIFICATIONS. REFERENCE DETAIL 9/SF-500 FOR TYPICAL BRIDGING CONNECTIONS. COORDINATE LOCATIONS WITH MECHANICAL EQUIPMENT.
8. **LOW ROOF DECK FASTENING NOTE:** 1 1/2"X20 GA METAL ROOF DECK TYPE "B" WIDE RIB. FASTEN TO ROOF DECK SUPPORTS WITH **#12 TEK** SCREWS OR HILTI PAF'S (SEE NOTE #9 UNDER STEEL DECK NOTES ON SI-100) WITH A **36/4 PATTERN**. FASTEN SIDELAPS W/ **(4) #10** TEK SCREWS EQUALLY SPACED BETWEEN SUPPORTS.
9. SEE DETAILS 2-5/SF-500 FOR TYPICAL MASONRY WALL CONSTRUCTION DETAILS.
10. SEE DETAIL 11/2-SF-500 & 1/2-SF-500 FOR TYPICAL LINTEL AND BEAM BEARING ON MASONRY DETAILS.
11. RD= ROOF DRAIN, OD= OVERFLOW DRAIN. REFERENCE DETAIL 14/2-SF-500 FOR ROOF DRAIN AND MECHANICAL ROOF PENETRATION FRAMING
12. ▶ INDICATES MOMENT FRAME CONNECTIONS. SEE DETAIL 6/ 2-SI-101

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MANAWA

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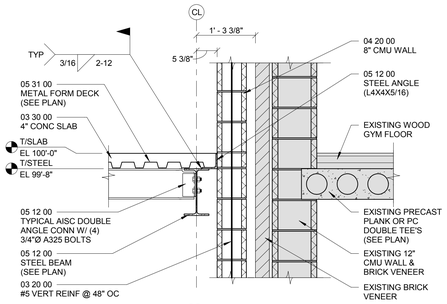
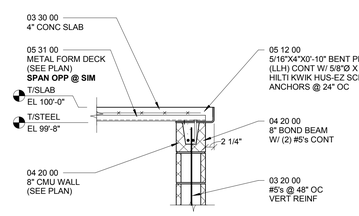
SHEET TITLE:
FRAMING PLANS- AREA C

SHEET NUMBER:
2-SF-202



21 SECTION
2-SF-501 3/4" = 1'-0"



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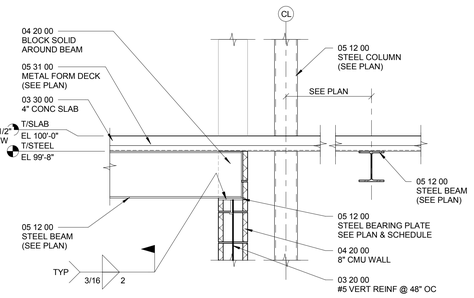
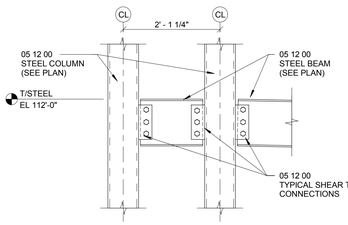
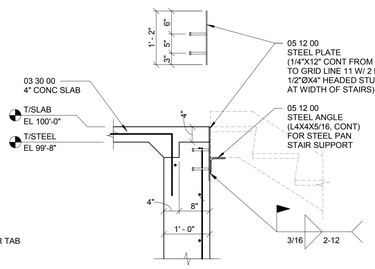


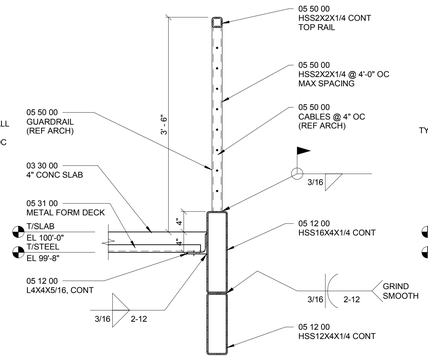
19 SECTION
2-SF-501 3/4" = 1'-0"



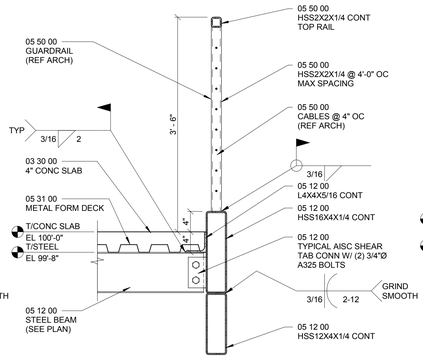
18 SECTION
2-SF-501 3/4" = 1'-0"



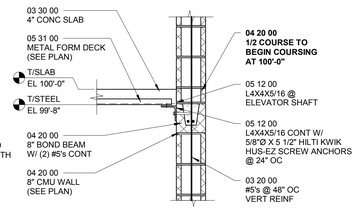
17 SECTION
2-SF-501 3/4" = 1'-0"



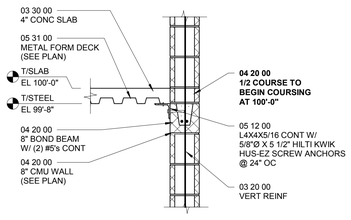
16 SECTION
2-SF-501 1" = 1'-0"



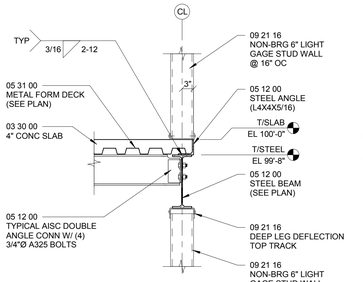
15 SECTION
2-SF-501 1" = 1'-0"



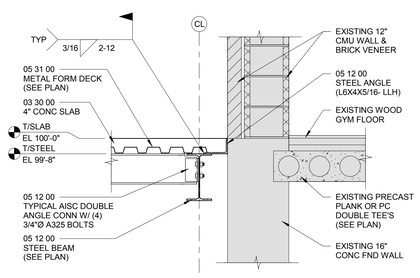
14 SECTION
2-SF-501 3/4" = 1'-0"



13 SECTION
2-SF-501 3/4" = 1'-0"



12 SECTION
2-SF-501 3/4" = 1'-0"



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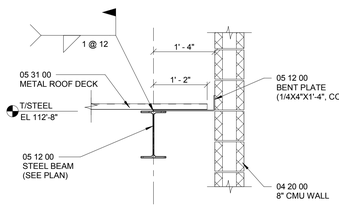

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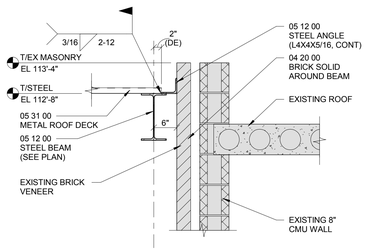

9 SECTION
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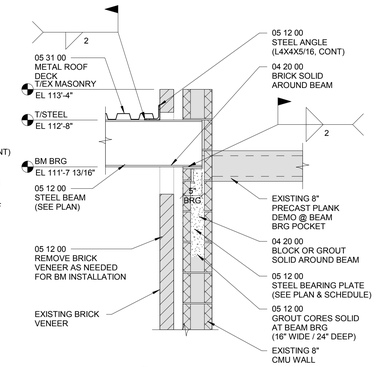
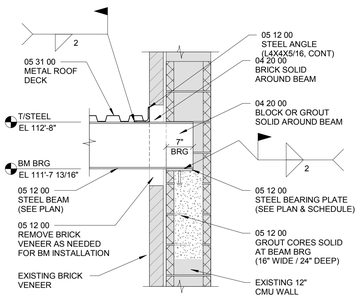


8 SECTION
2-SF-501 3/4" = 1'-0"



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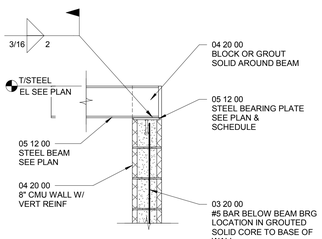
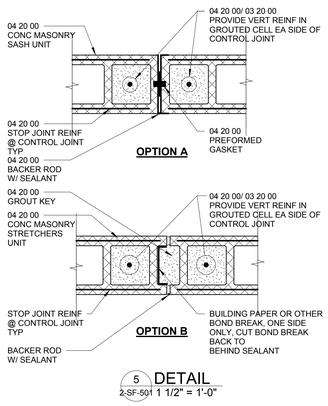
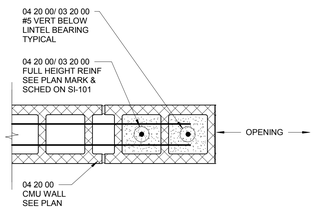


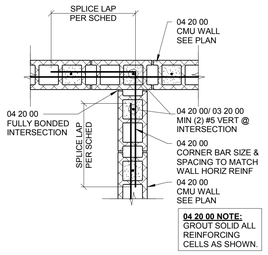
6 SECTION
2-SF-501 3/4" = 1'-0"



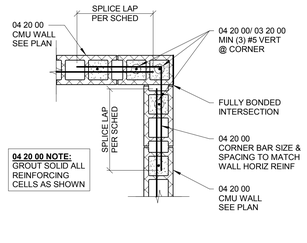
5 DETAIL
2-SF-501 1 1/2" = 1'-0"



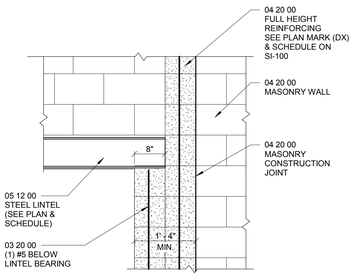
4 DETAIL
2-SF-501 1 1/2" = 1'-0"



3 DETAIL
2-SF-501 3/4" = 1'-0"



2 DETAIL
2-SF-501 3/4" = 1'-0"



1 DETAIL
2-SF-501 3/4" = 1'-0"

PRELIMINARY NOT FOR CONSTRUCTION

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www.larsonengr.com © 2019 LEI
Project Number: 31180284.000

MANAWA

ADDITIONS AND REMODELING FOR:
MANAWA MIDDLE & HIGH SCHOOL
2101 SCHAEFER CIRCLE, APPLTON, WI 54915

MARK	DATE
ISSUED:	06-06-19
PROJECT NO:	18268
CAD DWG FILE:	
DRAWN BY:	BJR
CHECKED BY:	LAW

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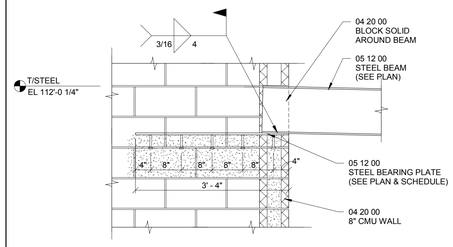
SHEET TITLE:
FRAMING DETAILS

SHEET NUMBER:
2-SF-501



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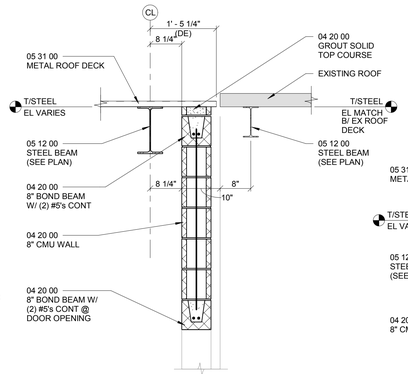

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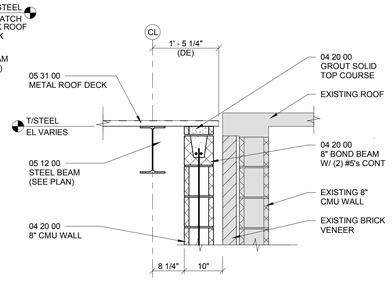

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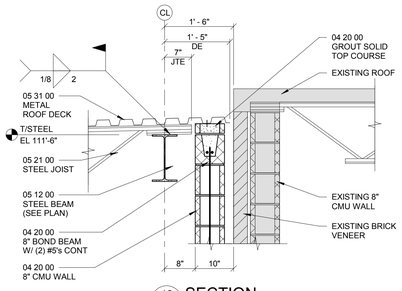

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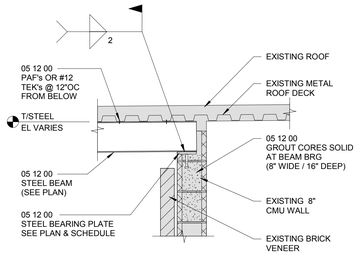

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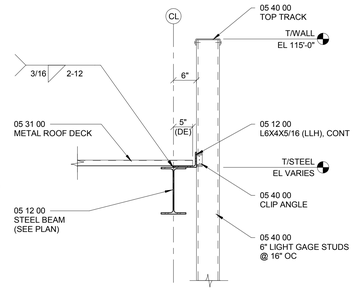

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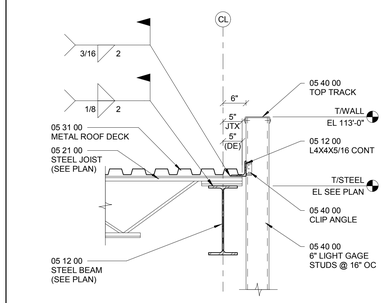

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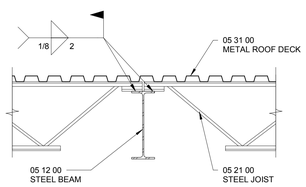

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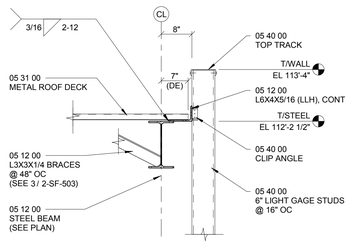

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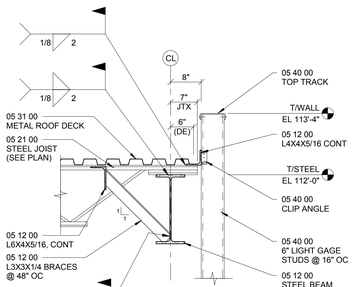

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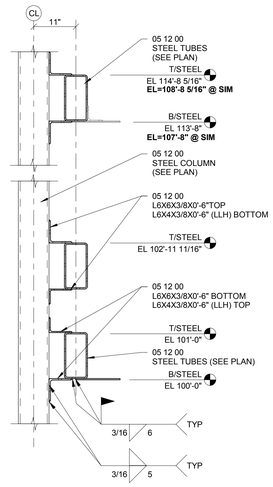
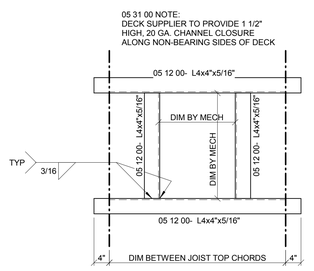
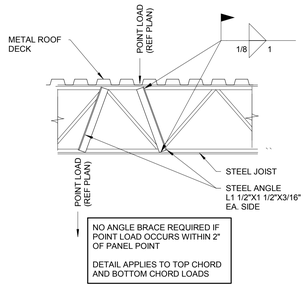


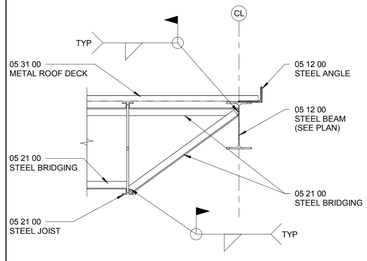
9 SECTION
2-SF-502 3/4" = 1'-0"



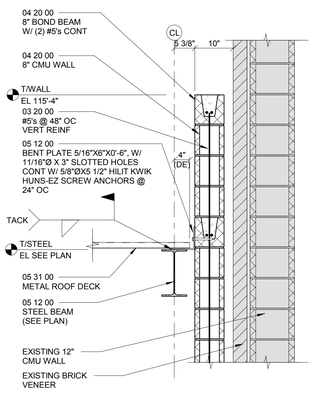
8 DETAIL
2-SF-502 3/4" = 1'-0"



7 DETAIL
2-SF-502 3/4" = 1'-0"



6 SECTION
2-SF-502 3/4" = 1'-0"



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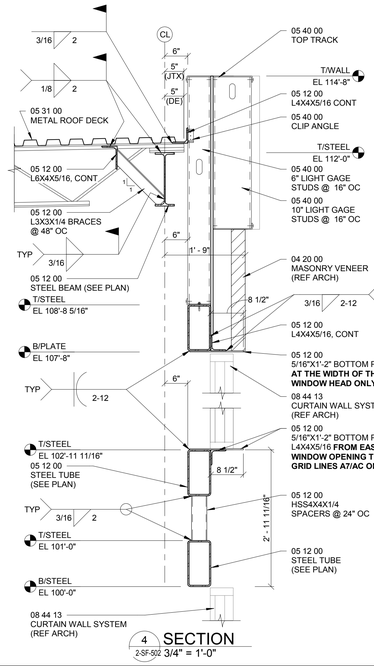
2-SF-502 3/4" = 1'-0"



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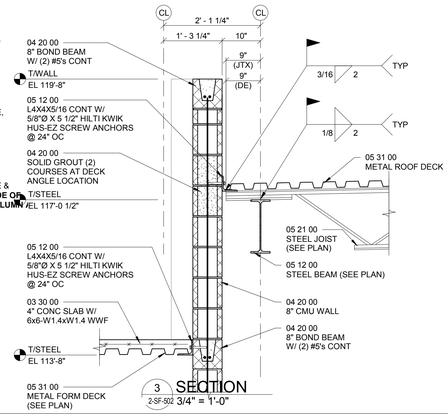

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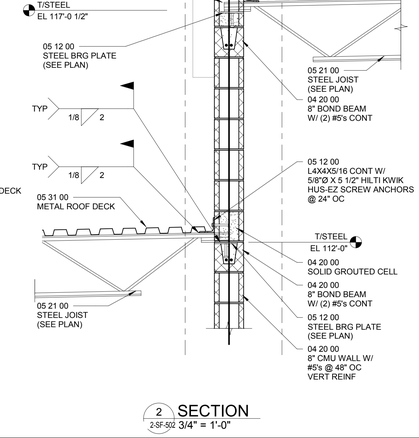
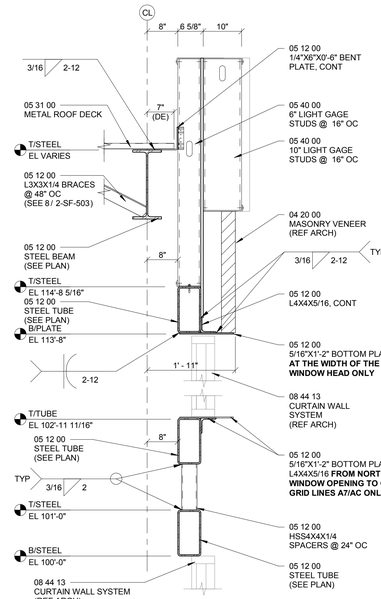


2 SECTION
2-SF-502 3/4" = 1'-0"



1 SECTION
2-SF-502 3/4" = 1'-0"

PRELIMINARY - NOT FOR CONSTRUCTION

6/6/2019 3:28:15 PM BIM 360://Manawa Schools/31180284- Manawa HS- R18.rvt

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Appleton, WI 54913-8100
920.734.9870 Fax: 920.734.9880
www.larsonengr.com © 2019 LEI
Project Number: 31180284.000

MANAWA

ADDITIONS AND REMODELING FOR:
MANAWA MIDDLE & HIGH SCHOOL
2101 SCHAEFER CIRCLE, APPLTON, WI 54915

MARK	DATE
ISSUED:	06-06-19
PROJECT NO:	18268
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CHECKED BY:	LAW

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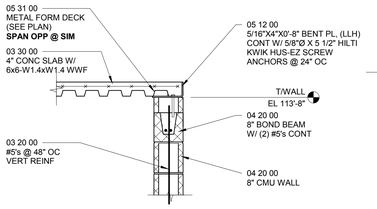
SHEET TITLE:
FRAMING DETAILS

SHEET NUMBER:
2-SF-502



15 SECTION
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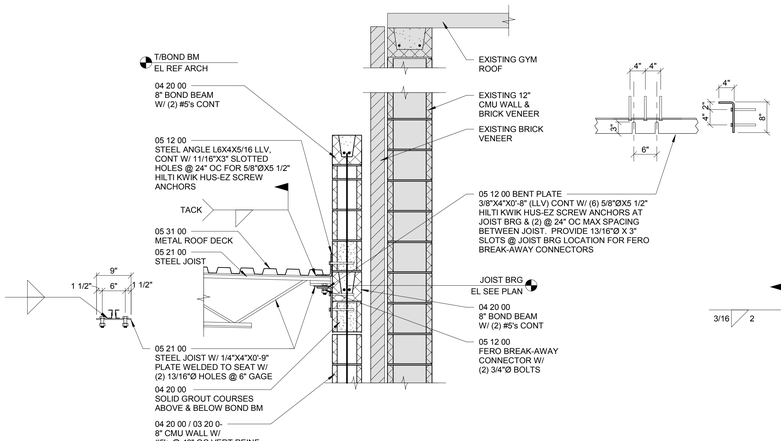

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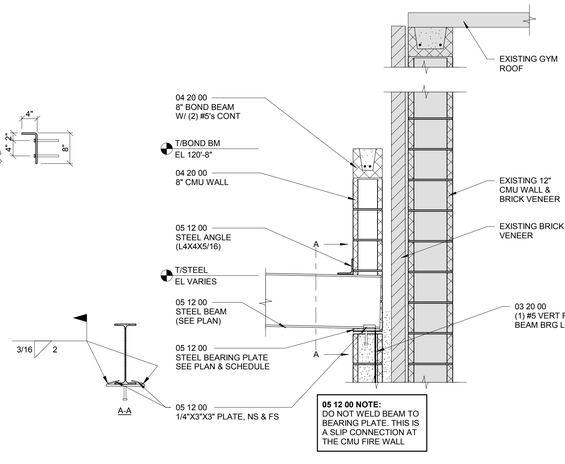

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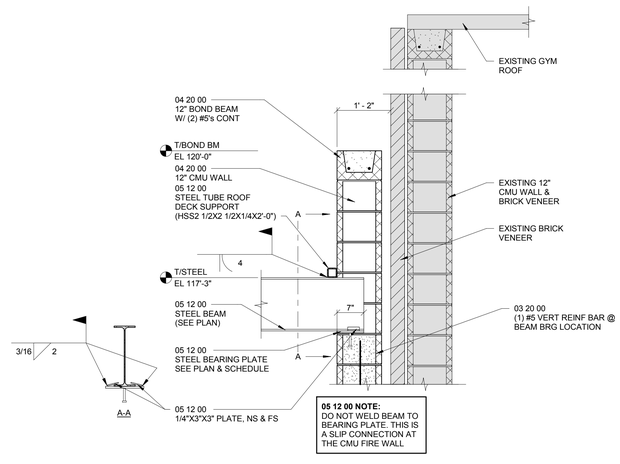

12 SECTION
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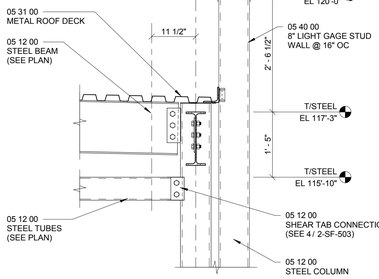

11 SECTION
2-SF-503 3/4" = 1'-0"

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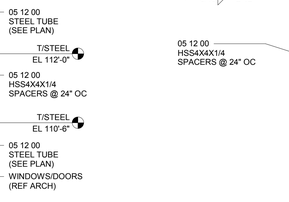

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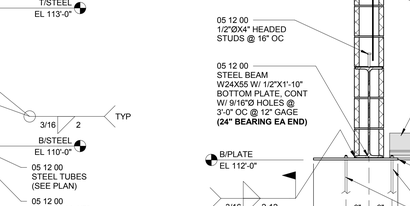
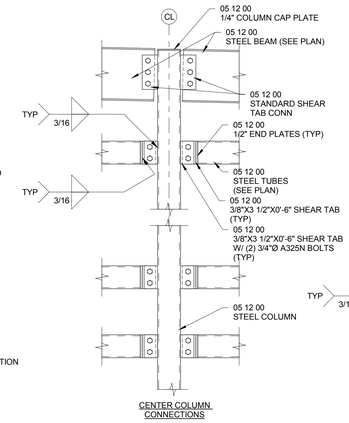


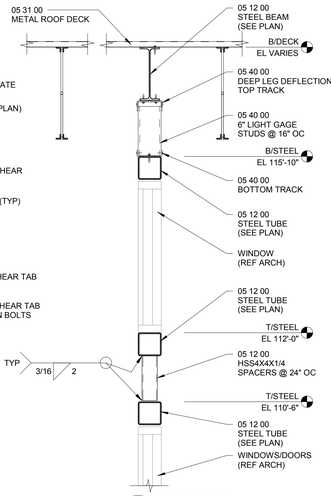
8 SECTION
2-SF-503 3/4" = 1'-0"

7 SECTION
2-SF-503 3/4" = 1'-0"

6 SECTION
2-SF-503 3/4" = 1'-0"

5 SECTION
2-SF-503 3/4" = 1'-0"





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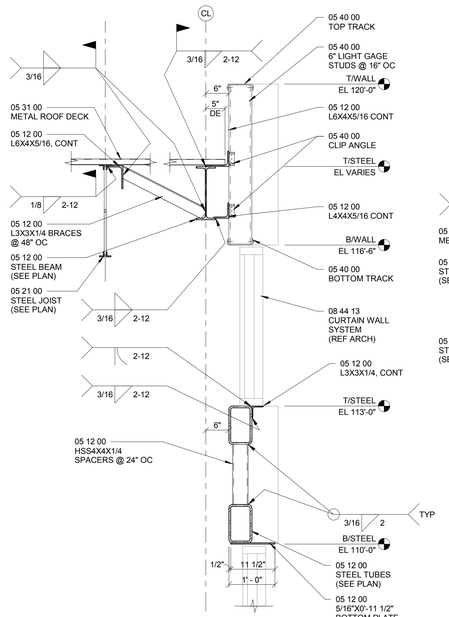
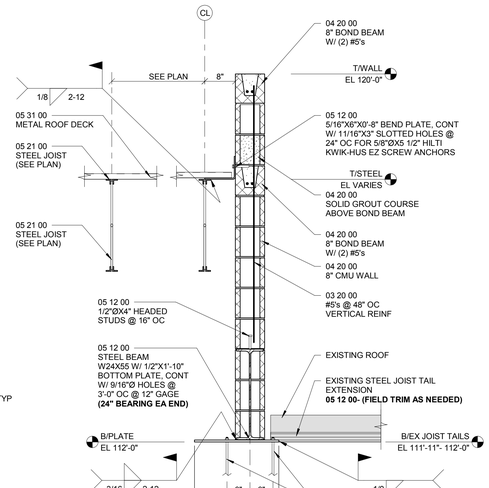


3 SECTION
2-SF-503 3/4" = 1'-0"



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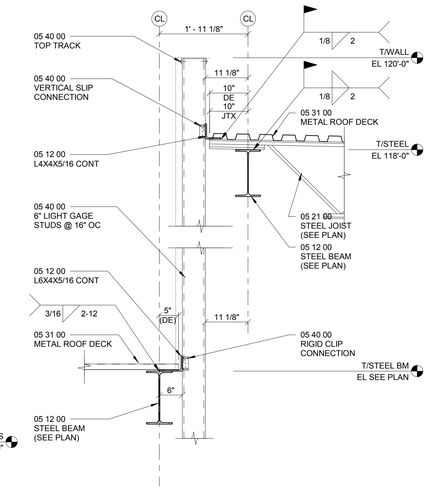

1 SECTION
2-SF-503 3/4" = 1'-0"

PRELIMINARY NOT FOR CONSTRUCTION

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CONSULTANT:
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920.734.9877 FAX: 920.734.9880
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Project Number: 31180284.000

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PROJECT NO:	18268
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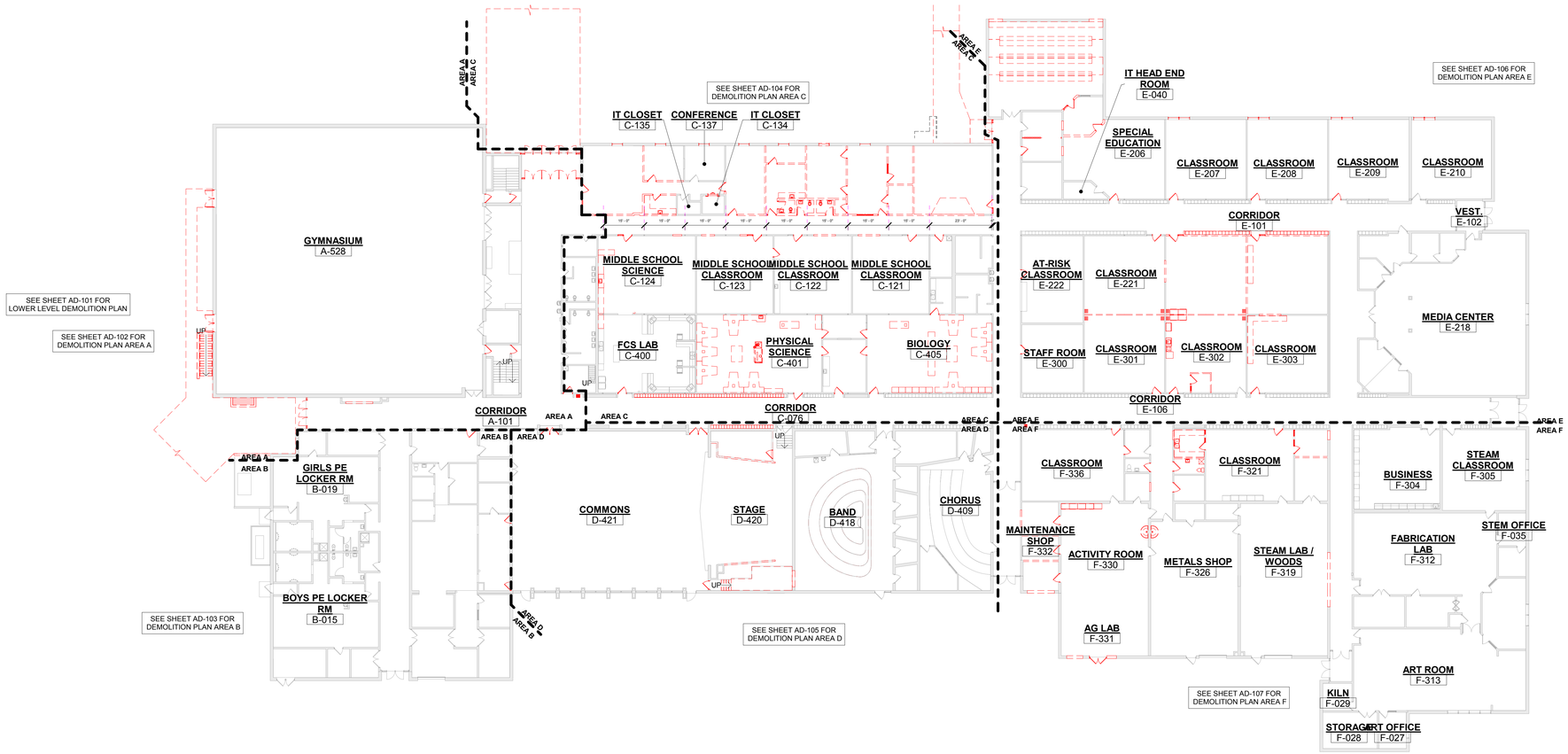
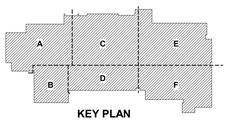
SHEET TITLE:
FRAMING
DETAILS

SHEET NUMBER:
2-SF-503



1 OVERALL FIRST FLOOR DEMOLITION PLAN

SCALE 1" = 20'-0"
AS REFERENCED BY: 2 / 2-AD-104



KEY PLAN

TRUE NORTH

PLAN NORTH

FOR BIDS
NOT FOR CONSTRUCTION

Hoffman
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CONSULTANT:

MANAWA

MANAWA ELEMENTARY SCHOOL - ALTERATIONS
MANAWA MIDDLE/HIGH SCHOOL - ADDITIONS & ALTERATIONS
PART 2 - MANAWA MIDDLE / HIGH SCHOOL
515 E. 4th STREET
MANAWA, WI 54949

MARK	DATE

ISSUED: 6 JUN 2019
PROJECT NO: 18268
CAD DWG FILE:
DRAWN BY: Author
CHECKED BY: Checker

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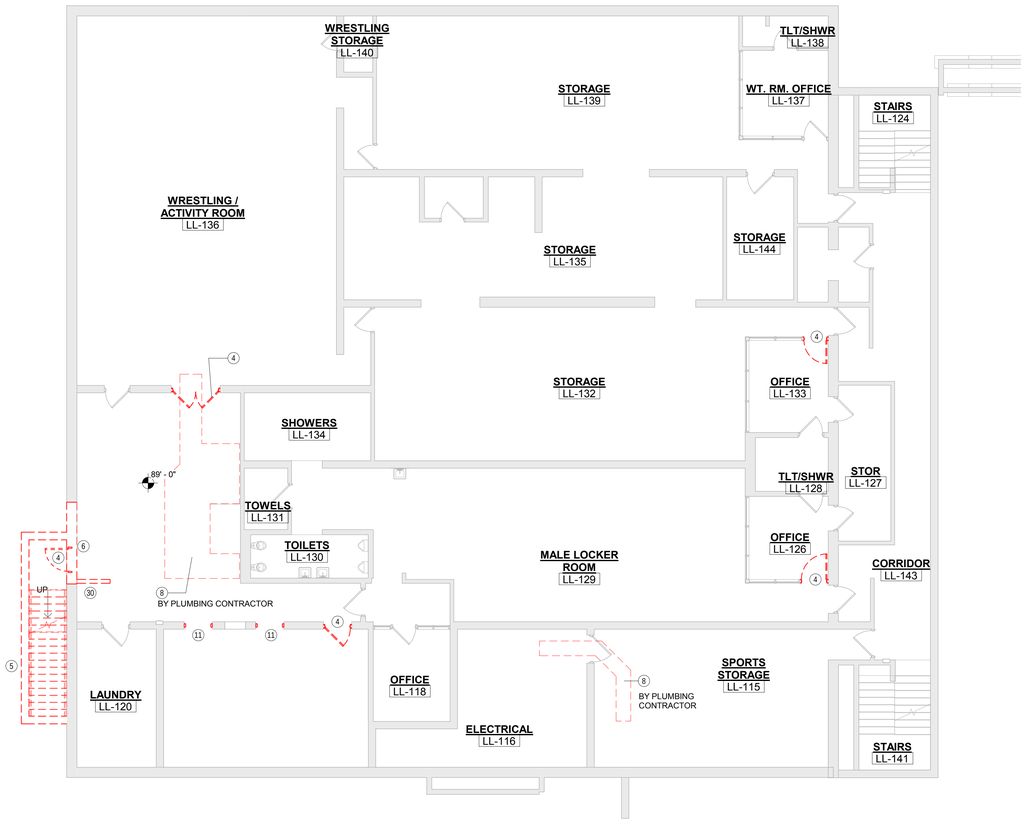
SHEET TITLE:
OVERALL DEMOLITION PLAN

SHEET NUMBER:
2-AD-100



1 LOWER FLOOR DEMOLITION PLAN

SCALE 1/8" = 1'-0"
AS REFERENCED BY: 1C / 2-AE-201

2-AE-202 2

GENERAL DEMOLITION NOTES

1. DEMOLOTION NOTES ON THIS SHEET APPLY TO THE MIDDLE SCHOOL / HIGH SCHOOL PROJECT ONLY.
2. NOT ALL NOTES ARE APPLICABLE TO THIS SHEET.
3. REFERENCE SECTION 02 41 00 FOR ITEMS TO BE REMOVED AND SALVAGED FOR OWNER RE-USE.
4. SEE CEILING DEMOLITION PLANS FOR CEILING DEMOLITION WORK.
5. COORDINATE ALL DEMOLITION WORK WITH NEW CONSTRUCTION. REFER TO AE SHEETS THIS SET.
6. REFERENCE MECHANICAL, PLUMBING, ELECTRICAL DEMOLITION PLANS FOR ADDITIONAL INFORMATION.
7. IN AREAS SCHEDULED TO RECIEVE NEW FLOORING. REMOVE ALL FLOORING, SETTING BEDS, MASTICS, ADHESIVES AND PREPARE FLOOR TO RECEIVE NEW FINISHES. REFER TO SECTION 09 XX XX - FOR ADDITIONAL INFORMATION.

DEMOLITION NOTES KEY

NO.	DESCRIPTION
1	02 41 00 B1 - REMOVE STUD WALL
2	02 41 00 A2 - REMOVE FOUNDATION COMPLETELY
3	02 41 00 - REMOVE DOOR SYSTEM IN ITS ENTIRETY
4	02 41 00 D1 - REMOVE DOOR, FRAME AND THRESHOLD
5	02 41 00 - REMOVE CONC STAIRS, FDTN WALLS, FTNGS, SLABS IN THEIRE ENTIRETY
6	02 41 00 - REMOVE PORTION OF WALL TO ALLOW FOR NEW DOOR OR WINDOW
7	02 41 00 - REMOVE HVAC EQUIP, CONC. ENCLOSURE WALLS AND FDTN
8	02 41 00 C2 - SAWCUT AND REMOVE PORTLAND CEMENT PAVEMENT
9	0241 00 - REMOVE SUSPENDED CEILING
11	02 41 00 - REMOVE DOOR FRAME
12	02 41 00 - REMOVE GATE AND FRAME
13	02 41 00 - REMOVE DOOR AND TRANSOM PANEL TO ALLOW FOR INSTALLATION OF NEW DOOR AND TRANSOM PANEL
14	02 41 00 - EQUIPMENT/FURNISHINGS TO BE REMOVED BY OWNER
15	02 41 00 - REMOVE LOCKERS AND STORE FOR POTENTIAL OWNER'S RE-USE
16	02 41 00 - REMOVE BRICK WALL AND ASSOCIATED FOUNDATION AND ADJACENT CONCRETE PAD TO ALLOW FOR NEW CONSTRUCITON
17	02 41 00 - REMOVE COUNTERTOP ASSEMBLY
18	02 41 00 - REMOVE RAISED FLOOR CONSTRUCTION DOWN TO EXISTING CONCRETE SLAB
19	02 41 00 F1 - REMOVE FLOORING AND ADHESIVE
20	02 41 00 - REMOVE PORTION OF WALL TO ALLOW FOR MECHANICAL WORK
21	02 41 00 - REMOVE CASEWORK & CTR TOPS IN THEIR ENTIRETY. REMOVAL OF MECHANICAL, ELECTRICAL AND PLUMBING SYSTEMS SHALL BE BY THE RESPECTIVE CONTRACTOR
22	02 41 00 - REMOVE WINDOW ASSEMBLY IN ITS ENTIRETY
23	02 41 00 - REMOVE RAISED FLOOR IN ITS ENTIRETY
24	02 41 00 P1 - REMOVE FIXTURE - PLUMBING TO DISCONNECT AND CAP.
25	02 41 00 - REMOVE STAIR SYSTEM AND RAILINGS IN THEIR ENTIRETY
26	02 41 00 P2 - REMOVE PLUMBING EQUIPMENT - RELOCATE ROOF DRAIN LEADER
27	02 41 00 B1 - REMOVE WALL/SOFFIT
28	02 41 00 - REMOVE DRENCH SHOWER/EYE WASH STATION, BASIN AND ALL ASSOCIATED PLUMING. REMOVE FLOOR DRAIN AND CAP.
29	02 41 00 H1 - EXISTING FUME HOOD STATION TO BE ROTATED 90 DEGREES AND REMAIN IN GENERAL SAME LOCATION. COORDINATE WITH OWNER.
30	02 41 00 B2 - REMOVE MASONRY WALL
31	02 41 00 G2A- REMOVE FURNISHINGS AND STORE FOR REINSTALLATION
32	02 41 00 F2- REMOVE BASE
33	02 41 00 D1A - REMOVE AND STORE DOOR
34	02 41 00 G1A - REMOVE AND STORE EXISTING CASEWORK
36	02 41 00 - REMOVE LOCKER BASE
37	0241 00 - REMOVE WOOD CEILING
38	02 41 00 - REMOVE PORTION OF ROOF, SOFFIT, FASCIA AND ASSOCIATED FRAMING
39	02 41 00 - REMOVE WOOD FRAMED WALL / SOFFIT INCLUDING ANY / ALL GYPSUM BOARD FINISHES AND/OR WOOD PANELING FINISH ABOVE EXISTING CEILING
40	0241 00 - REMOVE WOOD CEILING
41	02 41 00 - REMOVE WOOD FRAMING / BLOCKING

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Planning, Design & Construction, Inc.
800.236.2370 | hoffman.net

CONSULTANT:

MANAWA

MANAWA ELEMENTARY SCHOOL - ALTERATIONS
MANAWA MIDDLE/HIGH SCHOOL - ADDITIONS & ALTERATIONS
PART 2 - MANAWA MIDDLE / HIGH SCHOOL
515 E. 4th STREET
MANAWA, WI 54949

MARK	DATE

ISSUED: 6 JUN 2019
PROJECT NO: 18268
CAD DWG FILE:
DRAWN BY: Author
CHECKED BY: Checker

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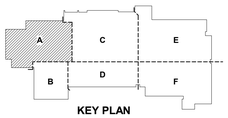
SHEET TITLE:
DEMOLITION PLAN - LOWER LEVEL

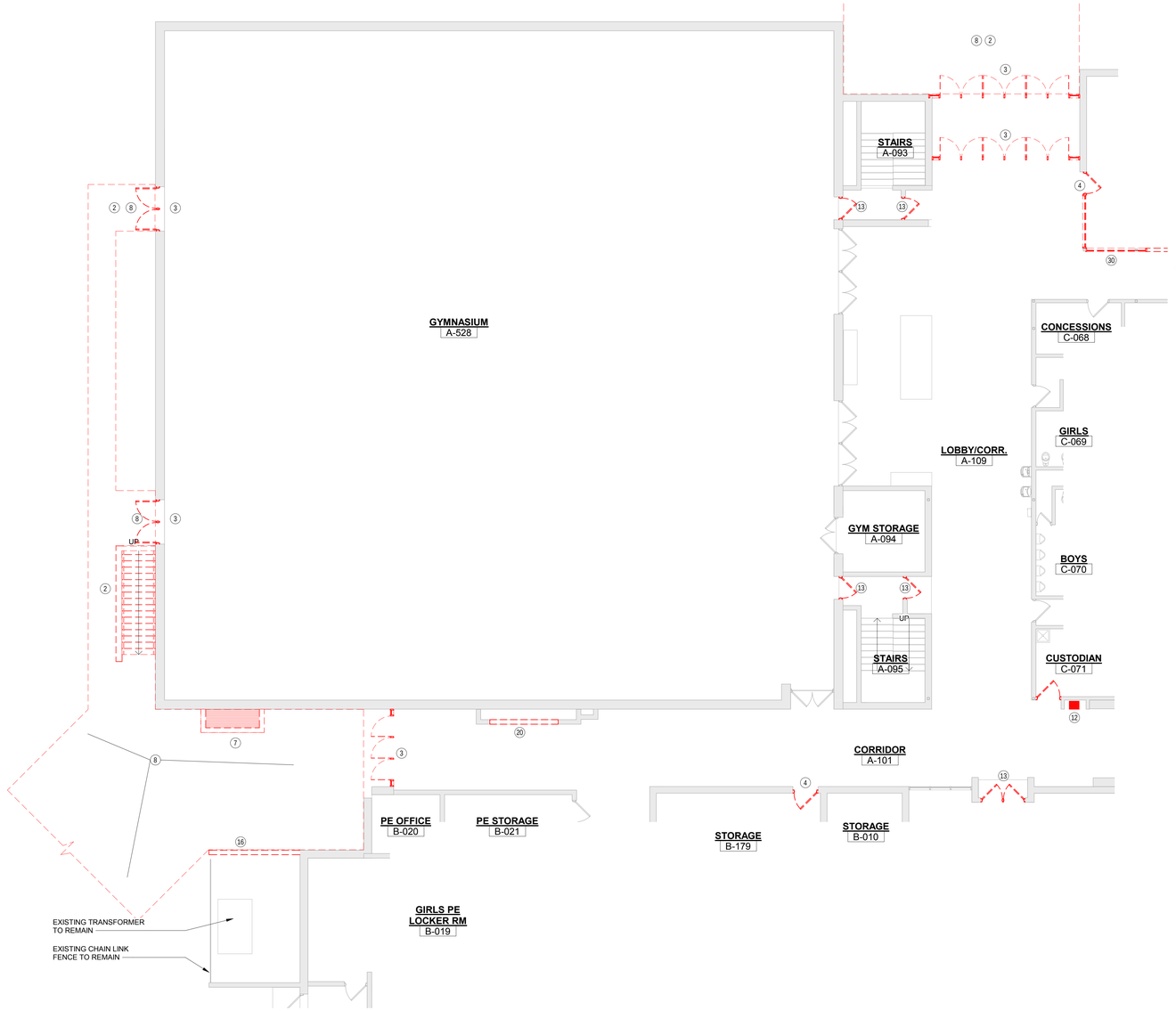
SHEET NUMBER:
2-AD-101



KEY PLAN

TRUE NORTH
PLAN NORTH

FOR BIDS
NOT FOR CONSTRUCTION



1 FIRST FLOOR DEMOLITION PLAN - AREA A

SCALE 1/8" = 1'-0"
AS REFERENCED BY: 2 / 2-AD-104

GENERAL DEMOLITION NOTES

1. DEMOLOTION NOTES ON THIS SHEET APPLY TO THE MIDDLE SCHOOL / HIGH SCHOOL PROJECT ONLY.
2. NOT ALL NOTES ARE APPLICABLE TO THIS SHEET.
3. REFERENCE SECTION 02 41 00 FOR ITEMS TO BE REMOVED AND SALVAGED FOR OWNER RE-USE.
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(#) DEMOLITION NOTES KEY

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41	02 41 00 - REMOVE WOOD FRAMING / BLOCKING

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CONSULTANT:

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515 E. 4th STREET
MANAWA, WI 54949

MARK	DATE
ISSUED:	6 JUN 2019
PROJECT NO:	18268
CAD DWG FILE:	
DRAWN BY:	Author
CHECKED BY:	Checker

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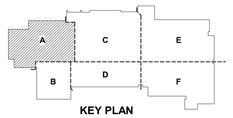
SHEET TITLE:
DEMOLITION PLAN - AREA A

SHEET NUMBER:
2-AD-102



KEY PLAN

TRUE NORTH
PLAN NORTH

FOR BIDS
NOT FOR CONSTRUCTION

1 FIRST FLOOR DEMOLITION PLAN - AREA B

SCALE 1/8" = 1'-0"
AS REFERENCED BY: 2 / 2-AD-104

GENERAL DEMOLITION NOTES

1. DEMOLOTION NOTES ON THIS SHEET APPLY TO THE MIDDLE SCHOOL / HIGH SCHOOL PROJECT ONLY.
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(#) DEMOLITION NOTES KEY

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2	02 41 00 A2 - REMOVE FOUNDATION COMPLETELY
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DRAWN BY: Author
CHECKED BY: Checker

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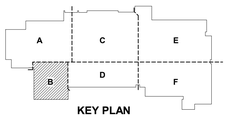
SHEET TITLE:
DEMOLITION PLAN - AREA B

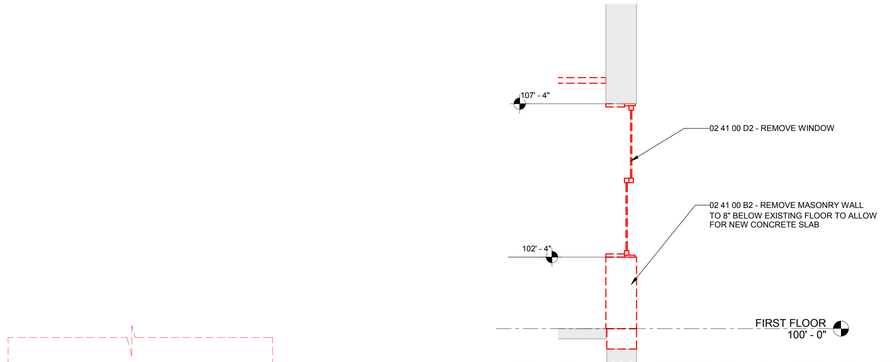
SHEET NUMBER:
2-AD-103



KEY PLAN

TRUE NORTH
PLAN NORTH

FOR BIDS
NOT FOR CONSTRUCTION



2 AREA C - WALL SECTION 6 - DEMO WORK

SCALE 1/2" = 1'-0"
AS REFERENCED BY: 1 / 2-AD-104

SEE SITE PLANS FOR ADDITIONAL SITE DEMOLITION INFORMATION

TYPICAL OF (7) WINDOWS THIS WALL

STAIRS A-093
OFFICE
ROOM NAME
CONFERENCE C-137
NURSE OFFICE
PRINCIPAL
HEALTH
GUIDANCE
TOILET E-037
ELECT. E-039
WORK
IT CLOSET C-135
IT CLOSET C-134
T.
W.
M.
CORRIDOR C-133
CONCESSIONS C-068
MIDDLE SCHOOL SCIENCE C-124
MIDDLE SCHOOL CLASSROOM C-123
MIDDLE SCHOOL CLASSROOM C-122
MIDDLE SCHOOL CLASSROOM C-121
CUSTODIAN C-072
GIRLS C-073
CORRIDOR E-107
SCIENCE STORAGE C-075
BOYS C-074
GIRLS C-069
LOBBY/CORR. A-109
GYM STORAGE A-094
BOYS C-070
FCS LAB C-400
KEEP DRAIN
SCIENCE OFFICE C-067
PHYSICAL SCIENCE C-401
SCIENCE STORAGE C-066
BIOLOGY C-405
STAIRS A-095
CUSTODIAN C-071
UP
CONCRETE BASE TO REMAIN
CORRIDOR C-076
LOCKER AND FIRE EXTINGUISHER CABINET TO REMAIN
AREA B
AREA D
STORAGE B-010
OFFICE D-065
INSTRUMENT STORAGE D-059
MUSIC LIBRARY D-057

1 FIRST FLOOR DEMOLITION PLAN - AREA C

SCALE 1/8" = 1'-0"
AS REFERENCED BY: 2 / 2-AD-104

GENERAL DEMOLITION NOTES

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NO.	DESCRIPTION
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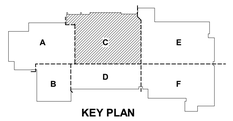
SHEET TITLE:
DEMOLITION PLAN - AREA C

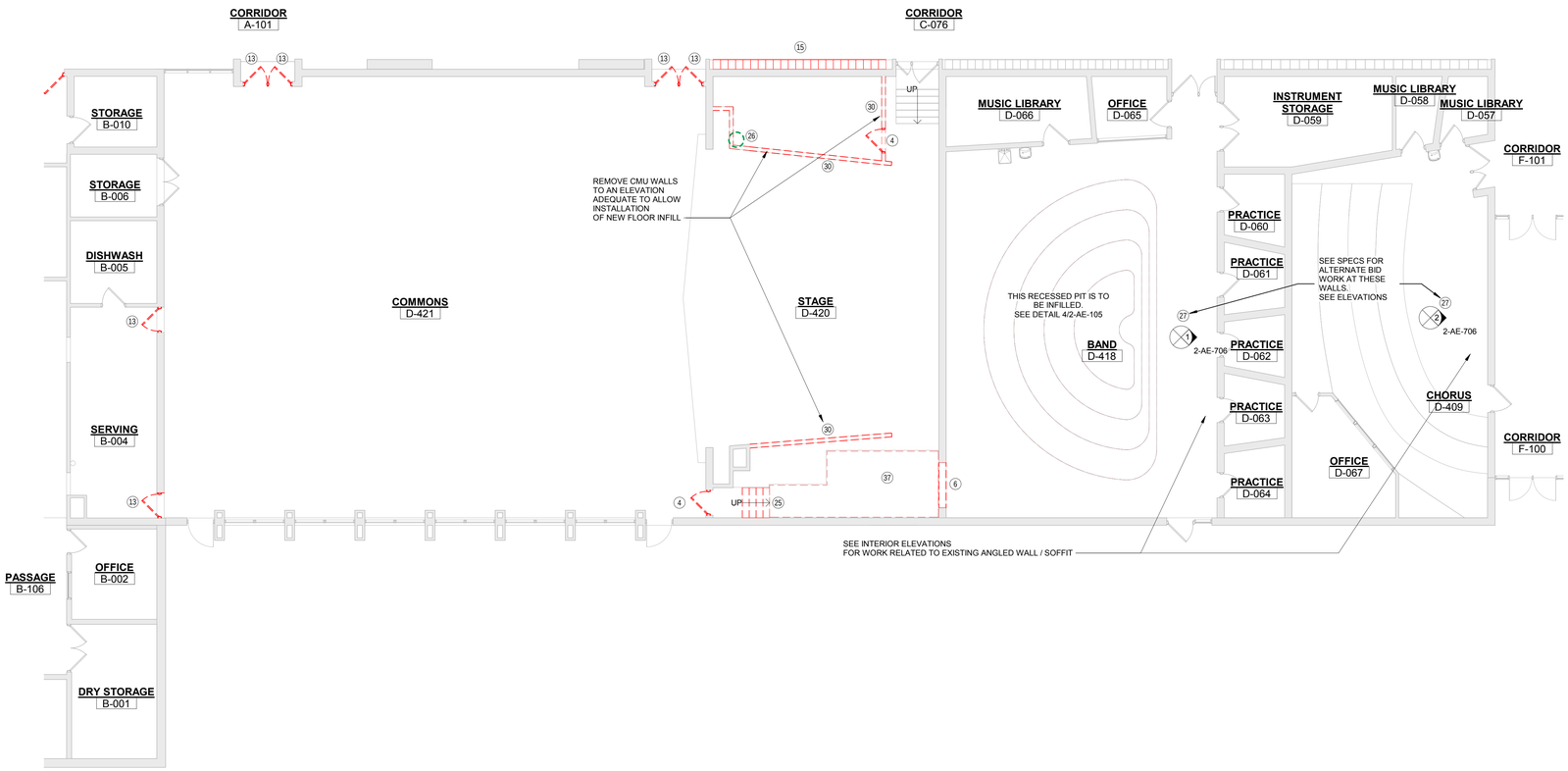
SHEET NUMBER:
2-AD-104



KEY PLAN

TRUE NORTH
PLAN NORTH

FOR BIDS
NOT FOR CONSTRUCTION



1 FIRST FLOOR DEMOLITION PLAN - AREA D

SCALE 1/8" = 1'-0"
AS REFERENCED BY: 2 / 2-AD-104

GENERAL DEMOLITION NOTES

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4. SEE CEILING DEMOLITION PLANS FOR CEILING DEMOLITION WORK.
5. COORDINATE ALL DEMOLITION WORK WITH NEW CONSTRUCTION. REFER TO AE SHEETS THIS SET.
6. REFERENCE MECHANICAL, PLUMBING, ELECTRICAL DEMOLITION PLANS FOR ADDITIONAL INFORMATION.
7. IN AREAS SCHEDULED TO RECIEVE NEW FLOORING. REMOVE ALL FLOORING, SETTING BEDS, MASTICS, ADHESIVES AND PREPARE FLOOR TO RECEIVE NEW FINISHES. REFER TO SECTION 09 XX XX - FOR ADDITIONAL INFORMATION.

(#) DEMOLITION NOTES KEY

NO.	DESCRIPTION
1	02 41 00 B1 - REMOVE STUD WALL
2	02 41 00 A2 - REMOVE FOUNDATION COMPLETELY
3	02 41 00 - REMOVE DOOR SYSTEM IN ITS ENTIRETY
4	02 41 00 D1 - REMOVE DOOR, FRAME AND THRESHOLD
5	02 41 00 - REMOVE CONC STAIRS, FDTN WALLS, FTNGS, SLABS IN THEIRE ENTIRETY
6	02 41 00 - REMOVE PORTION OF WALL TO ALLOW FOR NEW DOOR OR WINDOW
7	02 41 00 - REMOVE HVAC EQUIP, CONC. ENCLOSURE WALLS AND FDTN
8	02 41 00 C2 - SAWCUT AND REMOVE PORTLAND CEMENT PAVEMENT
9	0241 00 - REMOVE SUSPENDED CEILING
11	02 41 00 - REMOVE DOOR FRAME
12	02 41 00 - REMOVE GATE AND FRAME
13	02 41 00 - REMOVE DOOR AND TRANSOM PANEL TO ALLOW FOR INSTALLATION OF NEW DOOR AND TRANSOM PANEL
14	02 41 00 - EQUIPMENT/FURNISHINGS TO BE REMOVED BY OWNER
15	02 41 00 - REMOVE LOCKERS AND STORE FOR POTENTIAL OWNER'S RE-USE
16	02 41 00 - REMOVE BRICK WALL AND ASSOCIATED FOUNDATION AND ADJACENT CONCRETE PAD TO ALLOW FOR NEW CONSTRUCITON
17	02 41 00 - REMOVE COUNTERTOP ASSEMBLY
18	02 41 00 - REMOVE RAISED FLOOR CONSTRUCTION DOWN TO EXISTING CONCRETE SLAB
19	02 41 00 F1 - REMOVE FLOORING AND ADHESIVE
20	02 41 00 - REMOVE PORTION OF WALL TO ALLOW FOR MECHANICAL WORK
21	02 41 00 - REMOVE CASEWORK & CTR TOPS IN THEIR ENTIRETY. REMOVAL OF MECHANICAL, ELECTRICAL AND PLUMBING SYSTEMS SHALL BE BY THE RESPECTIVE CONTRACTOR
22	02 41 00 - REMOVE WINDOW ASSEMBLY IN ITS ENTIRETY
23	02 41 00 - REMOVE RAISED FLOOR IN ITS ENTIRETY
24	02 41 00 P1 - REMOVE FIXTURE - PLUMBING TO DISCONNECT AND CAP.
25	02 41 00 - REMOVE STAIR SYSTEM AND RAILINGS IN THEIR ENTIRETY
26	02 41 00 P2 - REMOVE PLUMBING EQUIPMENT - RELOCATE ROOF DRAIN LEADER
27	02 41 00 B1 - REMOVE WALL/SOFFIT
28	02 41 00 - REMOVE DRENCH SHOWER/EYE WASH STATION, BASIN AND ALL ASSOCIATED PLUMING. REMOVE FLOOR DRAIN AND CAP.
29	02 41 00 H1 - EXISTING FUME HOOD STATION TO BE ROTATED 90 DEGREES AND REMAIN IN GENERAL SAME LOCATION. COORDINATE WITH OWNER.
30	02 41 00 B2 - REMOVE MASONRY WALL
31	02 41 00 G2A- REMOVE FURNISHINGS AND STORE FOR REINSTALLATION
32	02 41 00 F2- REMOVE BASE
33	02 41 00 D1A - REMOVE AND STORE DOOR
34	02 41 00 G1A - REMOVE AND STORE EXISTING CASEWORK
36	02 41 00 - REMOVE LOCKER BASE
37	0241 00 - REMOVE WOOD CEILING
38	02 41 00 - REMOVE PORTION OF ROOF, SOFFIT, FASCIA AND ASSOCIATED FRAMING
39	02 41 00 - REMOVE WOOD FRAMED WALL / SOFFIT INCLUDING ANY / ALL GYPSUM BOARD FINISHES AND/OR WOOD PANELING FINISH ABOVE EXISTING CEILING
40	0241 00 - REMOVE WOOD CEILING
41	02 41 00 - REMOVE WOOD FRAMING / BLOCKING

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CONSULTANT:

MANAWA

MANAWA ELEMENTARY SCHOOL - ALTERATIONS
MANAWA MIDDLE/HIGH SCHOOL - ADDITIONS & ALTERATIONS
PART 2 - MANAWA MIDDLE / HIGH SCHOOL
515 E. 4th STREET
MANAWA, WI 54949

MARK	DATE
ISSUED:	6 JUN 2019
PROJECT NO:	18268
CAD DWG FILE:	
DRAWN BY:	Author
CHECKED BY:	Checker

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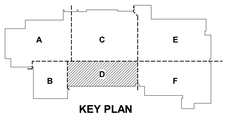


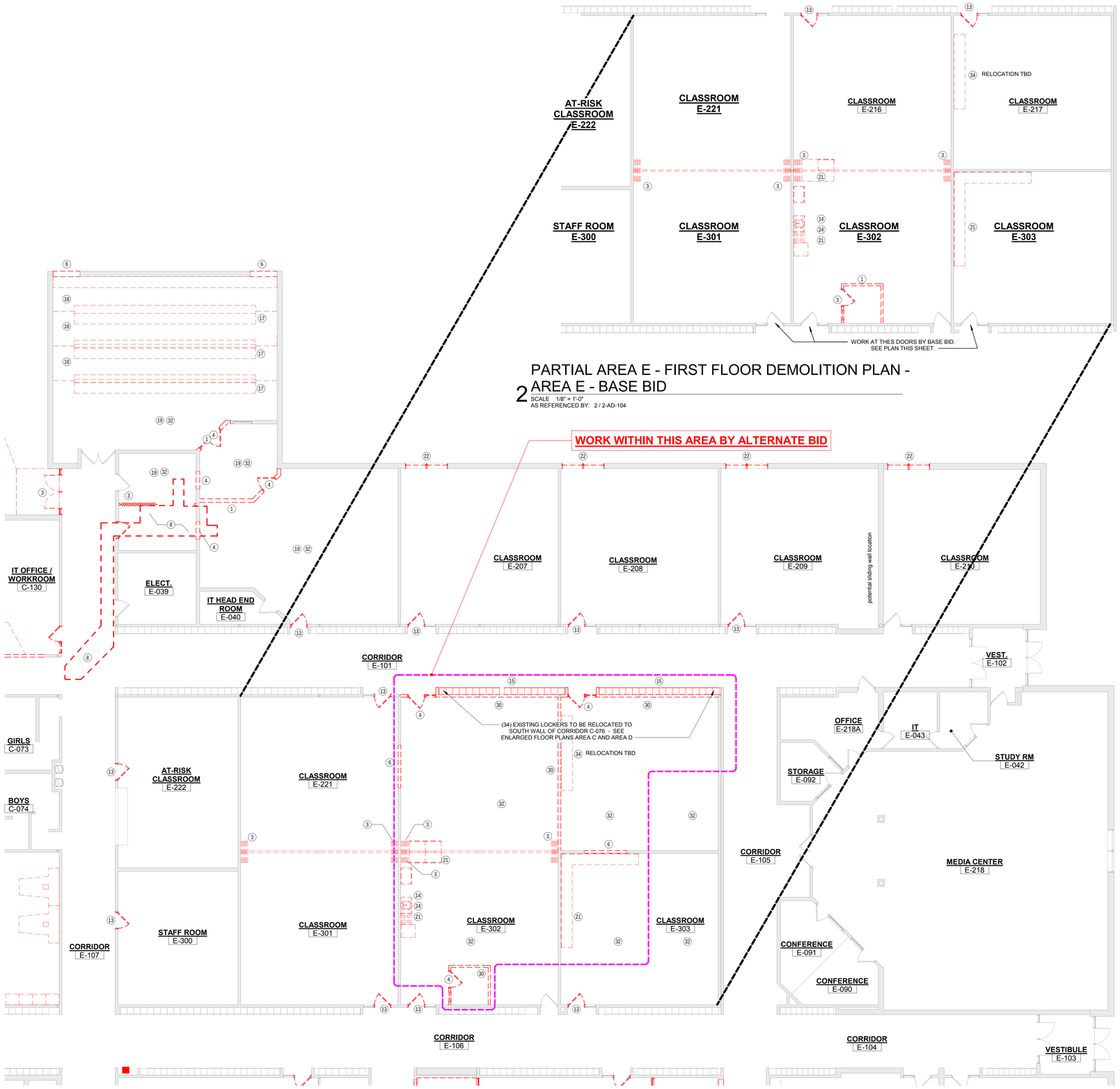
KEY PLAN

TRUE NORTH
PLAN NORTH

FOR BIDS
NOT FOR CONSTRUCTION

SHEET TITLE:
DEMOLITION PLAN - AREA D

SHEET NUMBER:
2-AD-105



2 PARTIAL AREA E - FIRST FLOOR DEMOLITION PLAN - AREA E - BASE BID

SCALE 1/8" = 1'-0"
AS REFERENCED BY: 2 / 2-AD-104

1 FIRST FLOOR DEMOLITION PLAN - AREA E

SCALE 1/8" = 1'-0"
AS REFERENCED BY: 2 / 2-AD-104

GENERAL DEMOLITION NOTES

1. DEMOLOTION NOTES ON THIS SHEET APPLY TO THE MIDDLE SCHOOL / HIGH SCHOOL PROJECT ONLY.
2. NOT ALL NOTES ARE APPLICABLE TO THIS SHEET.
3. REFERENCE SECTION 02 41 00 FOR ITEMS TO BE REMOVED AND SALVAGED FOR OWNER RE-USE.
4. SEE CEILING DEMOLITION PLANS FOR CEILING DEMOLITION WORK.
5. COORDINATE ALL DEMOLITION WORK WITH NEW CONSTRUCTION. REFER TO AE SHEETS THIS SET.
6. REFERENCE MECHANICAL, PLUMBING, ELECTRICAL DEMOLITION PLANS FOR ADDITIONAL INFORMATION.
7. IN AREAS SCHEDULED TO RECIEVE NEW FLOORING. REMOVE ALL FLOORING, SETTING BEDS, MASTICS, ADHESIVES AND PREPARE FLOOR TO RECEIVE NEW FINISHES. REFER TO SECTION 09 XX XX - FOR ADDITIONAL INFORMATION.

(#) DEMOLITION NOTES KEY

NO.	DESCRIPTION
1	02 41 00 B1 - REMOVE STUD WALL
2	02 41 00 A2 - REMOVE FOUNDATION COMPLETELY
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4	02 41 00 D1 - REMOVE DOOR, FRAME AND THRESHOLD
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6	02 41 00 - REMOVE PORTION OF WALL TO ALLOW FOR NEW DOOR OR WINDOW
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25	02 41 00 - REMOVE STAIR SYSTEM AND RAILINGS IN THEIR ENTIRETY
26	02 41 00 P2 - REMOVE PLUMBING EQUIPMENT - RELOCATE ROOF DRAIN LEADER
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28	02 41 00 - REMOVE DRENCH SHOWER/EYE WASH STATION, BASIN AND ALL ASSOCIATED PLUMING. REMOVE FLOOR DRAIN AND CAP.
29	02 41 00 H1 - EXISTING FUME HOOD STATION TO BE ROTATED 90 DEGREES AND REMAIN IN GENERAL SAME LOCATION. COORDINATE WITH OWNER.
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33	02 41 00 D1A - REMOVE AND STORE DOOR
34	02 41 00 G1A - REMOVE AND STORE EXISTING CASEWORK
36	02 41 00 - REMOVE LOCKER BASE
37	0241 00 - REMOVE WOOD CEILING
38	02 41 00 - REMOVE PORTION OF ROOF, SOFFIT, FASCIA AND ASSOCIATED FRAMING
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40	0241 00 - REMOVE WOOD CEILING
41	02 41 00 - REMOVE WOOD FRAMING / BLOCKING

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PART 2 - MANAWA MIDDLE / HIGH SCHOOL
515 E. 4th STREET
MANAWA, WI 54949

MARK	DATE
ISSUED:	6 JUN 2019
PROJECT NO:	18268
CAD DWG FILE:	
DRAWN BY:	Author
CHECKED BY:	Checker

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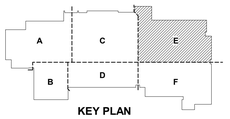

KEY PLAN

TRUE NORTH
PLAN NORTH

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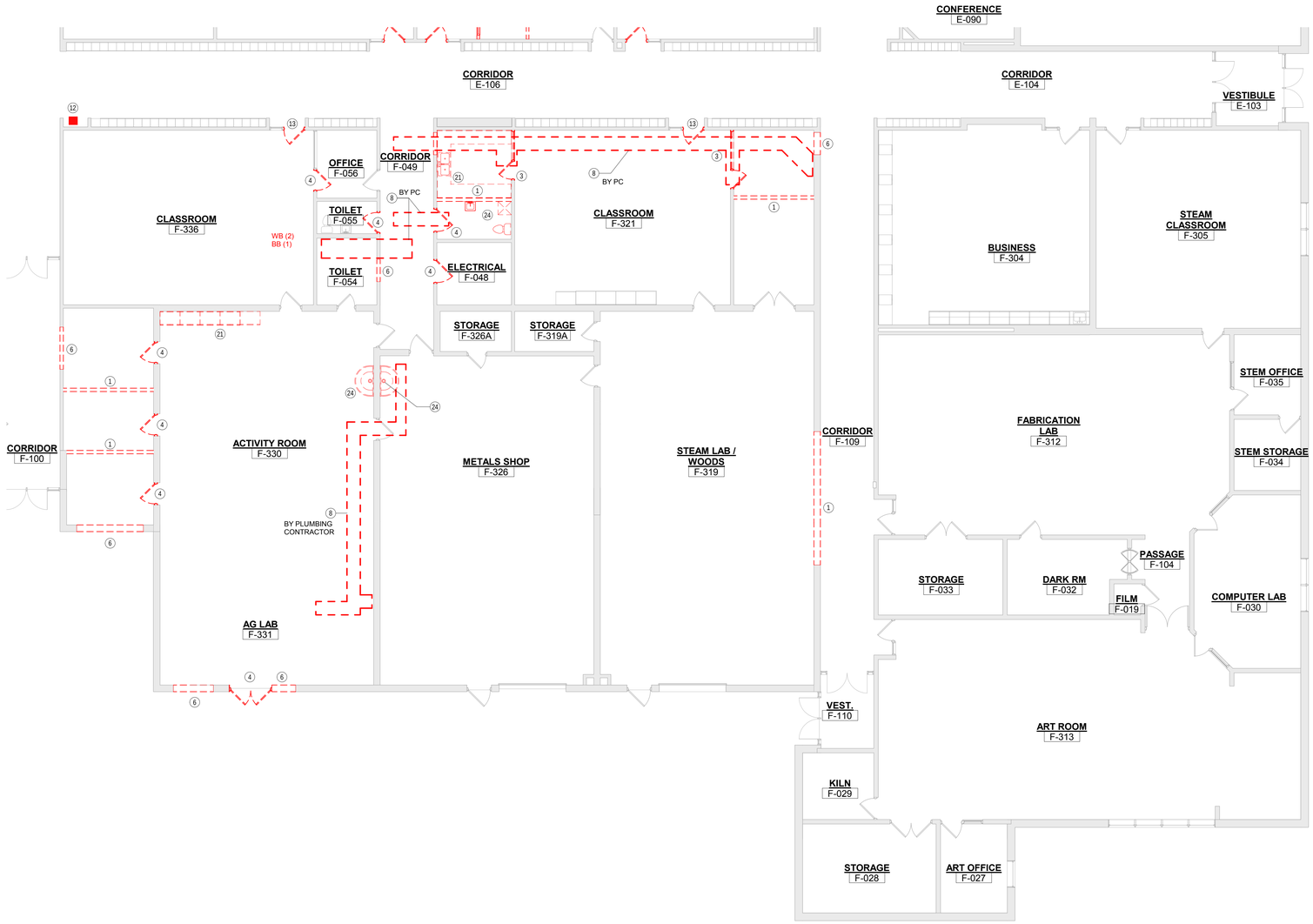
NOT FOR CONSTRUCTION

SHEET TITLE:
DEMOLITION PLAN - AREA E

SHEET NUMBER:
2-AD-106



1 FIRST FLOOR DEMOLITION PLAN - AREA F

SCALE 1/8" = 1'-0"
AS REFERENCED BY: 2 / 2-AD-104

GENERAL DEMOLITION NOTES

1. DEMOLOTION NOTES ON THIS SHEET APPLY TO THE MIDDLE SCHOOL / HIGH SCHOOL PROJECT ONLY.
2. NOT ALL NOTES ARE APPLICABLE TO THIS SHEET.
3. REFERENCE SECTION 02 41 00 FOR ITEMS TO BE REMOVED AND SALVAGED FOR OWNER RE-USE.
4. SEE CEILING DEMOLITION PLANS FOR CEILING DEMOLITION WORK.
5. COORDINATE ALL DEMOLITION WORK WITH NEW CONSTRUCTION. REFER TO AE SHEETS THIS SET.
6. REFERENCE MECHANICAL, PLUMBING, ELECTRICAL DEMOLITION PLANS FOR ADDITIONAL INFORMATION.
7. IN AREAS SCHEDULED TO RECIEVE NEW FLOORING. REMOVE ALL FLOORING, SETTING BEDS, MASTICS, ADHESIVES AND PREPARE FLOOR TO RECEIVE NEW FINISHES. REFER TO SECTION 09 XX XX - FOR ADDITIONAL INFORMATION.

(#) DEMOLITION NOTES KEY

NO.	DESCRIPTION
1	02 41 00 B1 - REMOVE STUD WALL
2	02 41 00 A2 - REMOVE FOUNDATION COMPLETELY
3	02 41 00 - REMOVE DOOR SYSTEM IN ITS ENTIRETY
4	02 41 00 D1 - REMOVE DOOR, FRAME AND THRESHOLD
5	02 41 00 - REMOVE CONC STAIRS, FDTN WALLS, FTNGS, SLABS IN THEIRE ENTIRETY
6	02 41 00 - REMOVE PORTION OF WALL TO ALLOW FOR NEW DOOR OR WINDOW
7	02 41 00 - REMOVE HVAC EQUIP, CONC. ENCLOSURE WALLS AND FDTN
8	02 41 00 C2 - SAWCUT AND REMOVE PORTLAND CEMENT PAVEMENT
9	0241 00 - REMOVE SUSPENDED CEILING
11	02 41 00 - REMOVE DOOR FRAME
12	02 41 00 - REMOVE GATE AND FRAME
13	02 41 00 - REMOVE DOOR AND TRANSOM PANEL TO ALLOW FOR INSTALLATION OF NEW DOOR AND TRANSOM PANEL
14	02 41 00 - EQUIPMENT/FURNISHINGS TO BE REMOVED BY OWNER
15	02 41 00 - REMOVE LOCKERS AND STORE FOR POTENTIAL OWNER'S RE-USE
16	02 41 00 - REMOVE BRICK WALL AND ASSOCIATED FOUNDATION AND ADJACENT CONCRETE PAD TO ALLOW FOR NEW CONSTRUCITON
17	02 41 00 - REMOVE COUNTERTOP ASSEMBLY
18	02 41 00 - REMOVE RAISED FLOOR CONSTRUCTION DOWN TO EXISTING CONCRETE SLAB
19	02 41 00 F1 - REMOVE FLOORING AND ADHESIVE
20	02 41 00 - REMOVE PORTION OF WALL TO ALLOW FOR MECHANICAL WORK
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22	02 41 00 - REMOVE WINDOW ASSEMBLY IN ITS ENTIRETY
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24	02 41 00 P1 - REMOVE FIXTURE - PLUMBING TO DISCONNECT AND CAP.
25	02 41 00 - REMOVE STAIR SYSTEM AND RAILINGS IN THEIR ENTIRETY
26	02 41 00 P2 - REMOVE PLUMBING EQUIPMENT - RELOCATE ROOF DRAIN LEADER
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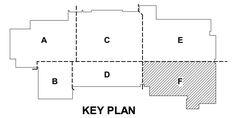
38	02 41 00 - REMOVE PORTION OF ROOF, SOFFIT, FASCIA AND ASSOCIATED FRAMING
39	02 41 00 - REMOVE WOOD FRAMED WALL / SOFFIT INCLUDING ANY / ALL GYPSUM BOARD FINISHES AND/OR WOOD PANELING FINISH ABOVE EXISTING CEILING
40	0241 00 - REMOVE WOOD CEILING
41	02 41 00 - REMOVE WOOD FRAMING / BLOCKING



KEY PLAN

TRUE NORTH

PLAN NORTH

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CONSULTANT:

MANAWA

MANAWA ELEMENTARY SCHOOL - ALTERATIONS
MANAWA MIDDLE/HIGH SCHOOL - ADDITIONS & ALTERATIONS
PART 2 - MANAWA MIDDLE / HIGH SCHOOL
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MANAWA, WI 54949

MARK	DATE
ISSUED:	6 JUN 2019
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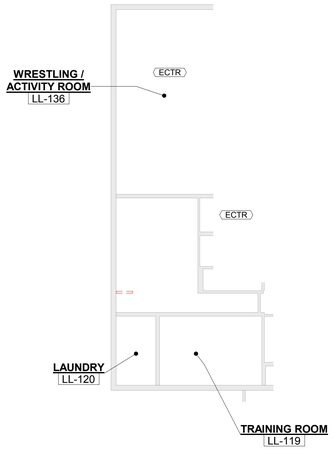
SHEET TITLE:

DEMOLITION PLAN - AREA F

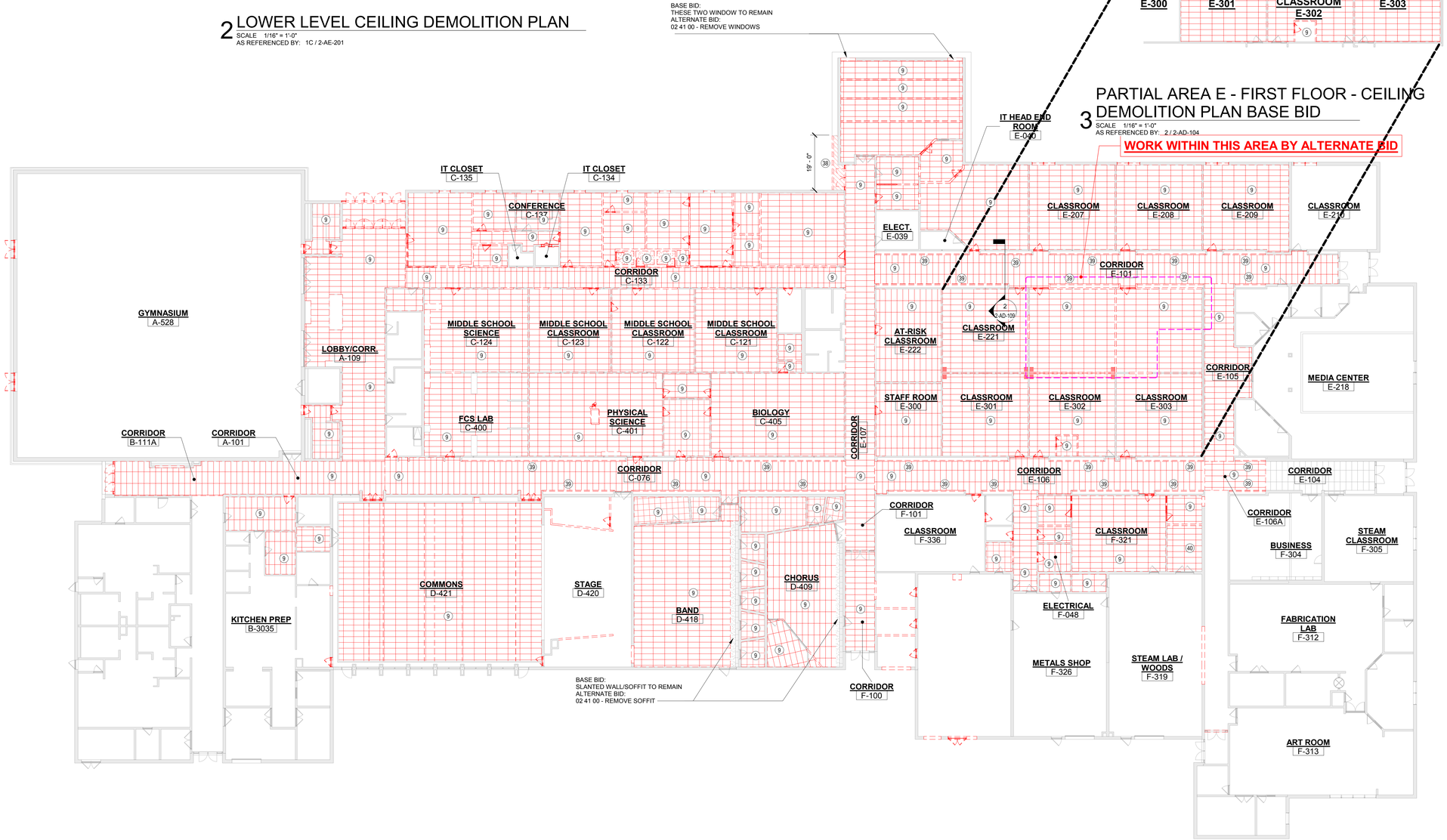
SHEET NUMBER:

2-AD-107



2 LOWER LEVEL CEILING DEMOLITION PLAN

SCALE 1/16" = 1'-0"
AS REFERENCED BY: 1C / 2-AE-201



3 PARTIAL AREA E - FIRST FLOOR - CEILING DEMOLITION PLAN BASE BID

SCALE 1/16" = 1'-0"
AS REFERENCED BY: 2 / 2-AD-104

WORK WITHIN THIS AREA BY ALTERNATE BID

1 FIRST FLOOR CEILING DEMOLITION PLAN

SCALE 1/16" = 1'-0"
AS REFERENCED BY: 2 / 2-AD-104

GENERAL CEILING DEMOLITION NOTES

1. REFERENCE SECTION 02 41 00 FOR ITEMS TO BE REMOVED AND SALVAGED FOR OWNER RE-USE.
2. COORDINATE ALL DEMOLITION WORK WITH NEW CONSTRUCTION. REFER TO AE SHEETS IN THIS SET.
3. REFER TO MECHANICAL, PLUMBING, ELECTRICAL DEMOLTION PLANS FOR ADDITIONAL DEMOLITION INFORMATION.

DEMOLITION NOTES KEY

NO.	DESCRIPTION
1	02 41 00 B1 - REMOVE STUD WALL
2	02 41 00 A2 - REMOVE FOUNDATION COMPLETELY
3	02 41 00 - REMOVE DOOR SYSTEM IN ITS ENTIRETY
4	02 41 00 D1 - REMOVE DOOR, FRAME AND THRESHOLD
5	02 41 00 - REMOVE CONC STARIS, FDTN WALLS, FTNGS, SLABS IN THEIRE ENTIRETY
6	02 41 00 - REMOVE PORTION OF WALL TO ALLOW FOR NEW DOOR OR WINDOW
7	02 41 00 - REMOVE HVAC EQUIP, CONC. ENCLOSURE WALLS AND FDTN
8	02 41 00 C2 - SAWCUT AND REMOVE PORTLAND CEMENT PAVEMENT
9	0241 00 - REMOVE SUSPENDED CEILING
11	02 41 00 - REMOVE DOOR FRAME
12	02 41 00 - REMOVE GATE AND FRAME
13	02 41 00 - REMOVE DOOR AND TRANSOM PANEL TO ALLOW FOR INSTALLATION OF NEW DOOR AND TRANSOM PANEL
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24	02 41 00 P1 - REMOVE FIXTURE - PLUMBING TO DISCONNECT AND CAP.
25	02 41 00 - REMOVE STAIR SYSTEM AND RAILINGS IN THEIR ENTIRETY
26	02 41 00 P2 - REMOVE PLUMBING EQUIPMENT - RELOCATE ROOF DRAIN LEADER
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30	02 41 00 B2 - REMOVE MASONRY WALL
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32	02 41 00 F2- REMOVE BASE
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41	02 41 00 - REMOVE WOOD FRAMING / BLOCKING

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CONSULTANT:

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MANAWA, WI 54949

MARK	DATE

ISSUED: 6 JUN 2019
PROJECT NO: 18268
CAD DWG FILE:
DRAWN BY: Author
CHECKED BY: Checker

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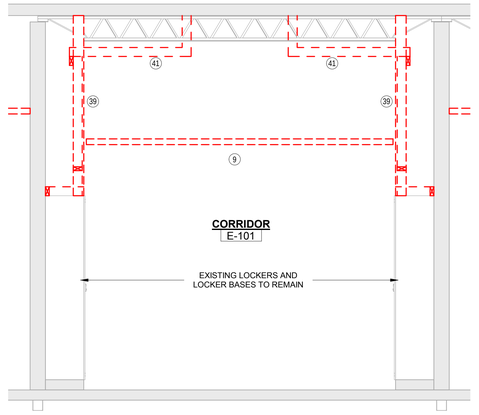
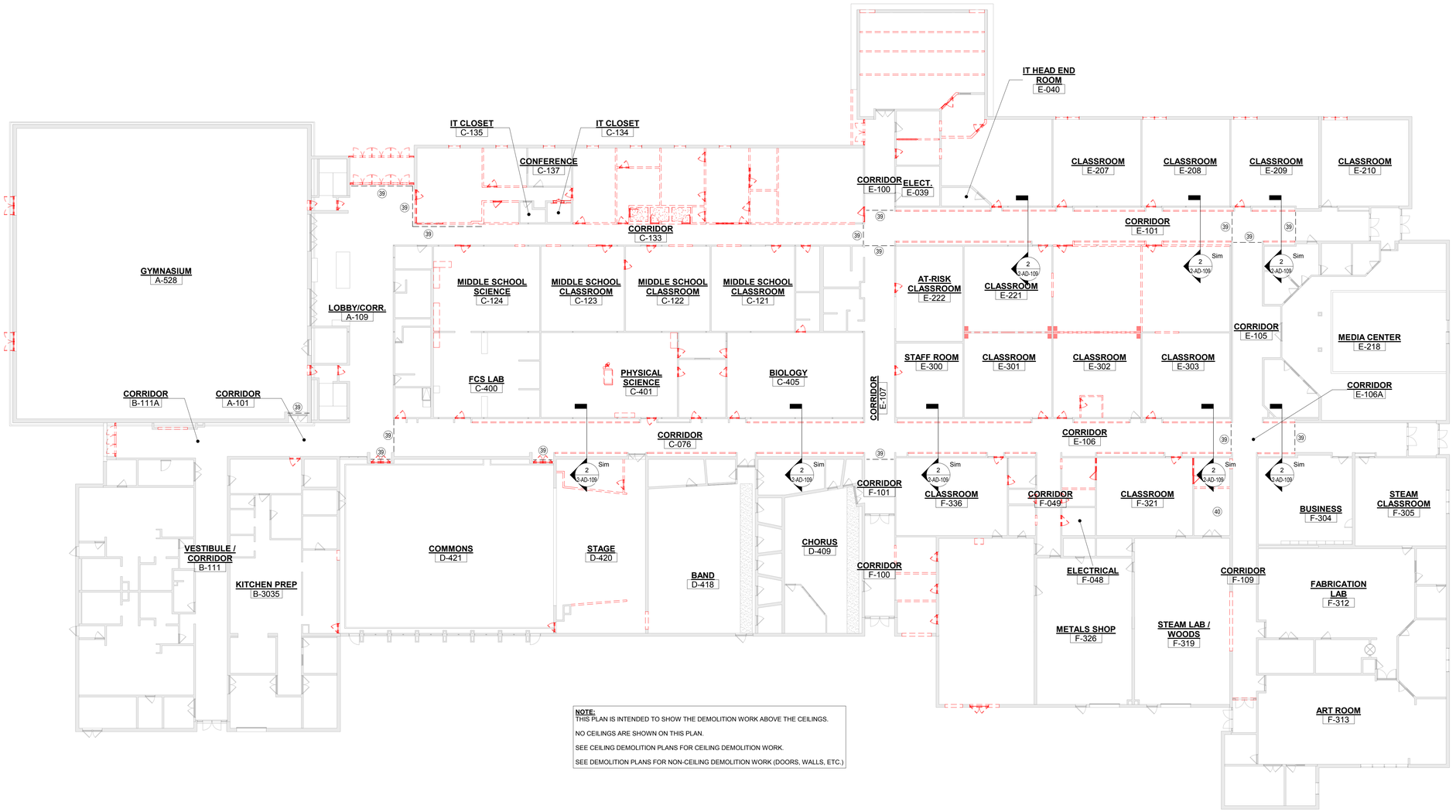
SHEET TITLE:
DEMOLITION PLANS - LL & FIRST FLR. CEILING

SHEET NUMBER:
2-AD-108



2 TYP. CORRIDOR PLENUM DEMOLITION SECTION

SCALE 1/2" = 1'-0"
AS REFERENCED BY: 1 / 2-AD-108



NOTE:
THIS PLAN IS INTENDED TO SHOW THE DEMOLITION WORK ABOVE THE CEILINGS.

NO CEILINGS ARE SHOWN ON THIS PLAN.

SEE CEILING DEMOLITION PLANS FOR CEILING DEMOLITION WORK.

SEE DEMOLITION PLANS FOR NON-CEILING DEMOLITION WORK (DOORS, WALLS, ETC.)

1 FIRST FLOOR CEILING PLENUM DEMOLITION PLAN

SCALE 1/16" = 1'-0"

GENERAL DEMOLITION NOTES

1. DEMOLOTION NOTES ON THIS SHEET APPLY TO THE MIDDLE SCHOOL / HIGH SCHOOL PROJECT ONLY.
2. NOT ALL NOTES ARE APPLICABLE TO THIS SHEET.
3. REFERENCE SECTION 02 41 00 FOR ITEMS TO BE REMOVED AND SALVAGED FOR OWNER RE-USE.
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GENERAL CEILING DEMOLITION NOTES

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KEYNOTE LEGEND

KEY NO.	KEYNOTE TEXT

DEMOLITION NOTES KEY

NO.	DESCRIPTION
1	02 41 00 B1 - REMOVE STUD WALL
2	02 41 00 A2 - REMOVE FOUNDATION COMPLETELY
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4	02 41 00 D1 - REMOVE DOOR, FRAME AND THRESHOLD
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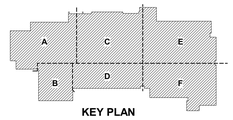
8	02 41 00 C2 - SAWCUT AND REMOVE PORTLAND CEMENT PAVEMENT
9	0241 00 - REMOVE SUSPENDED CEILING
11	02 41 00 - REMOVE DOOR FRAME
12	02 41 00 - REMOVE GATE AND FRAME
13	02 41 00 - REMOVE DOOR AND TRANSOM PANEL TO ALLOW FOR INSTALLATION OF NEW DOOR AND TRANSOM PANEL
14	02 41 00 - EQUIPMENT/FURNISHINGS TO BE REMOVED BY OWNER
15	02 41 00 - REMOVE LOCKERS AND STORE FOR POTENTIAL OWNER'S RE-USE
16	02 41 00 - REMOVE BRICK WALL AND ASSOCIATED FOUNDATION AND ADJACENT CONCRETE PAD TO ALLOW FOR NEW CONSTRUCITON
17	02 41 00 - REMOVE COUNTERTOP ASSEMBLY
18	02 41 00 - REMOVE RAISED FLOOR CONSTRUCTION DOWN TO EXISTING CONCRETE SLAB
19	02 41 00 F1 - REMOVE FLOORING AND ADHESIVE
20	02 41 00 - REMOVE PORTION OF WALL TO ALLOW FOR MECHANICAL WORK
21	02 41 00 - REMOVE CASEWORK & CTR TOPS IN THEIR ENTIRETY. REMOVAL OF MECHANICAL, ELECTRICAL AND PLUMBING SYSTEMS SHALL BE BY THE RESPECTIVE CONTRACTOR
22	02 41 00 - REMOVE WINDOW ASSEMBLY IN ITS ENTIRETY
23	02 41 00 - REMOVE RAISED FLOOR IN ITS ENTIRETY
24	02 41 00 P1 - REMOVE FIXTURE - PLUMBING TO DISCONNECT AND CAP.
25	02 41 00 - REMOVE STAIR SYSTEM AND RAILINGS IN THEIR ENTIRETY
26	02 41 00 P2 - REMOVE PLUMBING EQUIPMENT - RELOCATE ROOF DRAIN LEADER
27	02 41 00 B1 - REMOVE WALL/SOFFIT
28	02 41 00 - REMOVE DRENCH SHOWER/EYE WASH STATION, BASIN AND ALL ASSOCIATED PLUMING. REMOVE FLOOR DRAIN AND CAP.
29	02 41 00 H1 - EXISTING FUME HOOD STATION TO BE ROTATED 90 DEGREES AND REMAIN IN GENERAL SAME LOCATION. COORDINATE WITH OWNER.
30	02 41 00 B2 - REMOVE MASONRY WALL
31	02 41 00 G2A- REMOVE FURNISHINGS AND STORE FOR REINSTALLATION
32	02 41 00 F2- REMOVE BASE
33	02 41 00 D1A - REMOVE AND STORE DOOR
34	02 41 00 G1A - REMOVE AND STORE EXISTING CASEWORK
36	02 41 00 - REMOVE LOCKER BASE
37	0241 00 - REMOVE WOOD CEILING
38	02 41 00 - REMOVE PORTION OF ROOF, SOFFIT, FASCIA AND ASSOCIATED FRAMING
39	02 41 00 - REMOVE WOOD FRAMED WALL / SOFFIT INCLUDING ANY / ALL GYPSUM BOARD FINISHES AND/OR WOOD PANELING FINISH ABOVE EXISTING CEILING
40	0241 00 - REMOVE WOOD CEILING
41	02 41 00 - REMOVE WOOD FRAMING / BLOCKING



KEY PLAN

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CONSULTANT:

MANAWA

MANAWA ELEMENTARY SCHOOL - ALTERATIONS
MANAWA MIDDLE/HIGH SCHOOL - ADDITIONS & ALTERATIONS
PART 2 - MANAWA MIDDLE / HIGH SCHOOL
515 E. 4th STREET
MANAWA, WI 54949

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PROJECT NO:	18268
CAD DWG FILE:	
DRAWN BY:	DG
CHECKED BY:	

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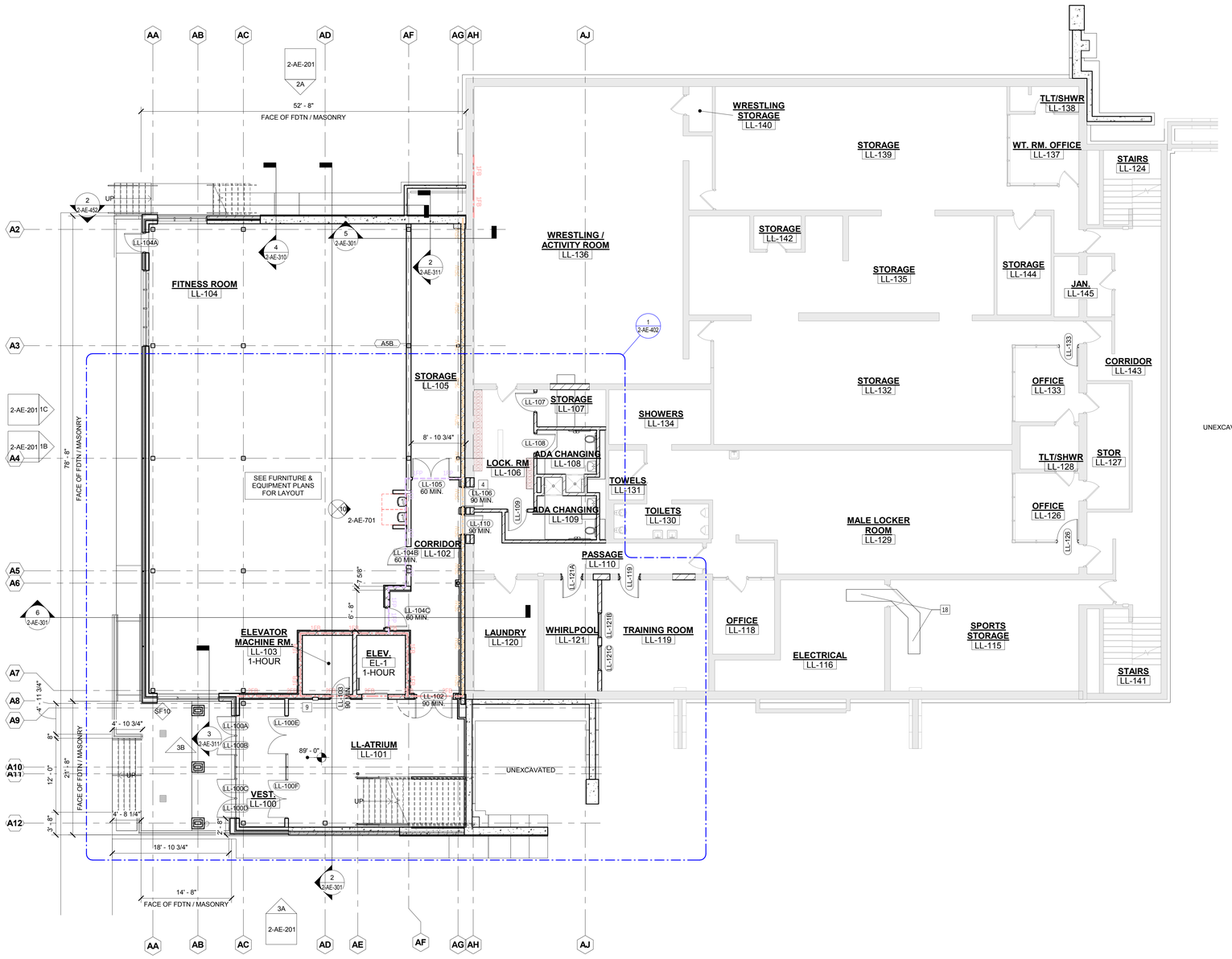
SHEET TITLE:
DEMOLITION PLAN - CEILING PLENUM

SHEET NUMBER:
2-AD-109

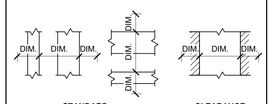


1 LOWER FLOOR PLAN - AREA A

SCALE 1/8" = 1'-0"
AS REFERENCED BY: 1C / 2-AE-201

WALL DIMENSION KEY

NOTE:
ALL WALLS ARE DIMENSIONED TO FACE OF STUD OR FACE OF MASONRY. CLEARANCE DIMENSIONS ARE FROM FACE OF STUDS OR FACE OF MASONRY.



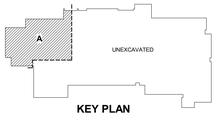
STANDARD DIMENSIONING | CLEARANCE DIMENSIONING

FLOOR PLAN LEGEND

- X — DENOTES WINDOW TYPE. SEE SHEET AE-630 & AE-631
- NIC — DENOTES ITEM NOT IN CONTRACT - BY OWNER
- XXXX — DENOTES WALL TYPE - SEE SHEET AE-501 FOR EXTERIOR AND AE-502 FOR INTERIOR WALLS

PLAN NOTES KEY

NO.	DESCRIPTION
1	SEE DOOR & FRAME SCHEDULE FOR WORK AT THIS DOOR
2	TOOTH IN NEW CMU INTO EXISTING COURSING
3	04 20 00 A2 - PROVIDE SOLID BULLNOSE CAP
4	ENLARGE EXISTING OPENING - SEE STRUCTURAL
5	INSTALL RESILIENT CHANNEL ON SIDE OF WALL WITH THIS #5 NOTATION
6	ROOF DRAIN AND OVERFLOW ROOF DRAIN LEADERS - SEE PLBG DRAWINGS
7	ROOF DRAIN LEADER - SEE PLBG DRAWINGS
8	ROOF OVERFLOW DRAIN LEADER - SEE PLBG DRAWINGS
9	10 44 00 - FIRE EXTINGUISHER IN SEMI-RECESSED CABINET
10	EXTEND MTL STUD/FURRING AND GYP WALL MIN. 4" ABOVE CEILING.
11	33 41 11 B - DOWNSPOUT RECIEVER
12	10 51 00 - RELOCATED LOCKERS FROM SOUTH WALL OF CORRIDOR E-101
13	FINISHED WALL LENGTH SHALL MATCH CASEWORK LENGTH
14	SLOPE EXTERIOR STOOPS AND SLABS FOR DRAINAGE MAX. 2% TO COMPLY WITH ADA.
15	TOP OF WALL TO MATCH TOP OF CASEWORK. PROVIDE 5/8" GYP. BD. CAP
16	33 41 11 - SITE DRAIN
17	09 21 16 F - PROVIDE ABUSE RESISTANT GYPSUM BOARD AT THE EXPOSED AREAS OF THIS WALL
18	03 33 00 - NEW CONCRETE SLAB AT AREA OF REMOVED SLAB. MATCH EXISTING THICKNESS. SLOPE TO DRAIN. IF REQUIRED, REFER TO PLUMBING DRAWINGS.
19	10 51 13 D - NEW SLOPED TOP FOR EXISTING LOCKERS
20	07 71 23 - MANUFACTURED GUTTERS AND DOWNSPOUTS
21	PROVIDE FLOORING, SUB-FLOORING AND STRUCTURAL WOOD JOISTS AS REQUIRED TO PATCH DEMO AREA



KEY PLAN

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CONSULTANT:

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PART 2 - MANAWA MIDDLE / HIGH SCHOOL
515 E. 4th STREET
MANAWA, WI 54949

MARK	DATE
ISSUED:	6 JUN 2019
PROJECT NO:	18268
CAD DWG FILE:	
DRAWN BY:	Author
CHECKED BY:	Checker

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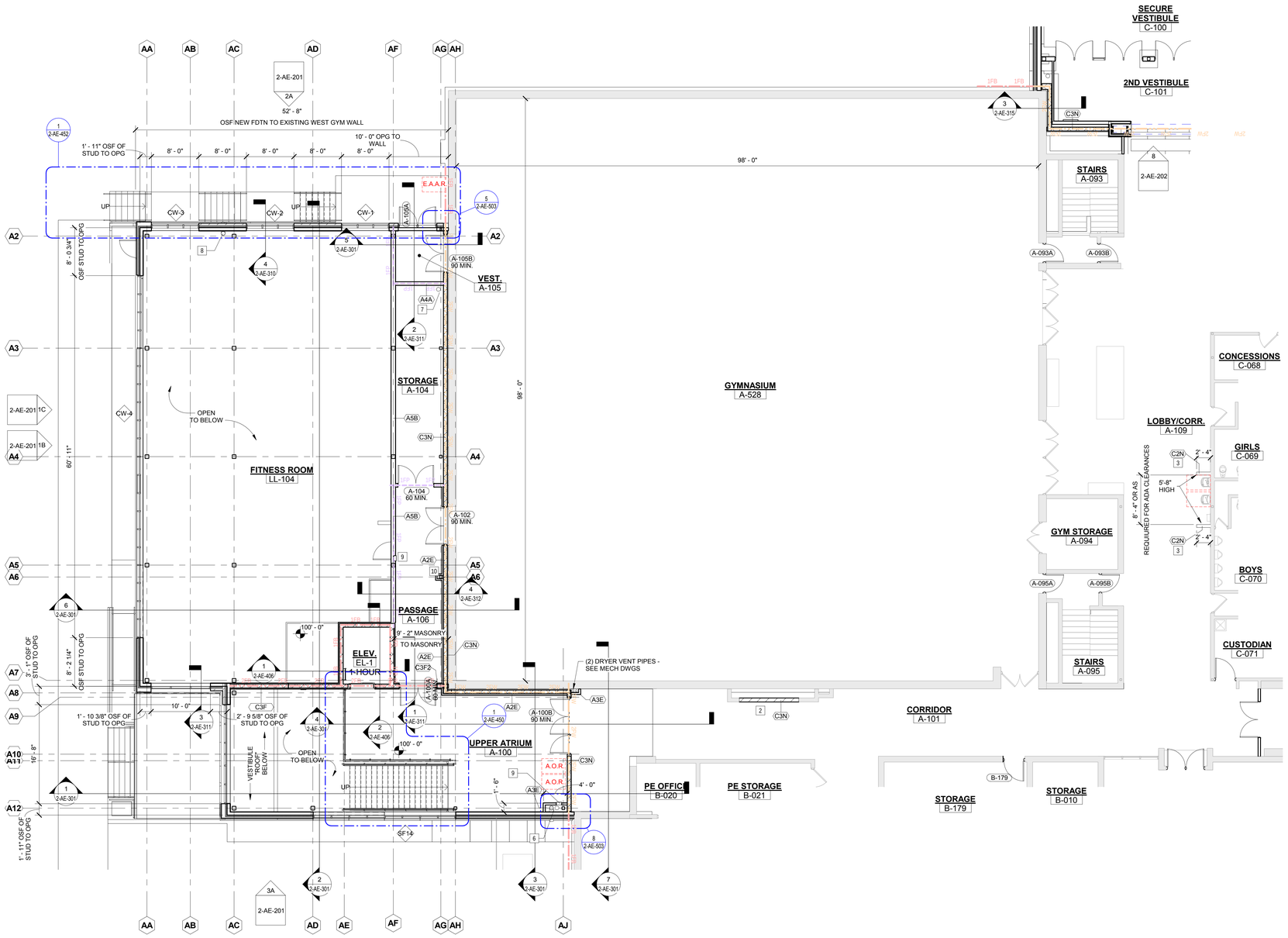
SHEET TITLE:
LOWER LEVEL PLAN

SHEET NUMBER:
2-AE-101

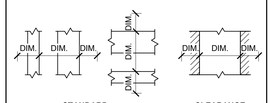


1 FIRST FLOOR PLAN - AREA A

SCALE 1/8" = 1'-0"
AS REFERENCED BY: 2 / 2-AD-104

WALL DIMENSION KEY

NOTE:
ALL WALLS ARE DIMENSIONED TO FACE OF STUD OR FACE OF MASONRY. CLEARANCE DIMENSIONS ARE FROM FACE OF STUDS OR FACE OF MASONRY.



STANDARD DIMENSIONING | CLEARANCE DIMENSIONING

FLOOR PLAN LEGEND

- X — DENOTES WINDOW TYPE. SEE SHEET AE-630 & AE-631
- NIC — DENOTES ITEM NOT IN CONTRACT - BY OWNER
- XXXX — DENOTES WALL TYPE - SEE SHEET AE-501 FOR EXTERIOR AND AE-502 FOR INTERIOR WALLS

PLAN NOTES KEY

NO.	DESCRIPTION
1	SEE DOOR & FRAME SCHEDULE FOR WORK AT THIS DOOR
2	TOOTH IN NEW CMU INTO EXISTING COURSING
3	04 20 00 A2 - PROVIDE SOLID BULLNOSE CAP
4	ENLARGE EXISTING OPENING - SEE STRUCTURAL
5	INSTALL RESILIENT CHANNEL ON SIDE OF WALL WITH THIS #5 NOTATION
6	ROOF DRAIN AND OVERFLOW ROOF DRAIN LEADERS - SEE PLBG DRAWINGS
7	ROOF DRAIN LEADER - SEE PLBG DRAWINGS
8	ROOF OVERFLOW DRAIN LEADER - SEE PLBG DRAWINGS
9	10 44 00 - FIRE EXTINGUISHER IN SEMI-RECESSED CABINET
10	EXTEND MTL STUD/FURRING AND GYP WALL MIN. 4" ABOVE CEILING.
11	33 41 11 B - DOWNSPOUT RECIEVER
12	10 51 00 - RELOCATED LOCKERS FROM SOUTH WALL OF CORRIDOR E-101
13	FINISHED WALL LENGTH SHALL MATCH CASEWORK LENGTH
14	SLOPE EXTERIOR STOOPS AND SLABS FOR DRAINAGE MAX. 2% TO COMPLY WITH ADA.
15	TOP OF WALL TO MATCH TOP OF CASEWORK. PROVIDE 5/8" GYP. BD. CAP
16	33 41 11 - SITE DRAIN
17	09 21 16 F - PROVIDE ABUSE RESISTANT GYPSUM BOARD AT THE EXPOSED AREAS OF THIS WALL.
18	03 33 00 - NEW CONCRETE SLAB AT AREA OF REMOVED SLAB. MATCH EXISTING THICKNESS. SLOPE TO DRAIN. IF REQUIRED. REFER TO PLUMBING DRAWINGS.
19	10 51 13 D - NEW SLOPED TOP FOR EXISTING LOCKERS
20	07 71 23 - MANUFACTURED GUTTERS AND DOWNSPOUTS
21	PROVIDE FLOORING, SUB-FLOORING AND STRUCTURAL WOOD JOISTS AS REQUIRED TO PATCH DEMO AREA

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CONSULTANT:

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CHECKED BY:	Checker

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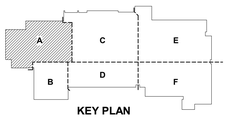
SHEET TITLE:
FIRST FLOOR PLAN - AREA A

SHEET NUMBER:
2-AE-102



KEY PLAN

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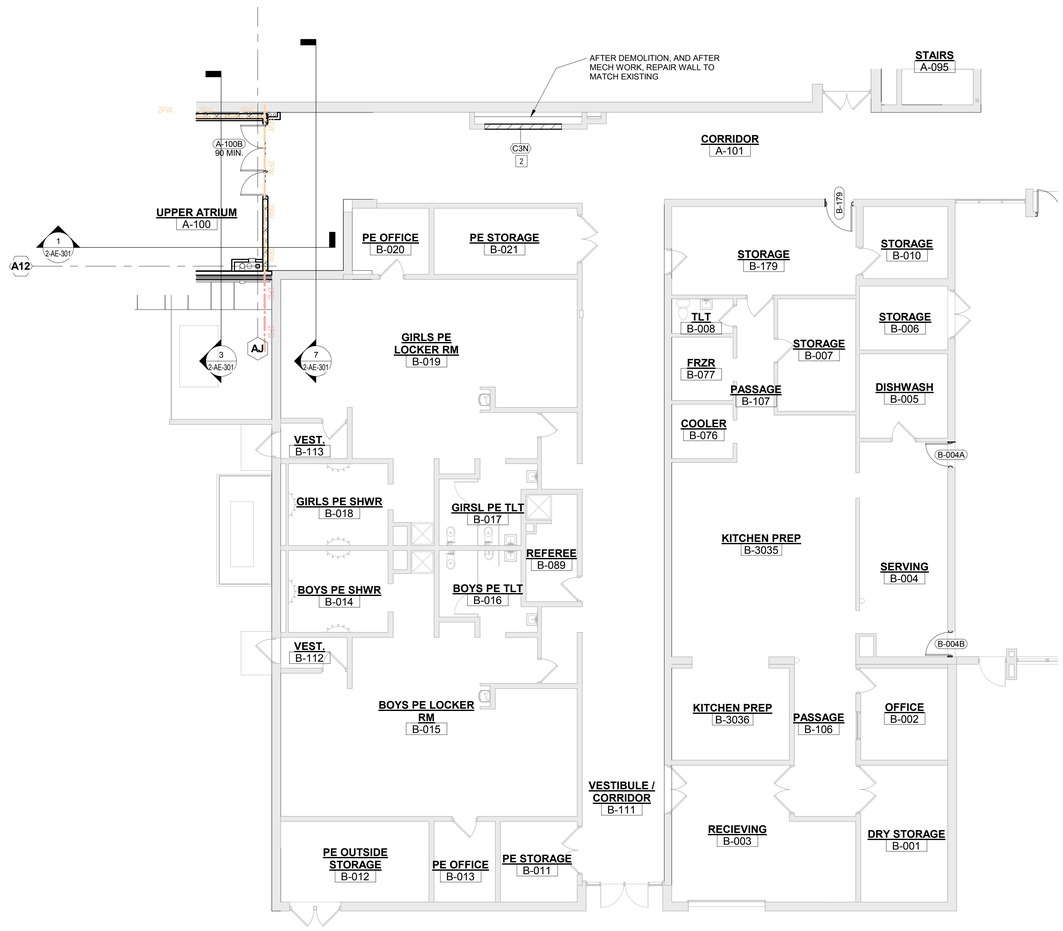
NOT FOR CONSTRUCTION

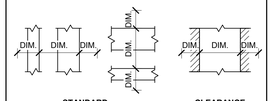


1 FIRST FLOOR PLAN - AREA B

SCALE 1/8" = 1'-0"
AS REFERENCED BY: 2 / 2-AD-104

WALL DIMENSION KEY

NOTE:
ALL WALLS ARE DIMENSIONED TO FACE OF STUD OR FACE OF MASONRY. CLEARANCE DIMENSIONS ARE FROM FACE OF STUDS OR FACE OF MASONRY.



STANDARD DIMENSIONING

CLEARANCE DIMENSIONING

FLOOR PLAN LEGEND

X — DENOTES WINDOW TYPE. SEE SHEET AE-630 & AE-631

NIC — DENOTES ITEM NOT IN CONTRACT - BY OWNER

XXXX — DENOTES WALL TYPE - SEE SHEET AE-501 FOR EXTERIOR AND AE-502 FOR INTERIOR WALLS

PLAN NOTES KEY

NO.	DESCRIPTION
1	SEE DOOR & FRAME SCHEDULE FOR WORK AT THIS DOOR
2	TOOTH IN NEW CMU INTO EXISTING COURSING
3	04 20 00 A2 - PROVIDE SOLID BULLNOSE CAP
4	ENLARGE EXISTING OPENING - SEE STRUCTURAL
5	INSTALL RESILIENT CHANNEL ON SIDE OF WALL WITH THIS #5 NOTATION
6	ROOF DRAIN AND OVERFLOW ROOF DRAIN LEADERS - SEE PLBG DRAWINGS
7	ROOF DRAIN LEADER - SEE PLBG DRAWINGS
8	ROOF OVERFLOW DRAIN LEADER - SEE PLBG DRAWINGS
9	10 44 00 - FIRE EXTINGUISHER IN SEMI-RECESSED CABINET
10	EXTEND MTL STUD/FURRING AND GYP WALL MIN. 4" ABOVE CEILING.
11	33 41 11 B - DOWNSPOUT RECIEVER.
12	10 51 00 - RELOCATED LOCKERS FROM SOUTH WALL OF CORRIDOR E-101
13	FINISHED WALL LENGTH SHALL MATCH CASEWORK LENGTH
14	SLOPE EXTERIOR STOOPS AND SLABS FOR DRAINAGE MAX. 2% TO COMPLY WITH ADA.
15	TOP OF WALL TO MATCH TOP OF CASEWORK. PROVIDE 5/8" GYP. BD. CAP
16	33 41 11 - SITE DRAIN
17	09 21 16 F - PROVIDE ABUSE RESISTANT GYPSUM BOARD AT THE EXPOSED AREAS OF THIS WALL
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19	10 51 13 D - NEW SLOPED TOP FOR EXISTING LOCKERS
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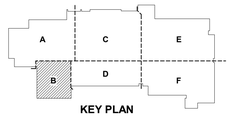
21	PROVIDE FLOORING, SUB-FLOORING AND STRUCTURAL WOOD JOISTS AS REQUIRED TO PATCH DEMO AREA



KEY PLAN

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CONSULTANT:

MANAWA

MANAWA ELEMENTARY SCHOOL - ALTERATIONS
MANAWA MIDDLE/HIGH SCHOOL - ADDITIONS & ALTERATIONS
PART 2 - MANAWA MIDDLE / HIGH SCHOOL
515 E. 4th STREET
MANAWA, WI 54949

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ISSUED:	6 JUN 2019
PROJECT NO:	18268
CAD DWG FILE:	
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CHECKED BY:	Checker

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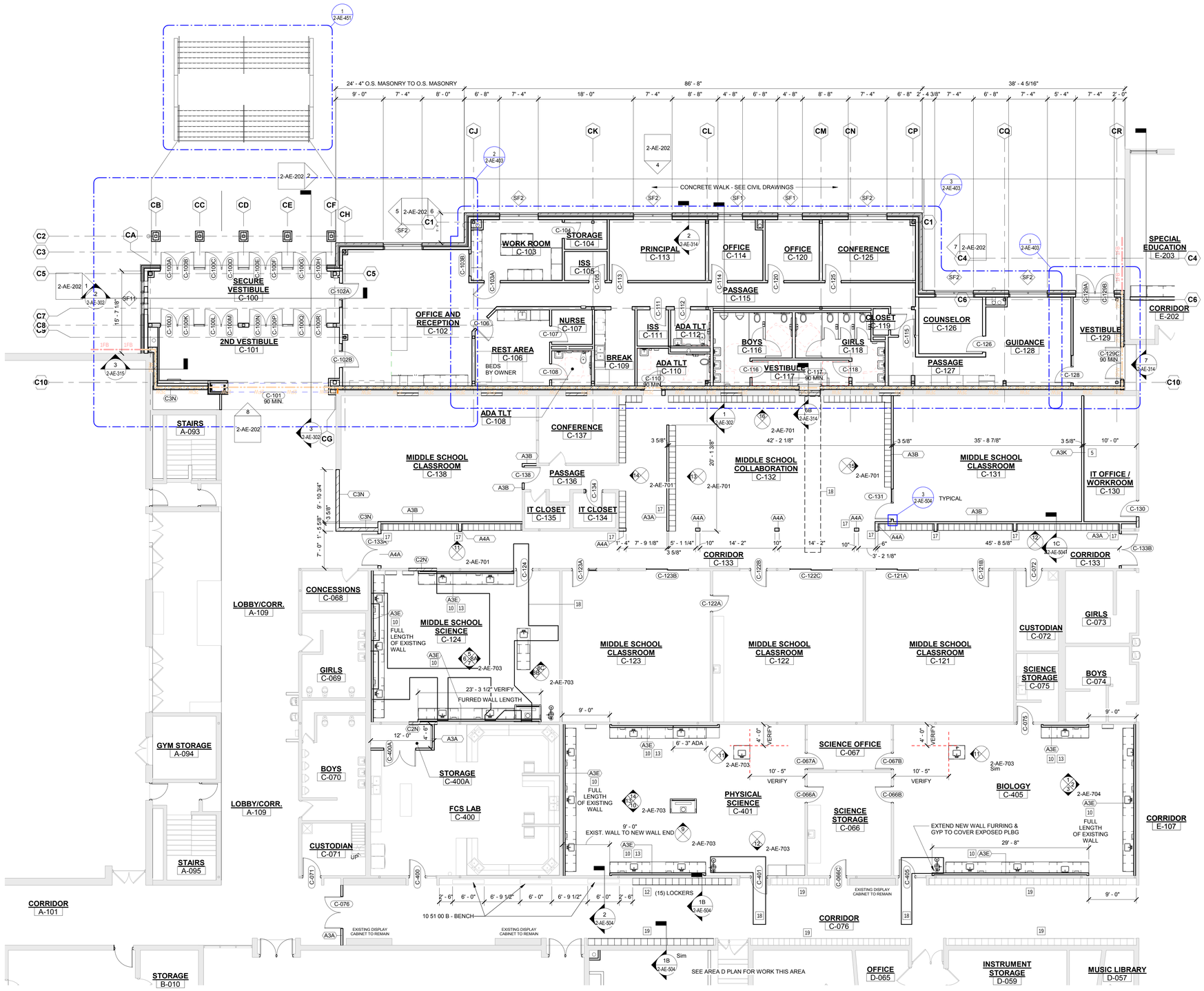
SHEET TITLE:
FIRST FLOOR PLAN - AREA B

SHEET NUMBER:
2-AE-103

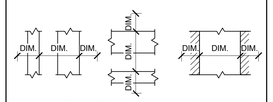


1 FIRST FLOOR PLAN - AREA C

SCALE 1/8" = 1'-0"
AS REFERENCED BY: 2 / 2-AD-104

WALL DIMENSION KEY

NOTE:
ALL WALLS ARE DIMENSIONED TO FACE OF STUD OR FACE OF MASONRY. CLEARANCE DIMENSIONS ARE FROM FACE OF STUDS OR FACE OF MASONRY.



FLOOR PLAN LEGEND

- X — DENOTES WINDOW TYPE. SEE SHEET AE-630 & AE-631
- NIC — DENOTES ITEM NOT IN CONTRACT - BY OWNER
- XXXX — DENOTES WALL TYPE - SEE SHEET AE-501 FOR EXTERIOR AND AE-502 FOR INTERIOR WALLS

PLAN NOTES KEY

NO.	DESCRIPTION
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3	04 20 00 A2 - PROVIDE SOLID BULLNOSE CAP
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5	INSTALL RESILIENT CHANNEL ON SIDE OF WALL WITH THIS #5 NOTATION
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7	ROOF DRAIN LEADER - SEE PLBG DRAWINGS
8	ROOF OVERFLOW DRAIN LEADER - SEE PLBG DRAWINGS
9	10 44 00 - FIRE EXTINGUISHER IN SEMI-RECESSED CABINET
10	EXTEND MTL STUD/FURRING AND GYP WALL MIN. 4" ABOVE CEILING.
11	33 41 11 B - DOWNSPOUT RECIEVER.
12	10 51 00 - RELOCATED LOCKERS FROM SOUTH WALL OF CORRIDOR E-101
13	FINISHED WALL LENGTH SHALL MATCH CASEWORK LENGTH
14	SLOPE EXTERIOR STOOPS AND SLABS FOR DRAINAGE MAX. 2% TO COMPLY WITH ADA.
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CHECKED BY:	Checker

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SHEET TITLE:
FIRST FLOOR PLAN - AREA C

SHEET NUMBER:
2-AE-104

KEY PLAN

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PLAN NORTH

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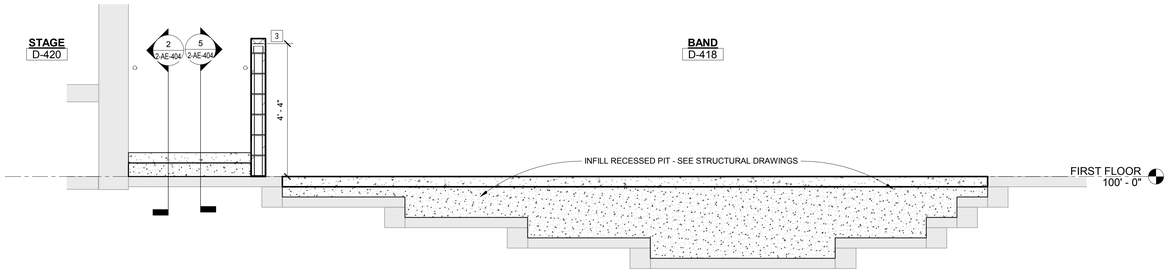
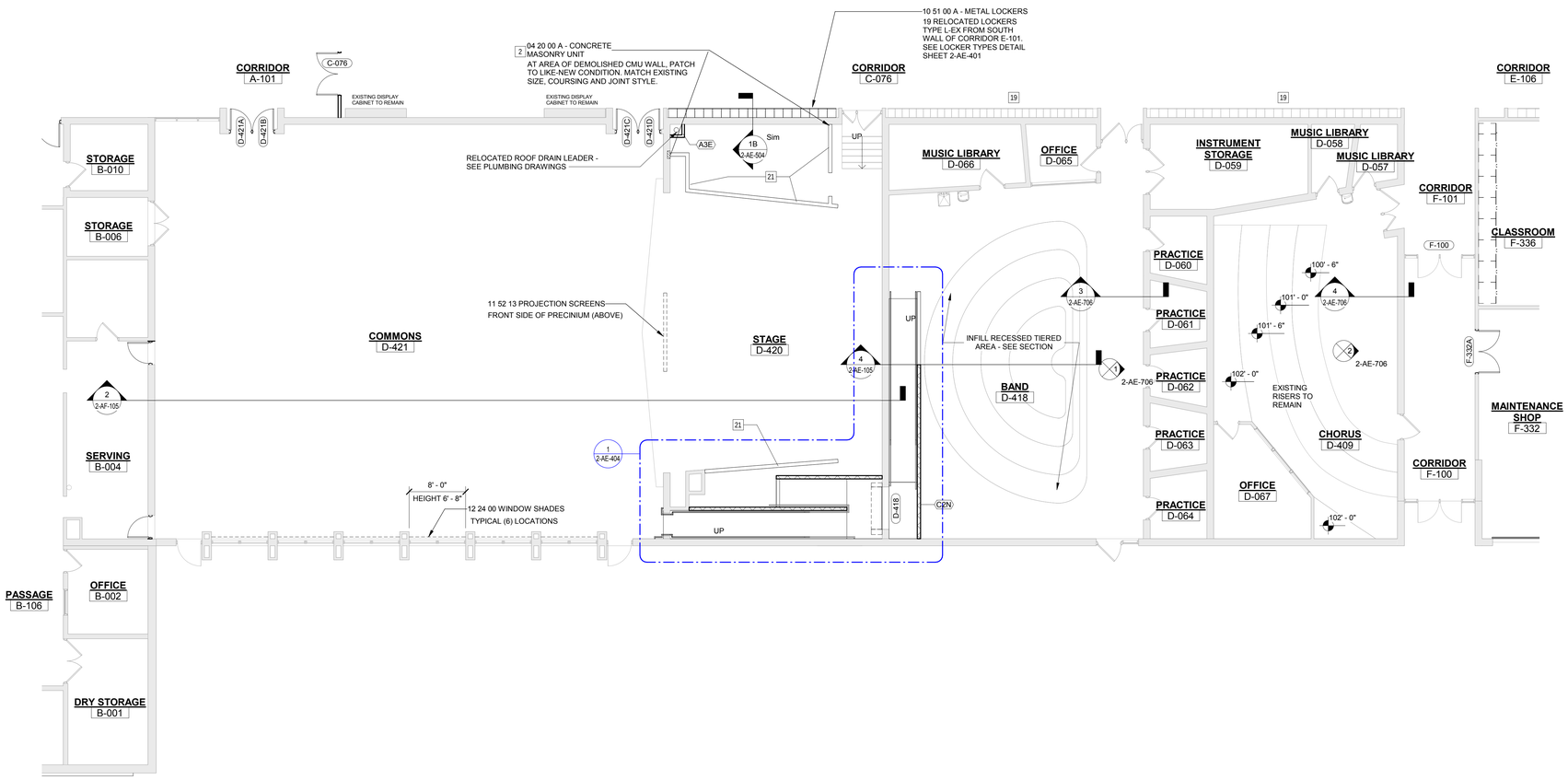


4 BAND D-418 - RAMP & FLOOR INFILL SECTION

SCALE 1/2" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-105



1 FIRST FLOOR PLAN - AREA D

SCALE 1/8" = 1'-0"
AS REFERENCED BY: 2 / 2-AD-104

WALL DIMENSION KEY

NOTE:
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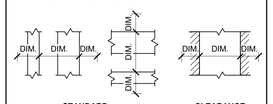

STANDARD DIMENSIONING | CLEARANCE DIMENSIONING

FLOOR PLAN LEGEND

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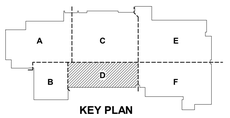
KEYNOTE LEGEND

KEY NO.	KEYNOTE TEXT
04 20 00 A -	CONCRETE MASONRY UNIT
10 51 00 A -	METAL LOCKERS
11 52 13	PROJECTION SCREENS
12 24 00	WINDOW SHADES



KEY PLAN

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NOT FOR CONSTRUCTION

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CONSULTANT:

MANAWA

MANAWA ELEMENTARY SCHOOL - ALTERATIONS
MANAWA MIDDLE/HIGH SCHOOL - ADDITIONS & ALTERATIONS
PART 2 - MANAWA MIDDLE / HIGH SCHOOL
515 E. 4th STREET
MANAWA, WI 54949

MARK	DATE
ISSUED:	6 JUN 2019
PROJECT NO:	18268
CAD DWG FILE:	
DRAWN BY:	Author
CHECKED BY:	Checker

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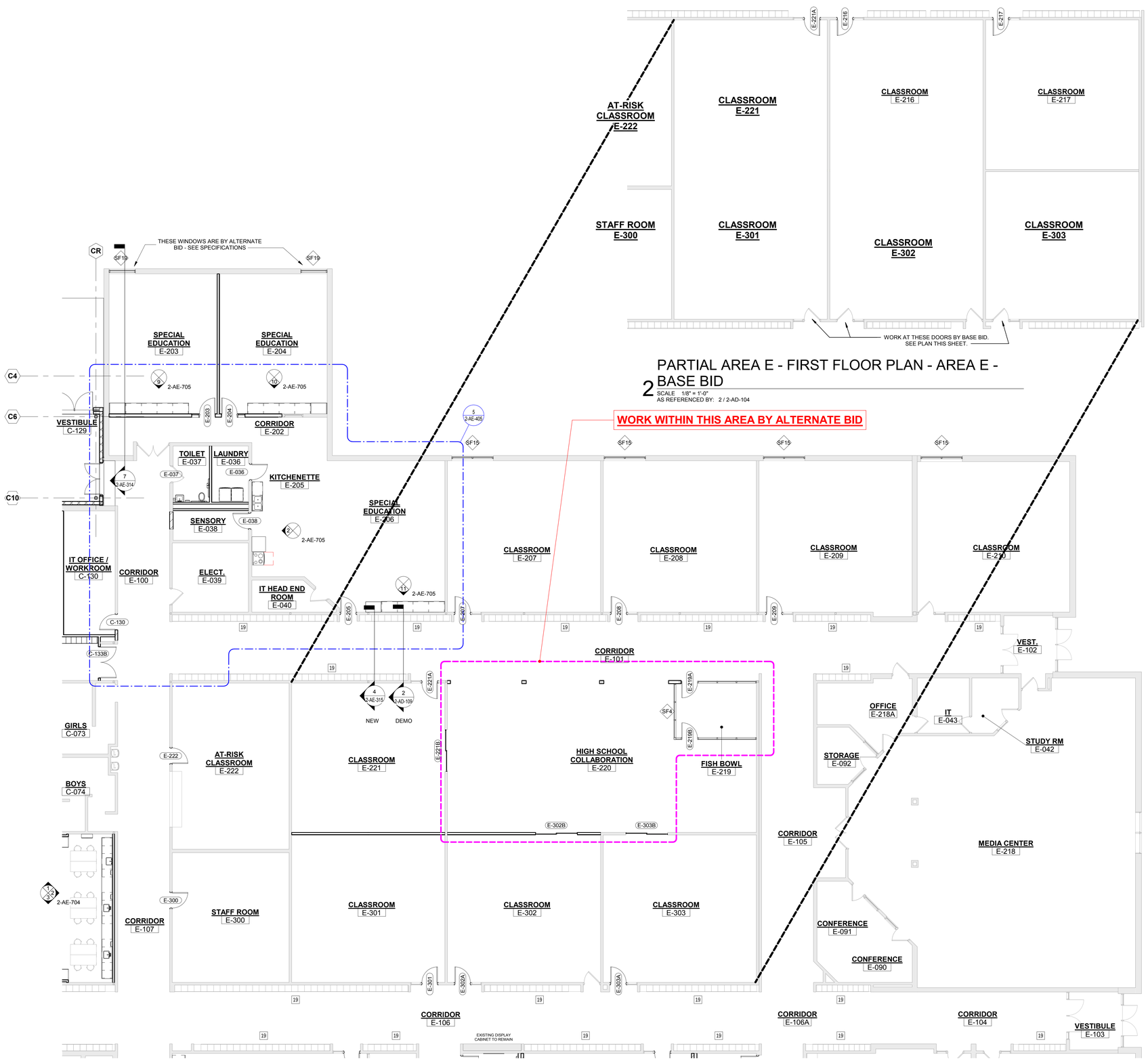
SHEET TITLE:
FIRST FLOOR PLAN - AREA D

SHEET NUMBER:
2-AE-105

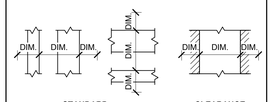


2 PARTIAL AREA E - FIRST FLOOR PLAN - AREA E - BASE BID
SCALE 1/8" = 1'-0"
AS REFERENCED BY: 2 / 2-AD-104

1 FIRST FLOOR PLAN - AREA E
SCALE 1/8" = 1'-0"
AS REFERENCED BY: 2 / 2-AD-104

WALL DIMENSION KEY

NOTE:
ALL WALLS ARE DIMENSIONED TO FACE OF STUD OR FACE OF MASONRY. CLEARANCE DIMENSIONS ARE FROM FACE OF STUDS OR FACE OF MASONRY.



FLOOR PLAN LEGEND

- X — DENOTES WINDOW TYPE. SEE SHEET AE-630 & AE-631
- NIC — DENOTES ITEM NOT IN CONTRACT - BY OWNER
- XXXX — DENOTES WALL TYPE - SEE SHEET AE-501 FOR EXTERIOR AND AE-502 FOR INTERIOR WALLS

PLAN NOTES KEY

NO.	DESCRIPTION
1	SEE DOOR & FRAME SCHEDULE FOR WORK AT THIS DOOR
2	TOOTH IN NEW CMU INTO EXISTING COURSING
3	04 20 00 A2 - PROVIDE SOLID BULLNOSE CAP
4	ENLARGE EXISTING OPENING - SEE STRUCTURAL
5	INSTALL RESILIENT CHANNEL ON SIDE OF WALL WITH THIS #5 NOTATION
6	ROOF DRAIN AND OVERFLOW ROOF DRAIN LEADERS - SEE PLBG DRAWINGS
7	ROOF DRAIN LEADER - SEE PLBG DRAWINGS
8	ROOF OVERFLOW DRAIN LEADER - SEE PLBG DRAWINGS
9	10 44 00 - FIRE EXTINGUISHER IN SEMI-RECESSED CABINET
10	EXTEND MTL STUD/FURRING AND GYP WALL MIN. 4" ABOVE CEILING.
11	33 41 11 B - DOWNSPOUT RECIEVER
12	10 51 00 - RELOCATED LOCKERS FROM SOUTH WALL OF CORRIDOR E-101
13	FINISHED WALL LENGTH SHALL MATCH CASEWORK LENGTH
14	SLOPE EXTERIOR STOOPS AND SLABS FOR DRAINAGE MAX. 2% TO COMPLY WITH ADA.
15	TOP OF WALL TO MATCH TOP OF CASEWORK. PROVIDE 5/8" GYP. BD. CAP
16	33 41 11 - SITE DRAIN
17	09 21 16 F - PROVIDE ABUSE RESISTANT GYPSUM BOARD AT THE EXPOSED AREAS OF THIS WALL
18	03 33 00 - NEW CONCRETE SLAB AT AREA OF REMOVED SLAB. MATCH EXISTING THICKNESS. SLOPE TO DRAIN, IF REQUIRED. REFER TO PLUMBING DRAWINGS.
19	10 51 13 D - NEW SLOPED TOP FOR EXISTING LOCKERS
20	07 71 23 - MANUFACTURED GUTTERS AND DOWNSPOUTS
21	PROVIDE FLOORING, SUB-FLOORING AND STRUCTURAL WOOD JOISTS AS REQUIRED TO PATCH DEMO AREA

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CAD DWG FILE:	
DRAWN BY:	Author
CHECKED BY:	Checker

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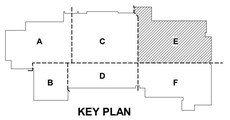
SHEET TITLE:
FIRST FLOOR PLAN - AREA E

SHEET NUMBER:
2-AE-106



KEY PLAN

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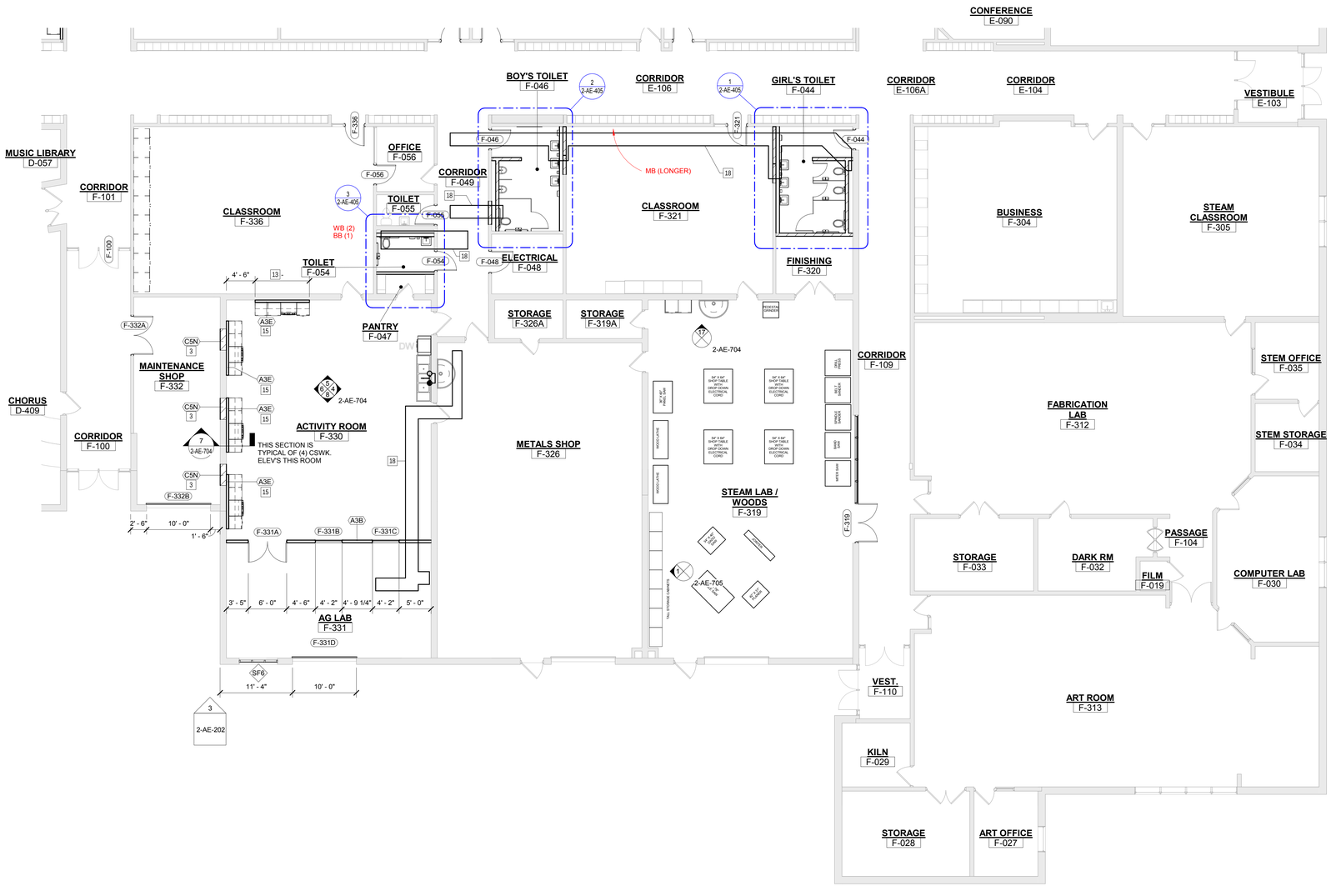
PLAN NORTH

FOR BIDS
NOT FOR CONSTRUCTION

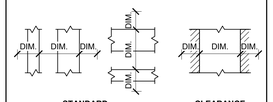


1 FIRST FLOOR PLAN - AREA F

SCALE 1/8" = 1'-0"
AS REFERENCED BY: 2 / 2-AD-104

WALL DIMENSION KEY

NOTE:
ALL WALLS ARE DIMENSIONED TO FACE OF STUD OR FACE OF MASONRY. CLEARANCE DIMENSIONS ARE FROM FACE OF STUDS OR FACE OF MASONRY.



FLOOR PLAN LEGEND

- X — DENOTES WINDOW TYPE. SEE SHEET AE-630 & AE-631
- NIC — DENOTES ITEM NOT IN CONTRACT - BY OWNER
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PLAN NOTES KEY

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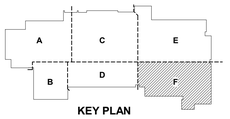
SHEET TITLE:
FIRST FLOOR PLAN - AREA F

SHEET NUMBER:
2-AE-107



KEY PLAN

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PLAN NORTH

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NOT FOR CONSTRUCTION

KEY TO ROOF NOTES

1	FULLY ADHERED 60 MIL. EPDM MEMBRANE OVER CONSISTENT 6" THICK POLYISOCYANURATE RIGID FOAM INSULATION OVER 1/2" EXTERIOR GYPSUM SHEATHING OVER ACOUSTICAL METAL DECKING OVER SLOPED STRUCTURE
2	FULLY ADHERED 60 MIL. EPDM MEMBRANE OVER CONSISTENT 6" THICK POLYISOCYANURATE RIGID FOAM INSULATION OVER METAL DECKING & CONCRETE OVER LEVEL STRUCTURE
3	MECHANCAL EQUIPMENT WITH CURB. SEE ROOF CURB DETAILS. SEE MECHANICAL DRAWINGS
4	INFILL TO MATCH EXISTING ROOF
5	07 53 00 E1 - ROOF PAVERS / WALKWAY PADS
6	FULLY ADHERED 60 MIL. EPDM MEMBRANE OVER CONSISTENT 6" THICK POLYISOCYANURATE RIGID FOAM INSULATION OVER METAL DECKING OVER SLOPED STRUCTURE

ROOF PLAN GENERAL NOTES

1. COORDINATE ALL ROOFING PENETRATIONS WITH APPROPRIATE DISCIPLINE.
2. SEE INDIVIDUAL AREA ROOF PLANS AND MECHANICAL DRAWINGS FOR ADDITIONAL INFORMATION.

ABBREVIATIONS AND SYMBOLS

X:12	INDICATES ROOF SLOPE. REFER TO ROOF TYPES SCHEDULE FOR SLOPED VS. FLAT STRUCTURE.
	07 53 00 - TAPERED RIGID FOAM INSULATION SADDLES
● or VTR	ROOF PENETRATION - SEE DETAILS 2-AE-520
R.E.	23 00 00 - HVAC EXHAUST THROUGH ROOF - SEE DETAILS 2-AE-520
TO 2	07 72 00 - FALL ARREST ROOF ANCHOR
	07 53 00 - PATCH NEW ROOF MEMBRANE INTO EXISTING AS NECESSARY
RD	22 14 26.13 A - ROOF DRAIN - SEE DETAILS 2-AE-520
ORD	22 14 26.13 B - OVERFLOW DRAIN - SEE DETAILS 2-AE-520
SC	07 62 00 - THRU-WALL SCUPPER - SEE DETAILS 2-AE-520

KEYNOTE LEGEND

KEY NO.	KEYNOTE TEXT
07 72 00 A -	ROOF HATCH
07 72 00 C -	SAFETY RAILING

NEW VESTIBULE ROOF

EXISTING ROOF

EXISTING MECH RM ROOF

UP

NEW LOBBY ROOF

AREA A
AREA B
AREA C
AREA D
AREA E
AREA F

07 72 00 C - SAFETY RAILING	REMOVAL/DEMOLITION OF EXISTING ROOF HATCH BY ALTERNATE BID.
07 72 00 A - ROOF HATCH	NEW ROOF HATCH AND AND NEW SAFETY RAILING BY ALTERNATE BID.

1 OVERALL ROOF PLAN
SCALE 1/16" = 1'-0"
AS REFERENCED BY: 2 / 2-AD-104

KEY PLAN

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CAD DWG FILE:	
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CHECKED BY:	Checker

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SHEET TITLE:
OVERALL ROOF PLAN

SHEET NUMBER:
2-AE-150

KEY TO ROOF NOTES

1. FULLY ADHERED 60 MIL. EPDM MEMBRANE OVER CONSISTENT 6" THICK POLYISOCYANURATE RIGID FOAM INSULATION OVER 1/2" EXTERIOR GYPSUM SHEATHING OVER ACOUSTICAL METAL DECKING OVER SLOPED STRUCTURE
2. FULLY ADHERED 60 MIL. EPDM MEMBRANE OVER CONSISTENT 6" THICK POLYISOCYANURATE RIGID FOAM INSULATION OVER METAL DECKING & CONCRETE OVER LEVEL STRUCTURE
3. MECHANCAL EQUIPMENT WITH CURB. SEE ROOF CURB DETAILS. SEE MECHANICAL DRAWINGS
4. INFILL TO MATCH EXISTING ROOF
5. 07 53 00 E1 - ROOF PAVERS / WALKWAY PADS
6. FULLY ADHERED 60 MIL. EPDM MEMBRANE OVER CONSISTENT 6" THICK POLYISOCYANURATE RIGID FOAM INSULATION OVER METAL DECKING OVER SLOPED STRUCTURE

ROOF PLAN GENERAL NOTES

1. COORDINATE ALL ROOFING PENETRATIONS WITH APPROPRIATE DISCIPLINE.
2. SEE INDIVIDUAL AREA ROOF PLANS AND MECHANICAL DRAWINGS FOR ADDITIONAL INFORMATION.

ABBREVIATIONS AND SYMBOLS

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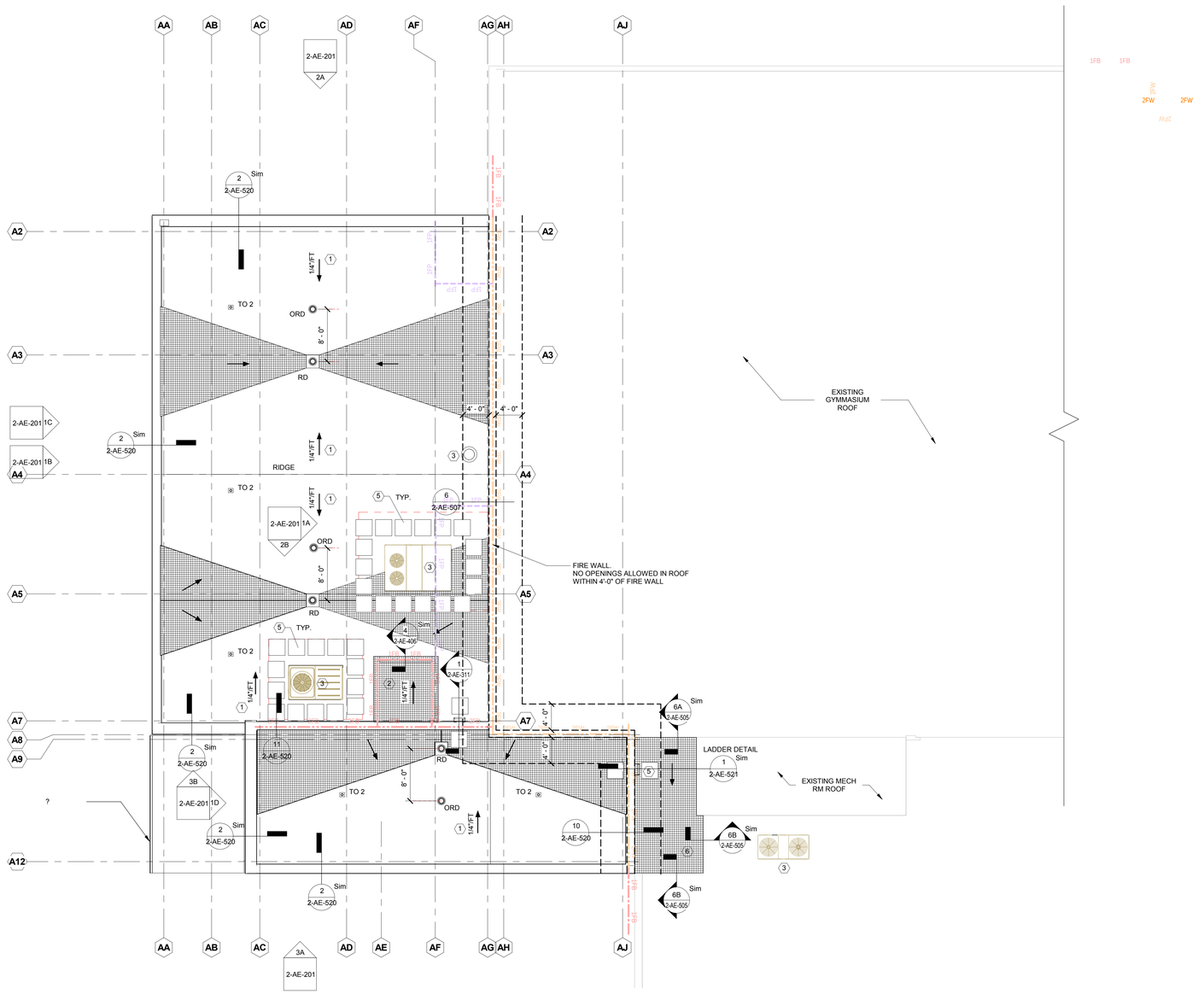
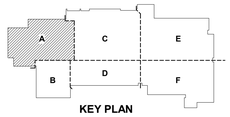
- ● or VTR — ROOF PENETRATION - SEE DETAILS 2-AE-520
- R.E. — 23 00 00 - HVAC EXHAUST THROUGH ROOF - SEE DETAILS 2-AE-520
- TO 2 — 07 72 00 - FALL ARREST ROOF ANCHOR
- 07 53 00 - PATCH NEW ROOF MEMBRANE INTO EXISTING AS NECESSARY
- RD — 22 14 26.13 A - ROOF DRAIN - SEE DETAILS 2-AE-520
- ORD — 22 14 26.13 B - OVERFLOW DRAIN - SEE DETAILS 2-AE-520
- SC — 07 62 00 - THRU-WALL SCUPPER - SEE DETAILS 2-AE-520



1 ROOF PLAN - AREA A

SCALE 1/8" = 1'-0"
AS REFERENCED BY: 2 / 2-AD-104



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CHECKED BY:	Checker

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SHEET TITLE:
ROOF PLAN - AREA A

SHEET NUMBER:
2-AE-151

KEY TO ROOF NOTES

1. FULLY ADHERED 60 MIL. EPDM MEMBRANE OVER CONSISTENT 6" THICK POLYISOCYANURATE RIGID FOAM INSULATION OVER 1/2" EXTERIOR GYPSUM SHEATHING OVER ACOUSTICAL METAL DECKING OVER SLOPED STRUCTURE
2. FULLY ADHERED 60 MIL. EPDM MEMBRANE OVER CONSISTENT 6" THICK POLYISOCYANURATE RIGID FOAM INSULATION OVER METAL DECKING & CONCRETE OVER LEVEL STRUCTURE
3. MECHANCAL EQUIPMENT WITH CURB. SEE ROOF CURB DETAILS. SEE MECHANICAL DRAWINGS
4. INFILL TO MATCH EXISTING ROOF
5. 07 53 00 E1 - ROOF PAVERS / WALKWAY PADS
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ROOF PLAN GENERAL NOTES

1. COORDINATE ALL ROOFING PENETRATIONS WITH APPROPRIATE DISCIPLINE.
2. SEE INDIVIDUAL AREA ROOF PLANS AND MECHANICAL DRAWINGS FOR ADDITIONAL INFORMATION.

ABBREVIATIONS AND SYMBOLS

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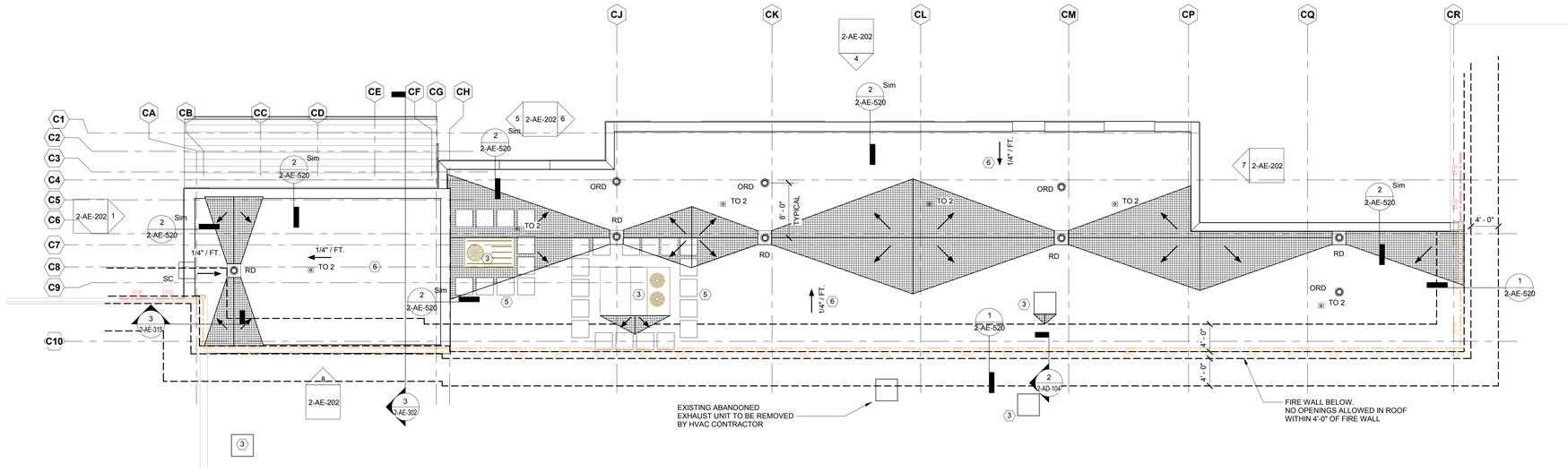
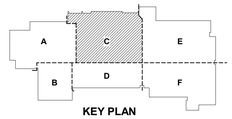
- R.E. — 23 00 00 - HVAC EXHAUST THROUGH ROOF - SEE DETAILS 2-AE-520
- TO 2 — 07 72 00 - FALL ARREST ROOF ANCHOR
- 07 53 00 - PATCH NEW ROOF MEMBRANE INTO EXISTING AS NECESSARY
- RD — 22 14 26.13 A - ROOF DRAIN - SEE DETAILS 2-AE-520
- ORD — 22 14 26.13 B - OVERFLOW DRAIN - SEE DETAILS 2-AE-520
- SC — 07 62 00 - THRU-WALL SCUPPER - SEE DETAILS 2-AE-520



1 ROOF PLAN - AREA C
SCALE 1/8" = 1'-0"
AS REFERENCED BY: 2 / 2-AD-104



KEY PLAN

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SHEET TITLE:
ROOF PLAN - AREA C

SHEET NUMBER:
2-AE-152

KEYNOTE LEGEND	
KEY NO.	KEYNOTE TEXT
07 62 00 B1 -	REMOVABLE COUNTERFLASHING
07 71 23 A -	GUTTER
07 71 23 B -	DOWNSPOUT
22 14 26.13 F -	DISCHARGE OUTLET

EXTERIOR MATERIALS LEGEND

METAL WALL PANELS:

MWP-1:	PAC-CLAD - HIGHLINE S1 - "CARDINAL RED"
MWP-2:	PAC-CLAD - HIGHLINE S1 - "GRANITE"
MWP-3	PAC-CLAD - HIGHLINE S1 - "MATTE BLACK"
PJ	PANEL JOINT / 1" REVEAL - COLOR TO MATCH ADJACENT PANELS

PREFINISHED METAL:

PMC-1:	COLOR TO MATCH MWP-1
PMC-2:	COLOR TO MATCH MWP-2
PMC-3	COLOR TO MATCH MWP-3
PMC-4	BURNISHED SLATE

MASONRY

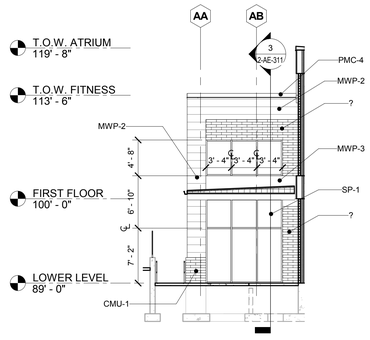
CMU-1:	ECHELON - TRENDSTONE - "BATON ROUGE"
CMU-2:	ECHELON - TRENDSTONE - "SHADOW GRAY"

PRECAST CONCRETE

PC-1:	AS SELECTED BY ARCHITECT FROM MFR'S STANDARD RANGE
PC-2:	AS SELECTED BY ARCHITECT FROM MFR'S STANDARD RANGE

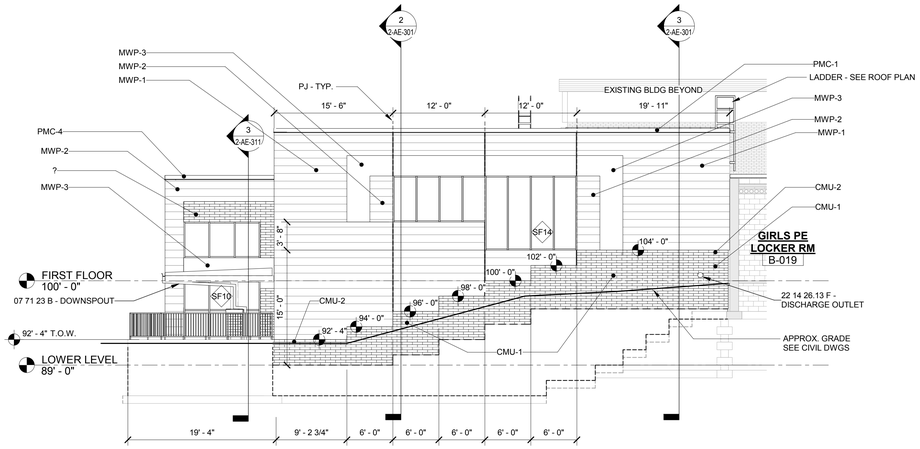
MISC

RM-1:	ROOF MEMBRANE "WHITE" - SEE SPECIFICATIONS



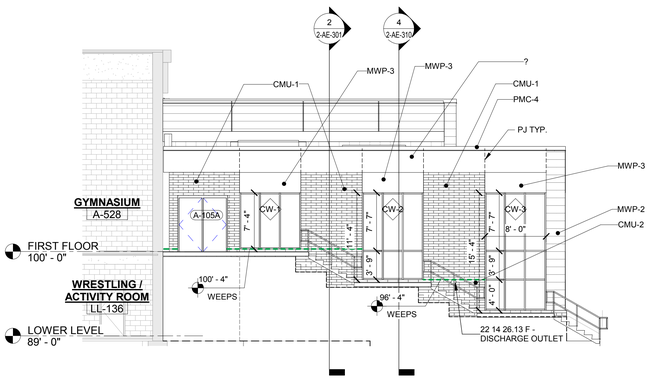
3B HIDDEN SOUTH ELEVATION - AREA A

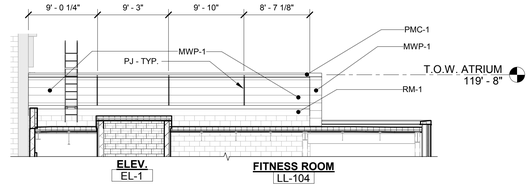
SCALE 1/8" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-101



3A SOUTH ELEVATION - AREA A

SCALE 1/8" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-101



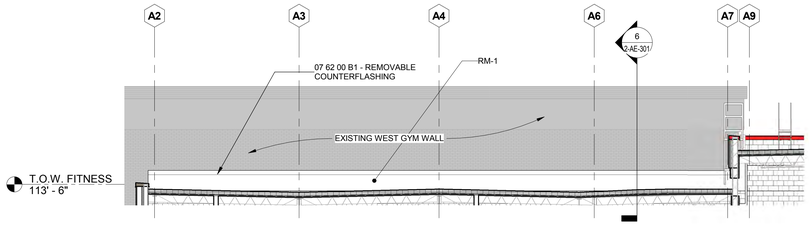


2A NORTH ELEVATION - AREA A

SCALE 1/8" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-101

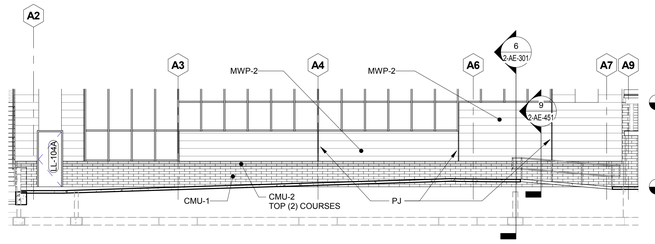
2B NORTH ELEVATION - AREA A - ABOVE FITNESS

SCALE 1/8" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-151



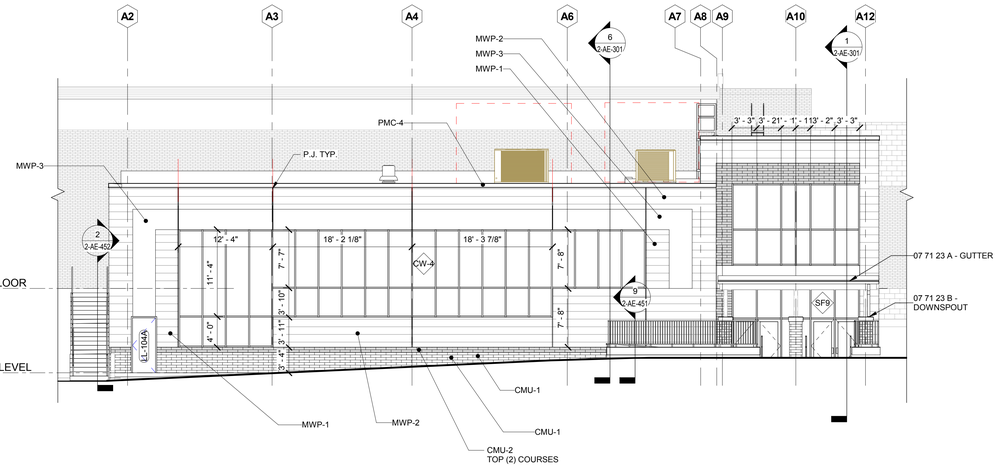
1A WEST ELEVATION 3 - AREA A - ABOVE FITNESS

SCALE 1/8" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-151



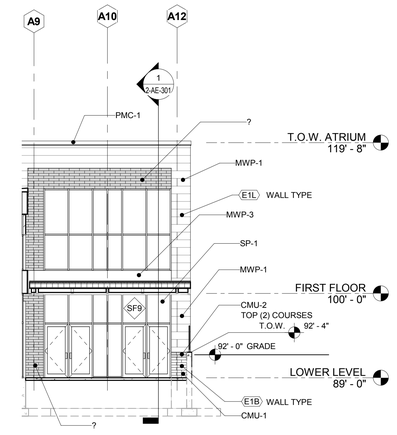
1B WEST ELEVATION 1 - AREA A1 AT RAMP

SCALE 1/8" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-101



1C WEST ELEVATION 1 - AREA A

SCALE 1/8" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-101



1D HIDDEN WEST ELEVATION 1 - AREA A

SCALE 1/8" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-151

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CONSULTANT:

MANAWA

MANAWA ELEMENTARY SCHOOL - ALTERATIONS
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PART 2 - MANAWA MIDDLE / HIGH SCHOOL
515 E. 4th STREET
MANAWA, WI 54949

MARK	DATE
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PROJECT NO:	18268
CAD DWG FILE:	
DRAWN BY:	Author
CHECKED BY:	Checker

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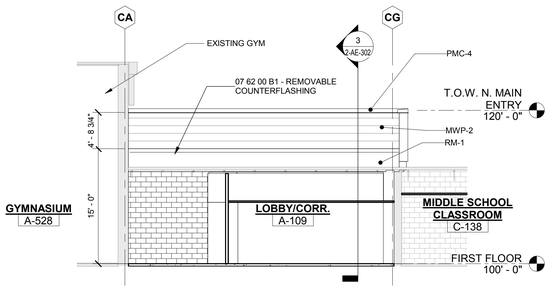
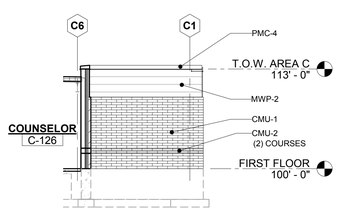
SHEET TITLE:
EXTERIOR ELEVATIONS - AREA A

SHEET NUMBER:
2-AE-201



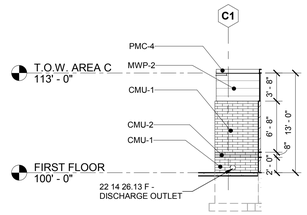
8 SOUTH ELEVATION - AREA C

SCALE 1/8" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-102



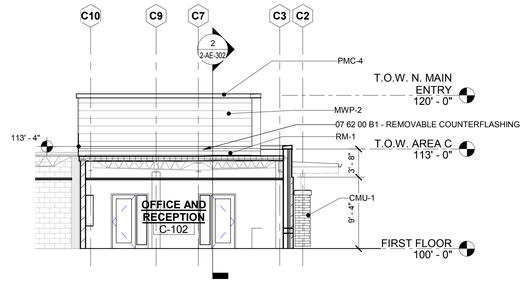
7 EAST ELEVATION 2 - AREA C

SCALE 1/8" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-104



6 WEST ELEVATION 2 - AREA C

SCALE 1/8" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-104



5 EAST ELEVATION 1 - AREA C

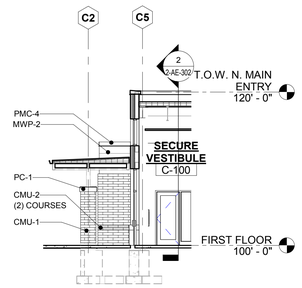
SCALE 1/8" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-104

4 NORTH ELEVATION AREA C

SCALE 1/8" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-104

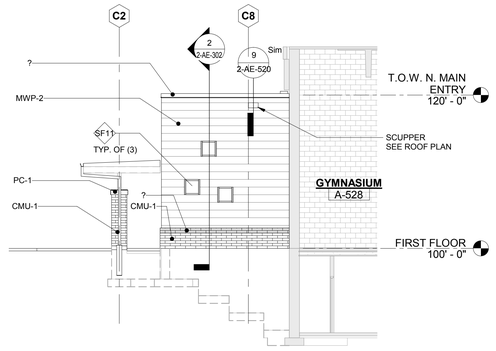
3 SOUTH ELEVATION - AREA F

SCALE 1/8" = 1'-0"
AS REFERENCED BY: 1 / 2-AD-105



2 EAST ELEVATION 3 - AREA C

SCALE 1/8" = 1'-0"
AS REFERENCED BY: 1 / 2-AD-101



1 WEST ELEVATION 1 - AREA C

SCALE 1/8" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-104

KEYNOTE LEGEND

KEY NO.	KEYNOTE TEXT
07 62 00 B1 -	REMOVABLE COUNTERFLASHING
22 14 26.13 F -	DISCHARGE OUTLET
33 41 11 B -	DOWNSPOUT RECEIVER

EXTERIOR MATERIALS LEGEND

METAL WALL PANELS:

MWP-1:	PAC-CLAD - HIGHLINE S1 - "CARDINAL RED"
MWP-2:	PAC-CLAD - HIGHLINE S1 - "GRANITE"
MWP-3	PAC-CLAD - HIGHLINE S1 - "MATTE BLACK"
PJ	PANEL JOINT / 1" REVEAL - COLOR TO MATCH ADJACENT PANELS

PREFINISHED METAL:

PMC-1:	COLOR TO MATCH MWP-1
PMC-2:	COLOR TO MATCH MWP-2
PMC-3	COLOR TO MATCH MWP-3
PMC-4	BURNISHED SLATE

MASONRY

CMU-1:	ECHELON - TRENDSTONE - "BATON ROUGE"
CMU-2:	ECHELON - TRENDSTONE - "SHADOW GRAY"

PRECAST CONCRETE

PC-1:	AS SELECTED BY ARCHITECT FROM MFR'S STANDARD RANGE
PC-2:	AS SELECTED BY ARCHITECT FROM MFR'S STANDARD RANGE

MISC

RM-1:	ROOF MEMBRANE "WHITE" - SEE SPECIFICATIONS

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MANAWA

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PART 2 - MANAWA MIDDLE / HIGH SCHOOL

515 E. 4th STREET
MANAWA, WI 54949

MARK	DATE
ISSUED:	6 JUN 2019
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CAD DWG FILE:	
DRAWN BY:	Author
CHECKED BY:	Checker

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SHEET TITLE:
EXTERIOR ELEVATIONS - AREAS C, E & F

SHEET NUMBER:
2-AE-202

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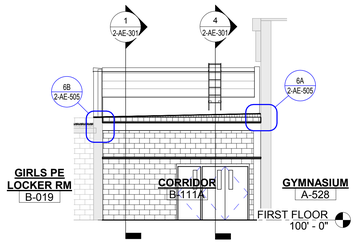
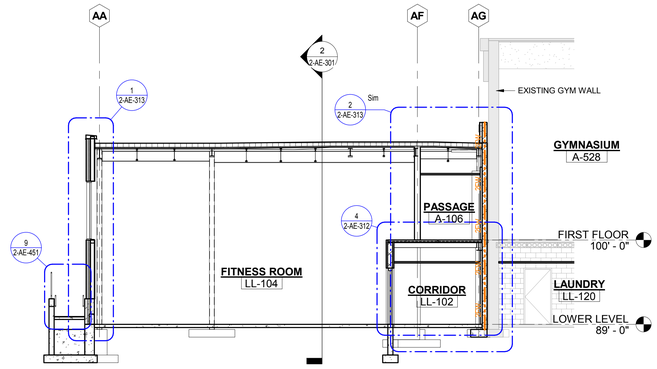
NOT FOR CONSTRUCTION



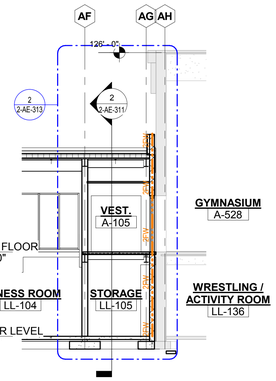
7 AREA A - BUILDING SECTION 7

SCALE 1/8" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-102



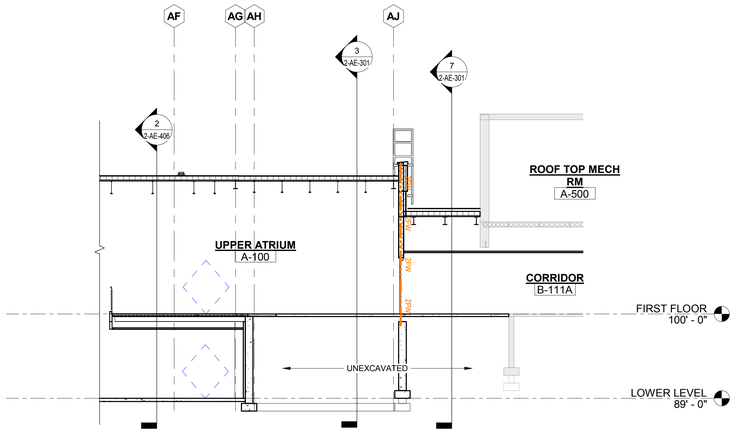
6 AREA A - BUILDING SECTION 6

SCALE 1/8" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-101



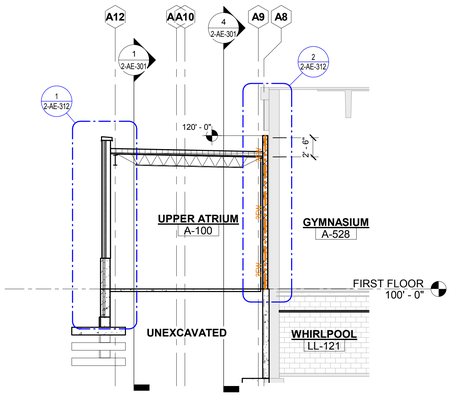
5 AREA A - BUILDING SECTION 5

SCALE 1/8" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-101



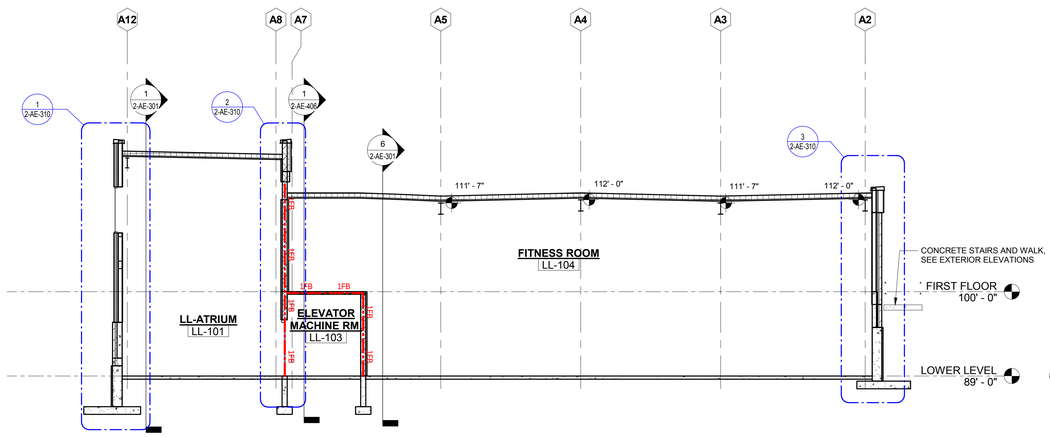
4 AREA A - BUILDING SECTION 4

SCALE 1/8" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-102



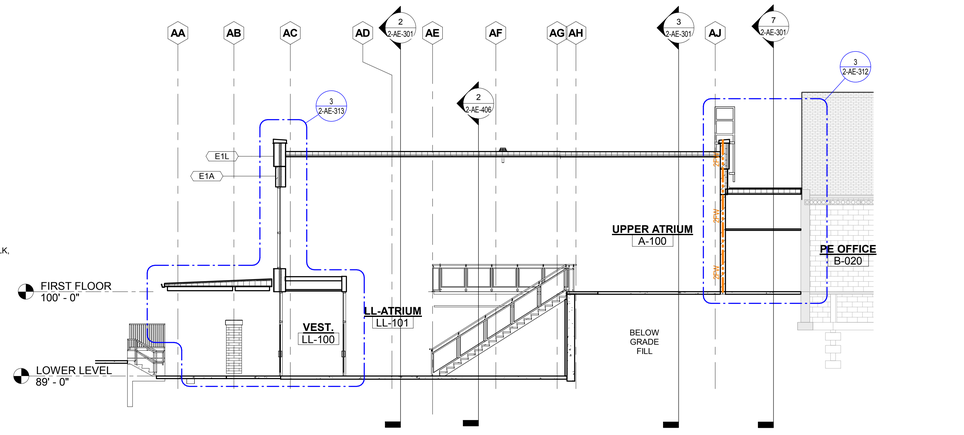
3 AREA A - BLDG SECTION 3

SCALE 1/8" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-102



2 AREA A - BUILDING SECTION 2

SCALE 1/8" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-101



1 AREA A - BUILDING SECTION 1

SCALE 1/8" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-102

KEYNOTE LEGEND

KEY NO.	KEYNOTE TEXT

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CONSULTANT:

MANAWA

MANAWA ELEMENTARY SCHOOL - ALTERATIONS
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PART 2 - MANAWA MIDDLE / HIGH SCHOOL
515 E. 4th STREET
MANAWA, WI 54949

MARK	DATE

ISSUED: 6 JUN 2019
PROJECT NO: 18268
CAD DWG FILE:
DRAWN BY: Author
CHECKED BY: Checker

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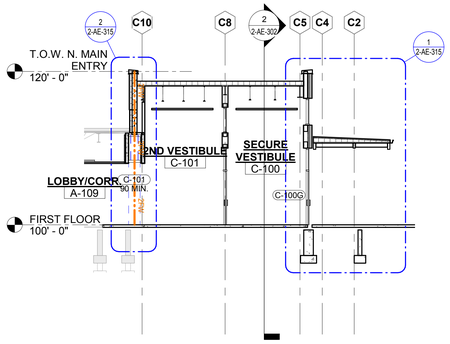
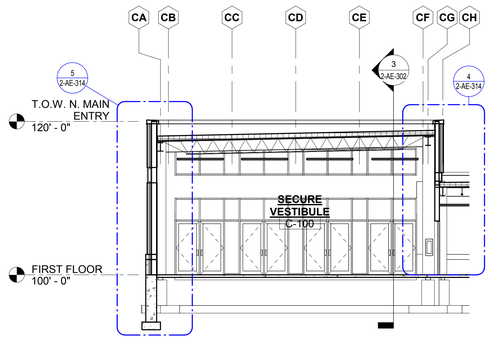
SHEET TITLE:
BUILDING SECTIONS - AREA A

SHEET NUMBER:
2-AE-301

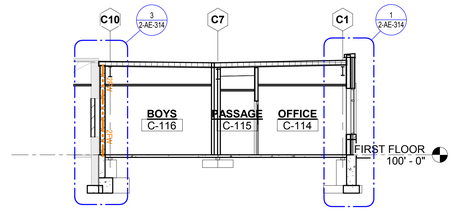
KEYNOTE LEGEND	
KEY NO.	KEYNOTE TEXT



3 AREA C - BUILDING SECTION 3
SCALE 1/8" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-104



2 AREA C - BUILDING SECTION 2
SCALE 1/8" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-104



1 AREA C - BUILDING SECTION 1
SCALE 1/8" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-104

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MARK	DATE
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PROJECT NO:	18268
CAD DWG FILE:	
DRAWN BY:	Author
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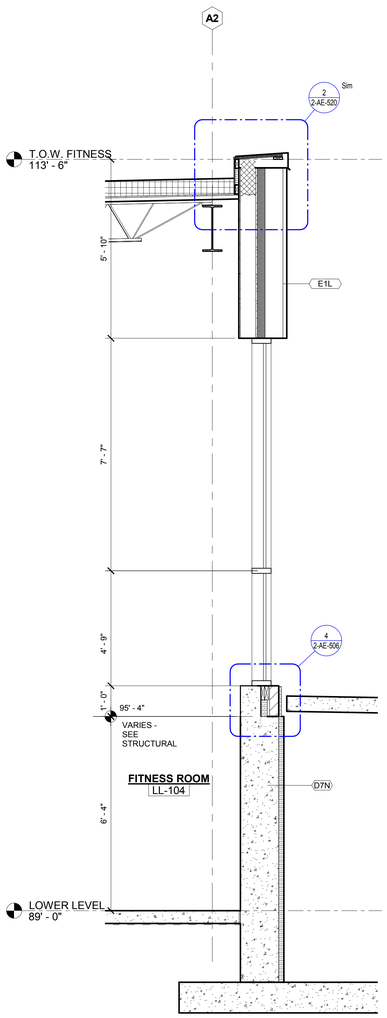
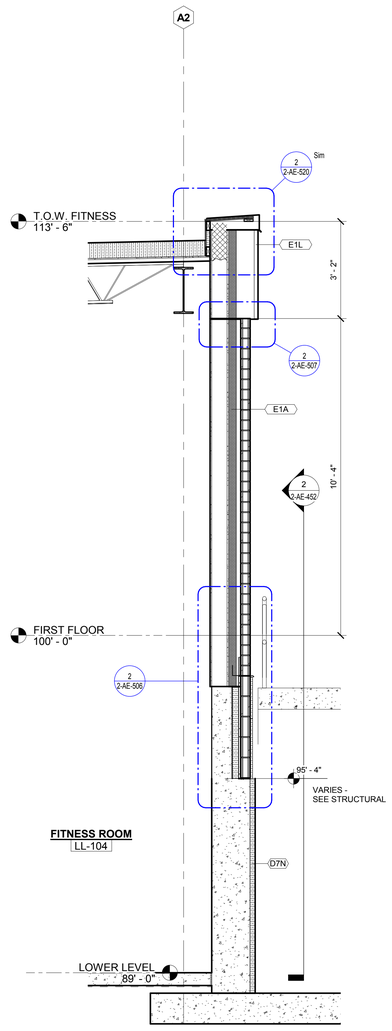
SHEET TITLE:
BUILDING SECTIONS - AREAS C & D

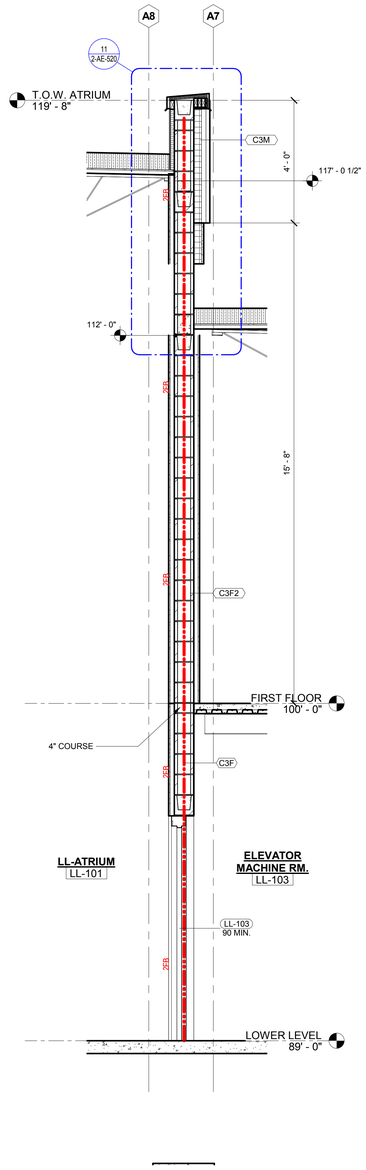
SHEET NUMBER:
2-AE-302



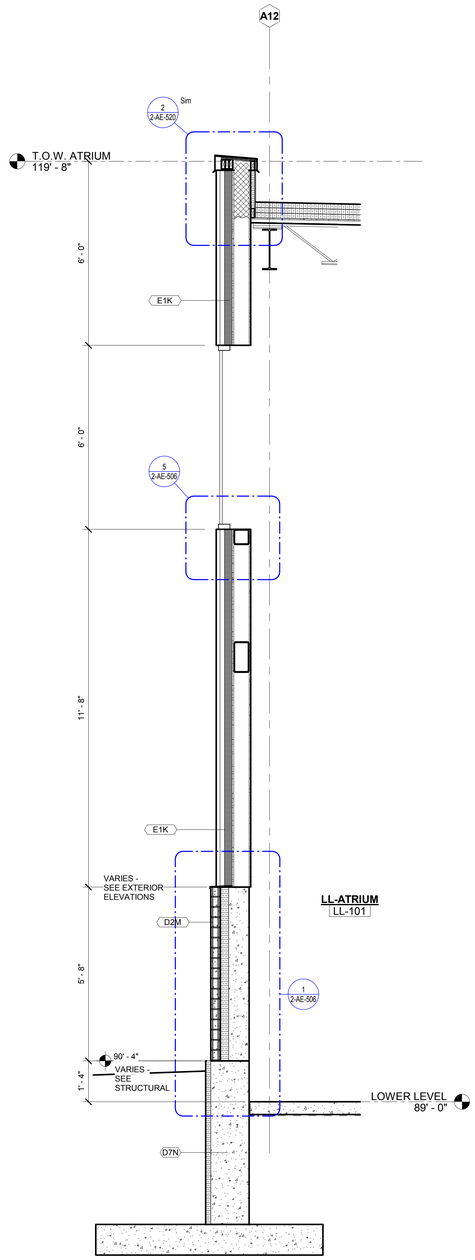
4 AREA A - FITNESS SECTION 2
SCALE 1/2" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-101



3 AREA A - FITNESS SECTION 1
SCALE 1/2" = 1'-0"
AS REFERENCED BY: 2 / 2-AE-301



2 AREA A - ATRIUM SECTION 2
SCALE 1/2" = 1'-0"
AS REFERENCED BY: 2 / 2-AE-301



1 AREA A - ATRIUM SECTION 1
SCALE 1/2" = 1'-0"
AS REFERENCED BY: 2 / 2-AE-301

STRUCTURAL COORDINATION NOTES

COORDINATE WITH STRUCTURAL ENGINEERING FOR THE FOLLOWING:

1. ALL FOOTING AND FOUNDATIONS.
2. ALL STOOP CONSTRUCTION
3. ALL WALL GROUTING / REINFORCING AND BOND BEAM LOCATIONS.
4. ALL BRICK LEDGE HEIGHTS AND LOCATIONS. ALSO REFER TO ARCHITECTURAL ELEVATIONS.
5. AREAS REQUIRING EXISTING STRUCTURAL REINFORCING.
6. DOWELED CONNECTION REQUIREMENTS BETWEEN EXISTING AND NEW CONCRETE SLABS.

KEYNOTE LEGEND	
KEY NO.	KEYNOTE TEXT

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CONSULTANT:

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SHEET TITLE:
WALL SECTIONS - AREA A

SHEET NUMBER:
2-AE-310

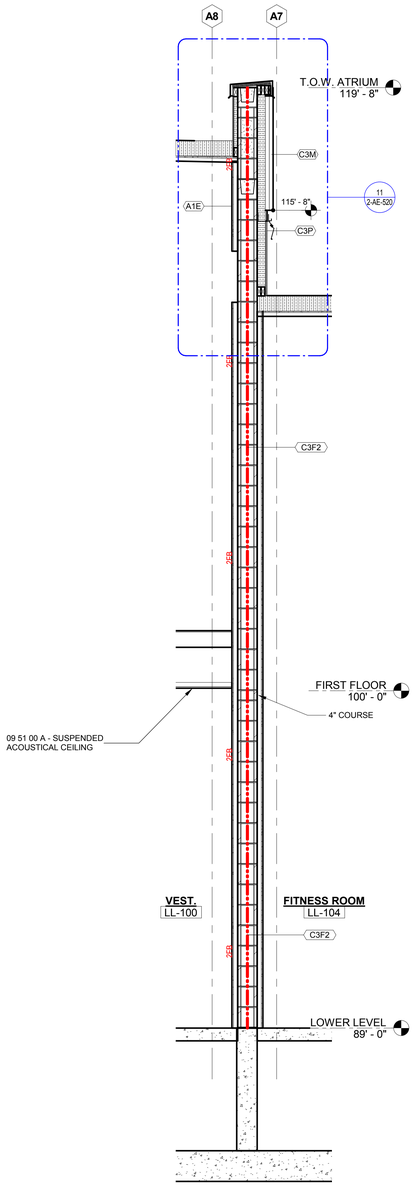
STRUCTURAL COORDINATION NOTES

COORDINATE WITH STRUCTURAL ENGINEERING FOR THE FOLLOWING:

1. ALL FOOTING AND FOUNDATIONS.
2. ALL STOOP CONSTRUCTION
3. ALL WALL GROUTING / REINFORCING AND BOND BEAM LOCATIONS.
4. ALL BRICK LEDGE HEIGHTS AND LOCATIONS. ALSO REFER TO ARCHITECTURAL ELEVATIONS.
5. AREAS REQUIRING EXISTING STRUCTURAL REINFORCING.
6. DOWELED CONNECTION REQUIREMENTS BETWEEN EXISTING AND NEW CONCRETE SLABS.

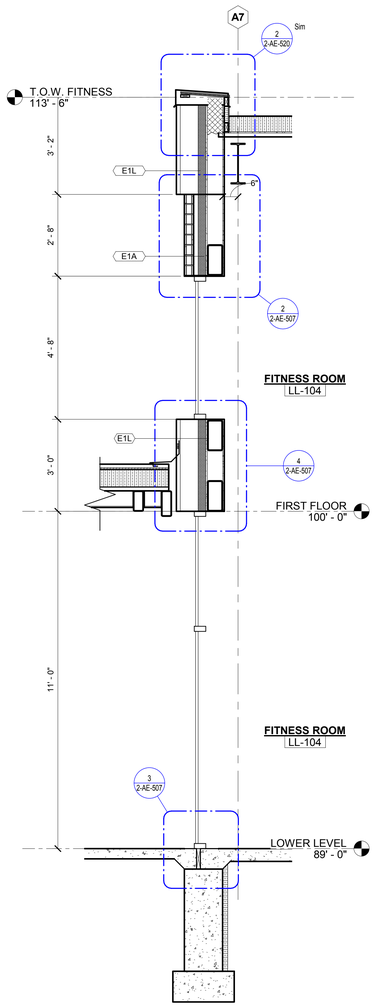
KEYNOTE LEGEND

KEY NO.	KEYNOTE TEXT
09 51 00 A -	SUSPENDED ACOUSTICAL CEILING



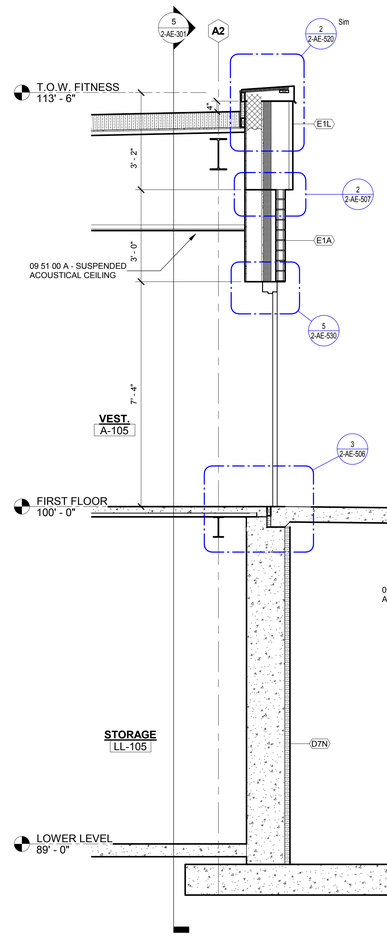
4 VESTIBULE / FITNESS WALL SECTION

SCALE 1/2" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-402



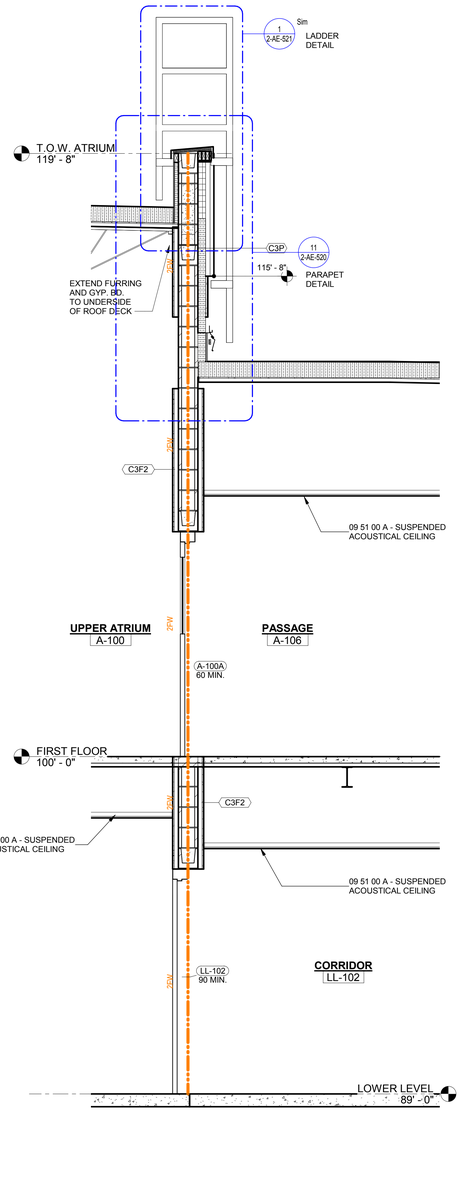
3 FITNESS EXTER. WALL SECTION

SCALE 1/2" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-101



2 CORRIDOR EXTER. WALL SECTION

SCALE 1/2" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-101



1 ATRIUM-PASSAGE SECTION

SCALE 1/2" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-102

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PART 2 - MANAWA MIDDLE / HIGH SCHOOL
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SHEET TITLE:
WALL SECTIONS - AREA A

SHEET NUMBER:
2-AE-311

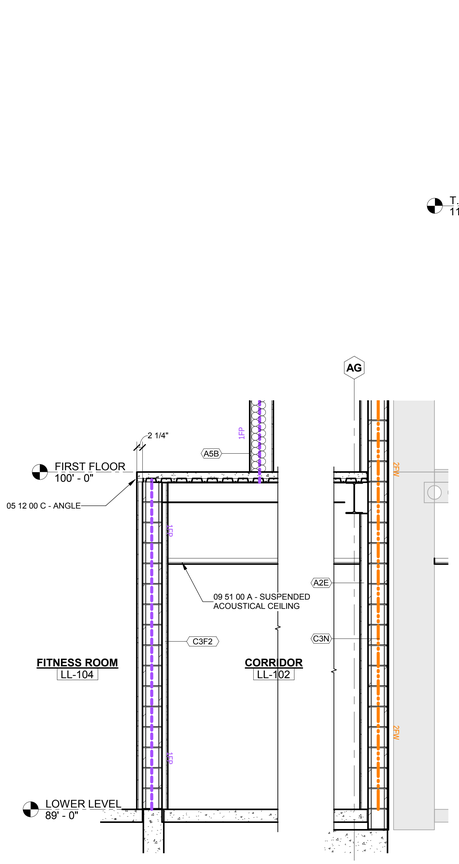
STRUCTURAL COORDINATION NOTES

COORDINATE WITH STRUCTURAL ENGINEERING FOR THE FOLLOWING:

1. ALL FOOTING AND FOUNDATIONS.
2. ALL STOOP CONSTRUCTION
3. ALL WALL GROUTING / REINFORCING AND BOND BEAM LOCATIONS.
4. ALL BRICK LEDGE HEIGHTS AND LOCATIONS. ALSO REFER TO ARCHITECTURAL ELEVATIONS.
5. AREAS REQUIRING EXISTING STRUCTURAL REINFORCING.
6. DOWELED CONNECTION REQUIREMENTS BETWEEN EXISTING AND NEW CONCRETE SLABS.

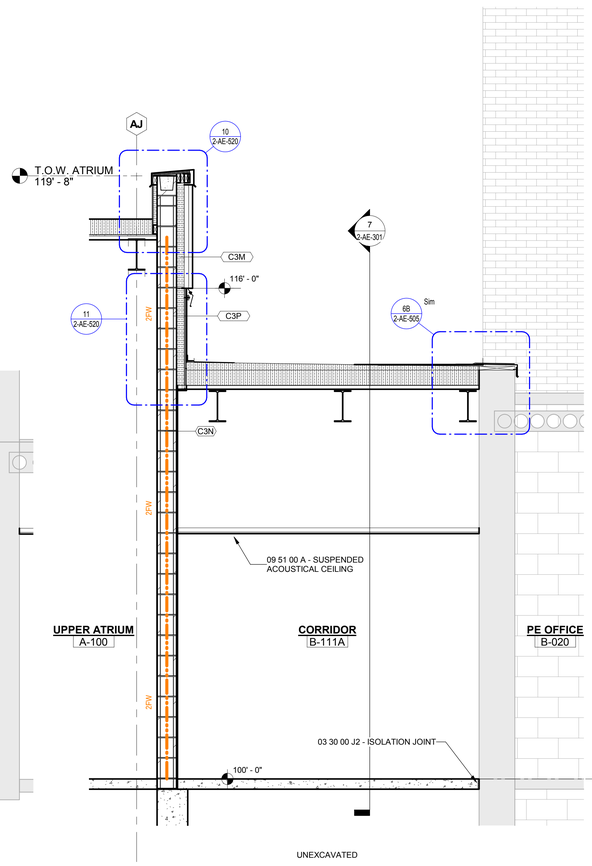
KEYNOTE LEGEND

KEY NO.	KEYNOTE TEXT
03 30 00 J2 -	ISOLATION JOINT
05 12 00 C -	ANGLE
06 10 00 CP2 -	PPT BLOCKING - 2x
06 10 00 DP -	PPT PLYWOOD
07 21 00 A -	BATT INSULATION
07 53 00 A3 -	MEMBRANE FLASHING
07 53 00 C -	RIGID FOAM INSULATION
07 53 00 H -	SEALANT
07 53 00 J -	TERMINATION BAR
07 53 00 K1 -	COMPRESSIBLE TUBE
07 62 00 A -	METAL COPING
09 51 00 A -	SUSPENDED ACOUSTICAL CEILING



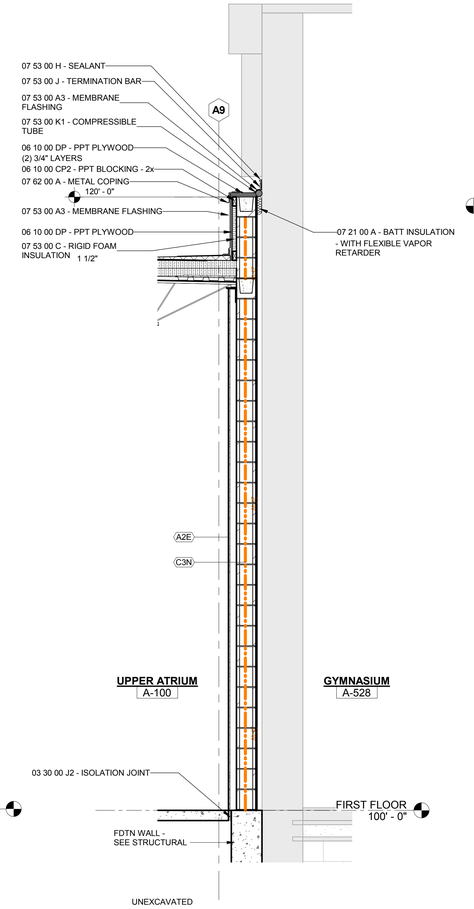
4 AREA A - PASSAGE SECTION 1

SCALE 1/2" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-102



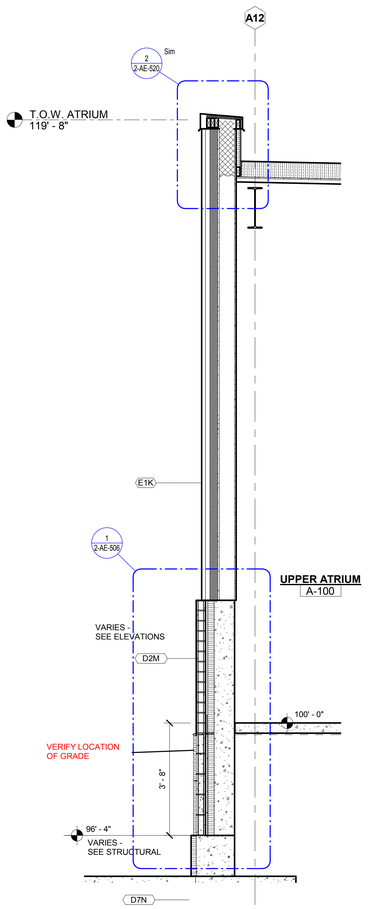
3 AREA A - ATRIUM SECTION 5

SCALE 1/2" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-301



2 AREA A - ATRIUM SECTION 7

SCALE 1/2" = 1'-0"
AS REFERENCED BY: 3 / 2-AE-301



1 AREA A - ATRIUM SECTION 6

SCALE 1/2" = 1'-0"
AS REFERENCED BY: 3 / 2-AE-301

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CONSULTANT:

MANAWA

MANAWA ELEMENTARY SCHOOL - ALTERATIONS
MANAWA MIDDLE/HIGH SCHOOL - ADDITIONS & ALTERATIONS
PART 2 - MANAWA MIDDLE / HIGH SCHOOL
515 E. 4th STREET
MANAWA, WI 54949

MARK	DATE

ISSUED: 6 JUN 2019
PROJECT NO: 18268
CAD DWG FILE:
DRAWN BY: Author
CHECKED BY: Checker

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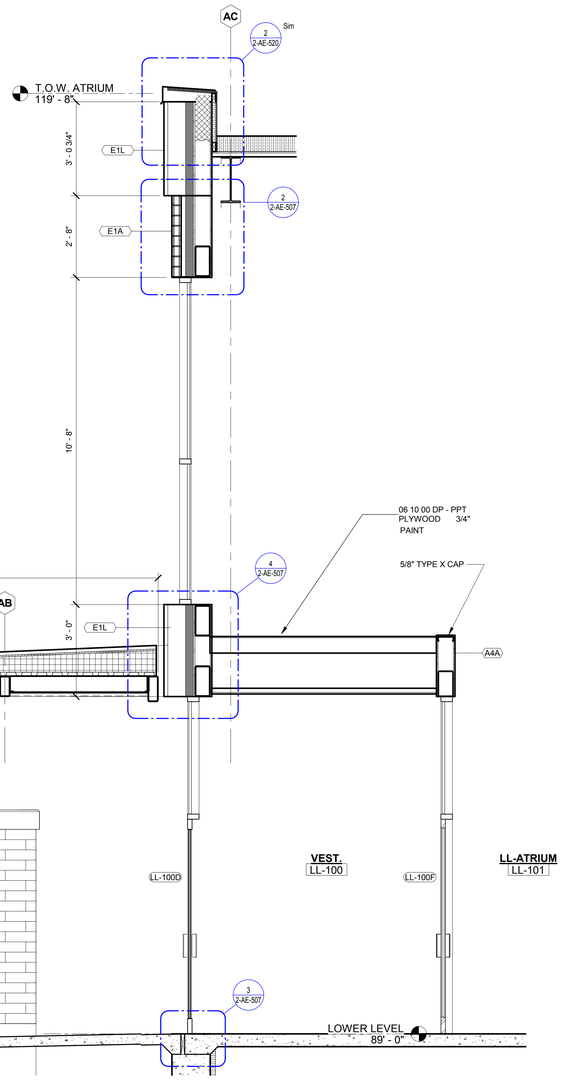
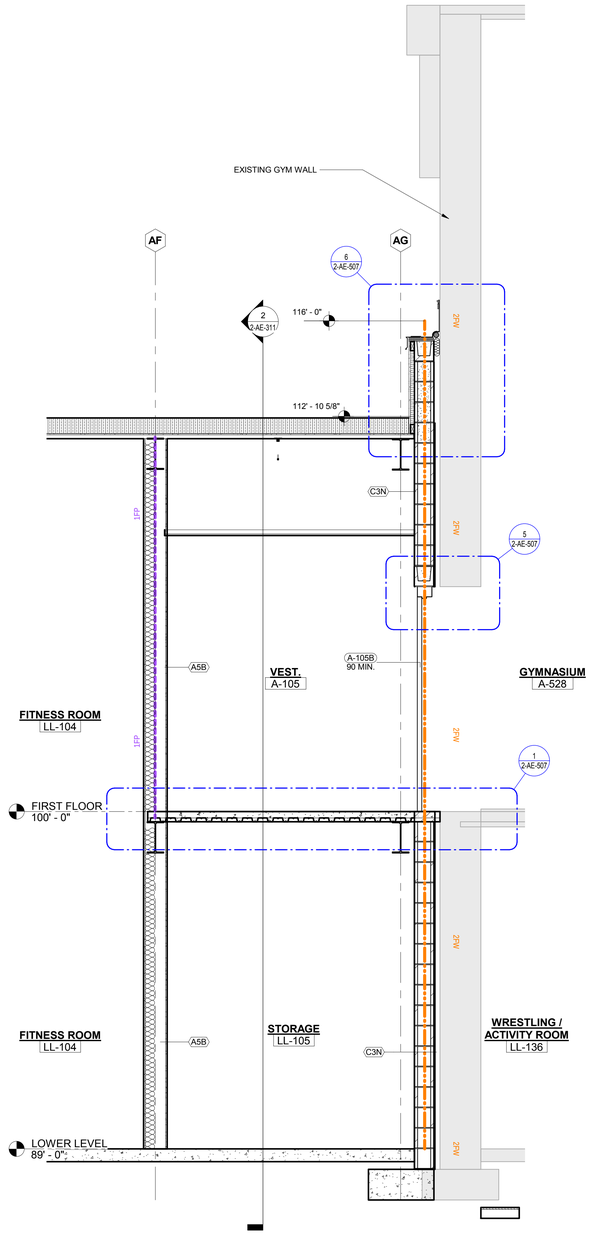
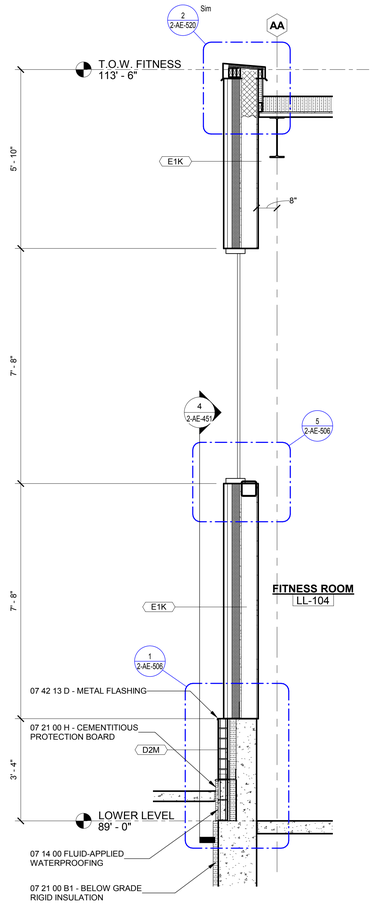
SHEET TITLE:
WALL SECTIONS - AREA A

SHEET NUMBER:
2-AE-312







3 AREA A - VESTIBULE SECTION

SCALE 1/2" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-301

2 AREA A - CORRIDOR SECTION

SCALE 1/2" = 1'-0"
AS REFERENCED BY: 5 / 2-AE-301

1 AREA A - FITNESS SECTION

SCALE 1/2" = 1'-0"
AS REFERENCED BY: 6 / 2-AE-301

STRUCTURAL COORDINATION NOTES

COORDINATE WITH STRUCTURAL ENGINEERING FOR THE FOLLOWING:

1. ALL FOOTING AND FOUNDATIONS.
2. ALL STOOP CONSTRUCTION
3. ALL WALL GROUTING / REINFORCING AND BOND BEAM LOCATIONS.
4. ALL BRICK LEDGE HEIGHTS AND LOCATIONS. ALSO REFER TO ARCHITECTURAL ELEVATIONS.
5. AREAS REQUIRING EXISTING STRUCTURAL REINFORCING.
6. DOWELED CONNECTION REQUIREMENTS BETWEEN EXISTING AND NEW CONCRETE SLABS.

KEYNOTE LEGEND

KEY NO.	KEYNOTE TEXT
04 72 00 D -	CAST STONE CAP
05 12 00 H -	HSS SECTION
05 40 00	COLD-FORMED METAL FRAMING
06 10 00 DP -	PPT PLYWOOD
07 14 00	FLUID-APPLIED WATERPROOFING
07 21 00 B1 -	BELOW GRADE RIGID INSULATION
07 21 00 H -	CEMENTITIOUS PROTECTION BOARD
07 42 13 C -	METAL SOFFIT PANEL
07 42 13 D -	METAL FLASHING
07 71 23 A -	GUTTER
32 13 13 K1 -	EXPANSION JOINT - 1/2"
33 41 11 H -	TRENCH FRAME AND GRATE

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CONSULTANT:

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DRAWN BY:	Author
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SHEET TITLE:
WALL SECTIONS - AREA A

SHEET NUMBER:
2-AE-313

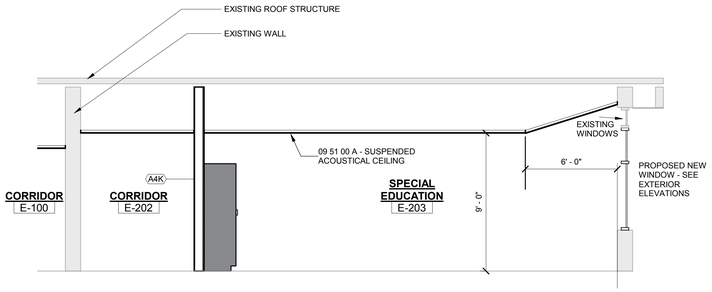
STRUCTURAL COORDINATION NOTES

COORDINATE WITH STRUCTURAL ENGINEERING FOR THE FOLLOWING:

1. ALL FOOTING AND FOUNDATIONS.
2. ALL STOOP CONSTRUCTION
3. ALL WALL GROUTING / REINFORCING AND BOND BEAM LOCATIONS.
4. ALL BRICK LEDGE HEIGHTS AND LOCATIONS. ALSO REFER TO ARCHITECTURAL ELEVATIONS.
5. AREAS REQUIRING EXISTING STRUCTURAL REINFORCING.
6. DOWELED CONNECTION REQUIREMENTS BETWEEN EXISTING AND NEW CONCRETE SLABS.

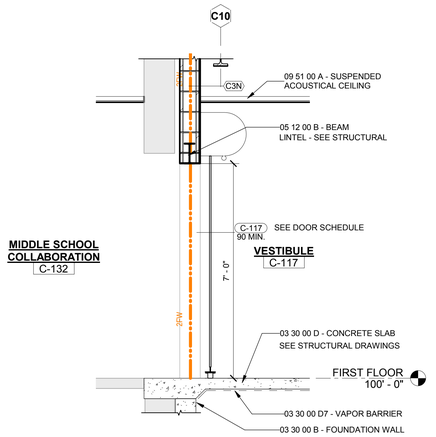
KEYNOTE LEGEND

KEY NO.	KEYNOTE TEXT
03 30 00 B -	FOUNDATION WALL
03 30 00 D7 -	VAPOR BARRIER
03 30 00 D -	CONCRETE SLAB
05 12 00 B -	BEAM
09 51 00 A -	SUSPENDED ACOUSTICAL CEILING



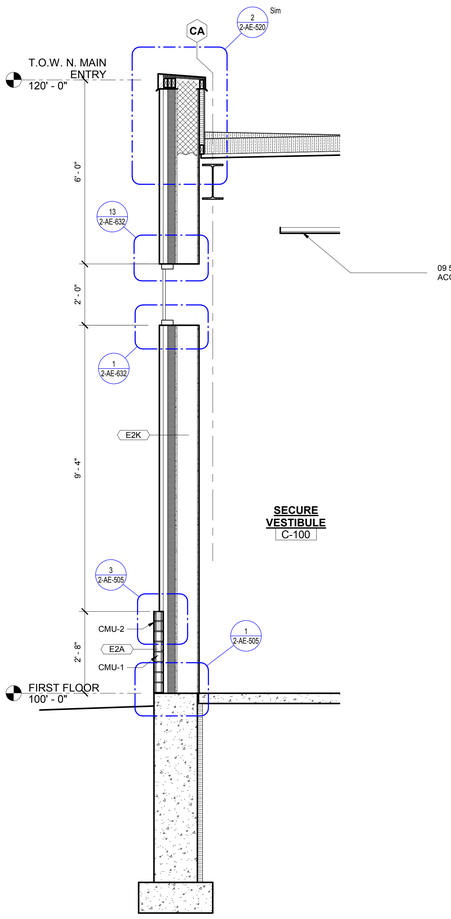
7 AREA C - WALL SECTION 7

SCALE 1/4" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-104



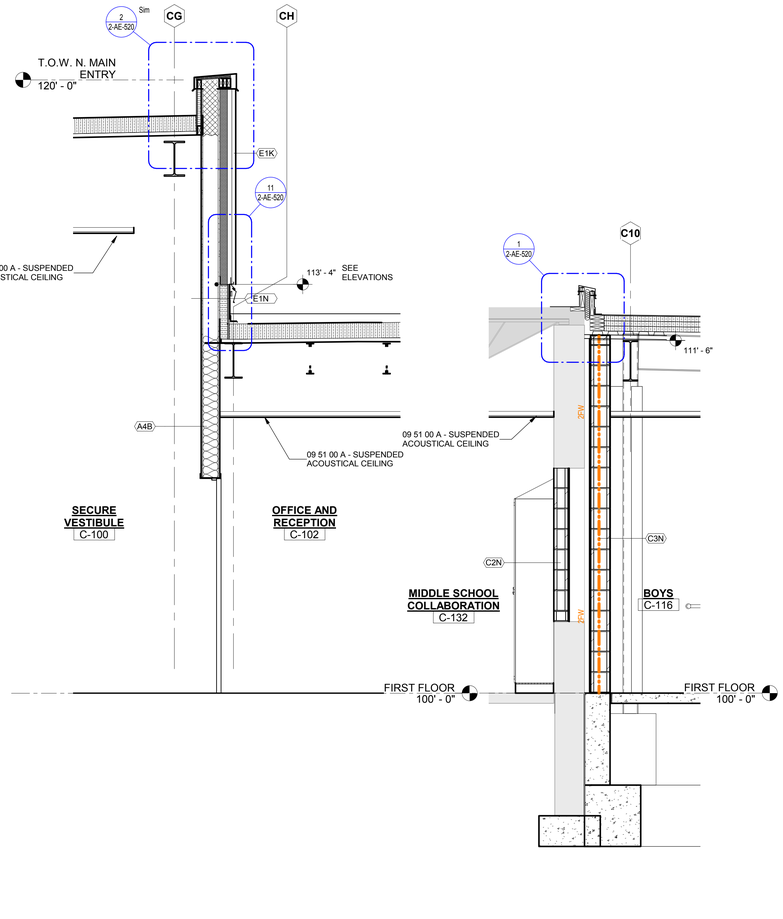
6B AREA C - WALL SECTION 6 - NEW WORK

SCALE 1/2" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-104 SEE DETAIL 2 / 2-AD-104 FOR DEMO SECTION



5 AREA C - WALL SECTION 5

SCALE 1/2" = 1'-0"
AS REFERENCED BY: 2 / 2-AE-302

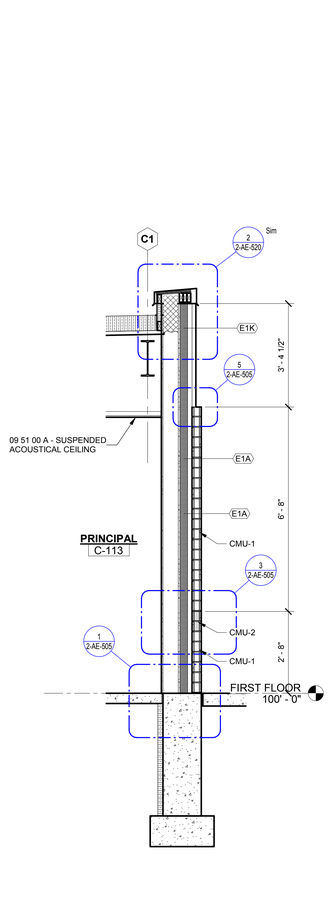


4 AREA C - WALL SECTION 4

SCALE 1/2" = 1'-0"
AS REFERENCED BY: 2 / 2-AE-302

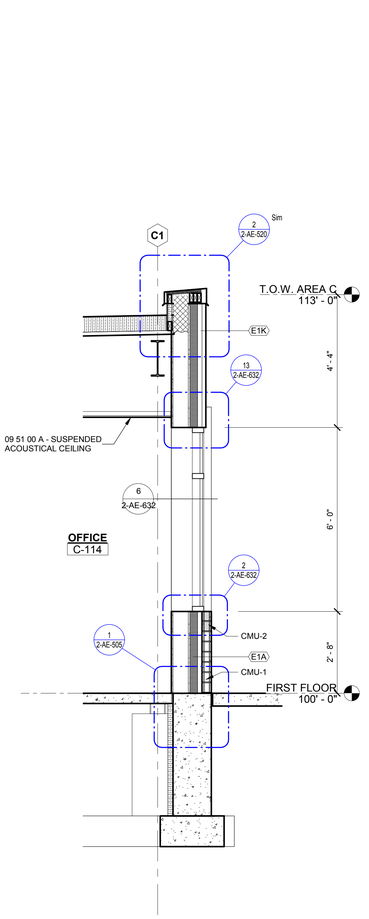
3 AREA C - WALL SECTION 3

SCALE 1/2" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-302



2 AREA C - WALL SECTION 2

SCALE 1/2" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-104



1 AREA C - WALL SECTION 1

SCALE 1/2" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-302

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CONSULTANT:

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515 E. 4th STREET
MANAWA, WI 54949

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PROJECT NO:	18268
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SHEET TITLE:

WALL SECTIONS - AREA C

SHEET NUMBER:

2-AE-314

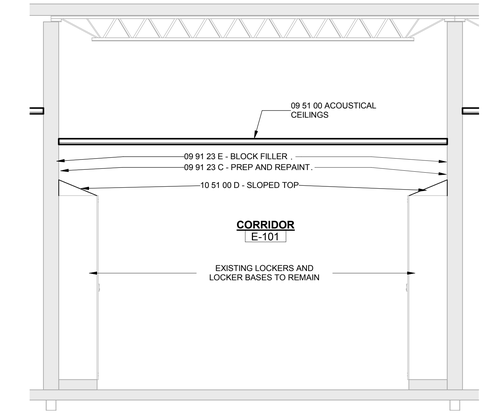
STRUCTURAL COORDINATION NOTES

COORDINATE WITH STRUCTURAL ENGINEERING FOR THE FOLLOWING:

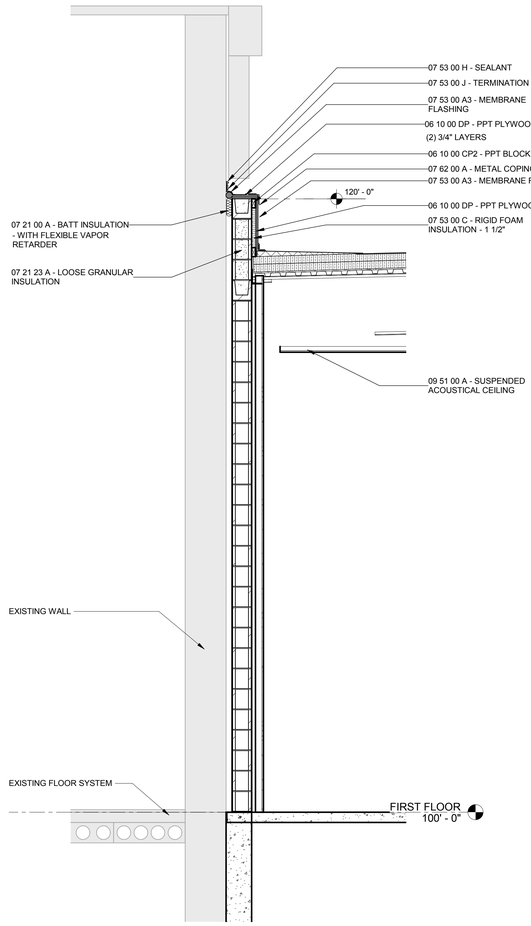
1. ALL FOOTING AND FOUNDATIONS.
2. ALL STOOP CONSTRUCTION
3. ALL WALL GROUTING / REINFORCING AND BOND BEAM LOCATIONS.
4. ALL BRICK LEDGE HEIGHTS AND LOCATIONS. ALSO REFER TO ARCHITECTURAL ELEVATIONS.
5. AREAS REQUIRING EXISTING STRUCTURAL REINFORCING.
6. DOWELED CONNECTION REQUIREMENTS BETWEEN EXISTING AND NEW CONCRETE SLABS.

KEYNOTE LEGEND

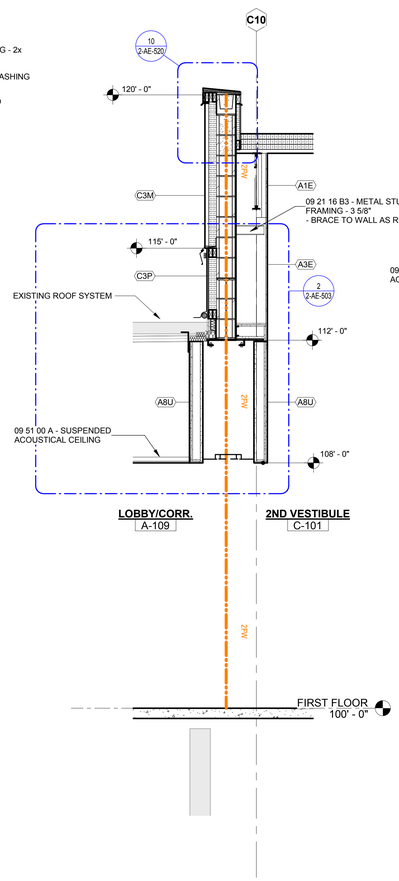
KEY NO.	KEYNOTE TEXT
04 72 00 D -	CAST STONE CAP
05 12 00	STRUCTURAL STEEL
05 31 00	STEEL DECKING
05 40 00	COLD-FORMED METAL FRAMING
06 10 00 CP2 -	PPT BLOCKING - 2x
06 10 00 DP -	PPT PLYWOOD
07 21 00 A -	BATT INSULATION
07 21 00 B1 -	BELOW GRADE RIGID INSULATION
07 21 00 B -	RIGID INSULATION
07 21 23 A -	LOOSE GRANULAR INSULATION
07 42 13 C -	METAL SOFFIT PANEL
07 53 00 A3 -	MEMBRANE FLASHING
07 53 00 C -	RIGID FOAM INSULATION
07 53 00 H -	SEALANT
07 53 00 J -	TERMINATION BAR
07 61 00 A -	STANDING SEAM METAL ROOF
07 61 00 D -	ICE AND WATER BARRIER
07 62 00 A -	METAL COPING
07 71 23	MANUFACTURED GUTTERS AND DOWNSPOUTS
09 21 16 B3 -	METAL STUD FRAMING - 3 5/8"
09 51 00	ACOUSTICAL CEILINGS
09 51 00 A -	SUSPENDED ACOUSTICAL CEILING
09 91 23 C -	PREP AND REPAINT
09 91 23 E -	BLOCK FILLER
10 51 00 D -	SLOPED TOP



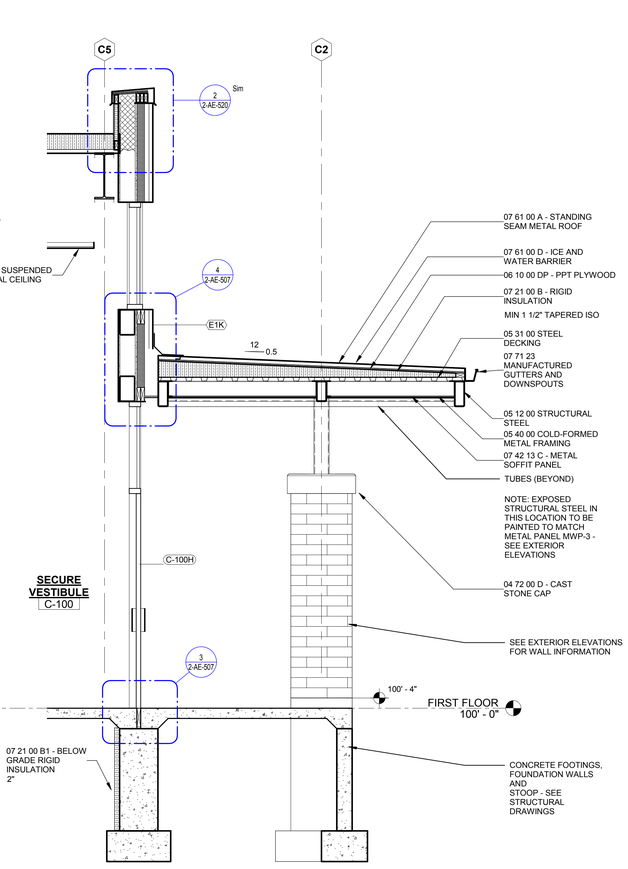
4 TYP. CORRIDOR NEW WORK SECTION
SCALE 1/2" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-106



3 AREA C - WALL SECTION 16
SCALE 1/2" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-102



2 AREA C - WALL SECTION 9
SCALE 1/2" = 1'-0"
AS REFERENCED BY: 3 / 2-AE-302



1 AREA C - WALL SECTION 8
SCALE 1/2" = 1'-0"
AS REFERENCED BY: 3 / 2-AE-302

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CONSULTANT:

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MANAWA MIDDLE/HIGH SCHOOL - ADDITIONS & ALTERATIONS
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MANAWA, WI 54949

MARK	DATE
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PROJECT NO:	18268
CAD DWG FILE:	
DRAWN BY:	Author
CHECKED BY:	Checker

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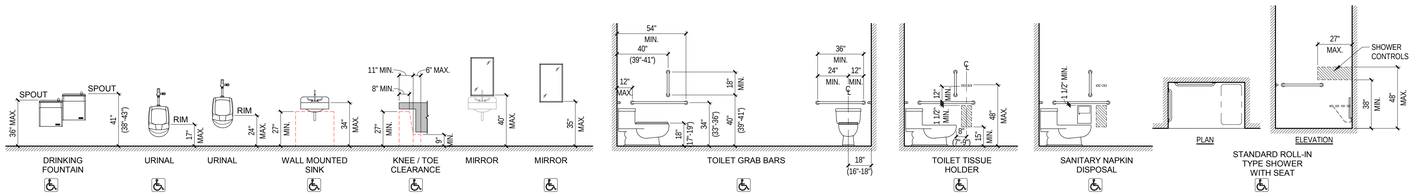
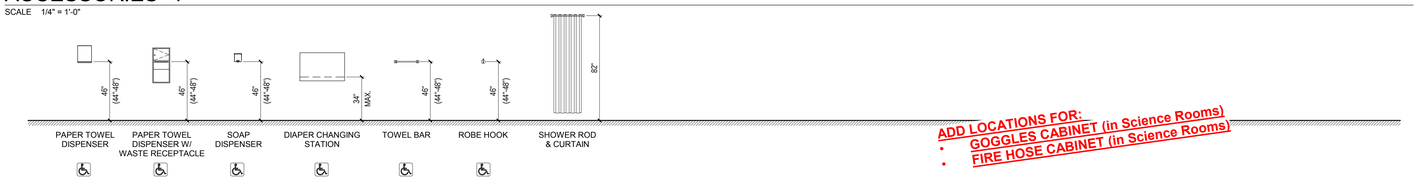
SHEET TITLE:
WALL SECTIONS - AREA C

SHEET NUMBER:
2-AE-315



MOUNTING LOCATIONS - FIXTURES AND ACCESSORIES -1

SCALE 1/4" = 1'-0"



ADD LOCATIONS FOR:
- GOGGLES CABINET (in Science Rooms)
- FIRE HOSE CABINET (in Science Rooms)

MOUNTING LOCATIONS - FIXTURES AND ACCESSORIES - 2

N.T.S.

VERIFY FIXTURES INCLUDED

TOILET ACCESSORIES SCHEDULE - 10 28 00

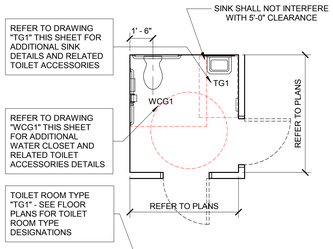
TAG	DESCRIPTION	MFR	MODEL	REMARKS
TA-1A	GRAB BAR - 42"	BOBRICK	B-6806	
TA-1B	GRAB BAR - 18" VERTICAL	BOBRICK	B-6806	
TA-1C	GRAB BAR - 36"	BOBRICK	B-6806	
TA-2A	CHANNEL-FRAME MIRROR - 18"x30"	BOBRICK	B-165 1830	
TA-3	PAPER TOWEL DISPENSER	BY OWNER		
TA-6	TOILET PAPER DISPENSER	BY OWNER		
TA-9A	SOAP DISPENSER	BY OWNER		

AS NEW TOILET ACCESSORIES ARE PLACED IN THE MODEL, PLEASE TAG AS FOLLOWS:

SANITARY NAPKIN DISPOSAL	TA-8 BOBRICK B-254
SANITARY NAPKIN DISPENSER	TA-7 BOBRICK B-3706C
SHOWER CURTAIN ROD	TA-14 BOBRICK B-207
SHOWER CURTAIN	? ?
ADA SHOWER SEAT	TA-13 BOBRICK B-5191
MOP RACK WITH SHELF	TA-17 BOBRICK B-239
TILTED MIRROR (ADA)	TA-2B BOBRICK B-293-2436

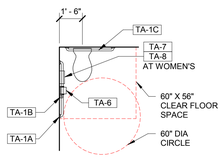
KEYNOTE LEGEND

KEY NO.	KEYNOTE TEXT
10 51 00 A -	METAL LOCKERS
10 51 00 D -	SLOPED TOP



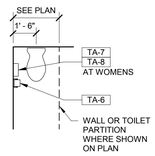
TG1 TYP. ACCESSIBLE TOILET ROOM

SCALE 1/4" = 1'-0"



WCG1 TYP. ACCESSIBLE WATER CLOSET

SCALE 1/4" = 1'-0"

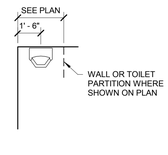


WCG2 WATER CLOSET

SCALE 1/4" = 1'-0"

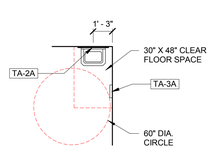
UG1 TYP. ACCESSIBLE URINAL

SCALE 1/4" = 1'-0"



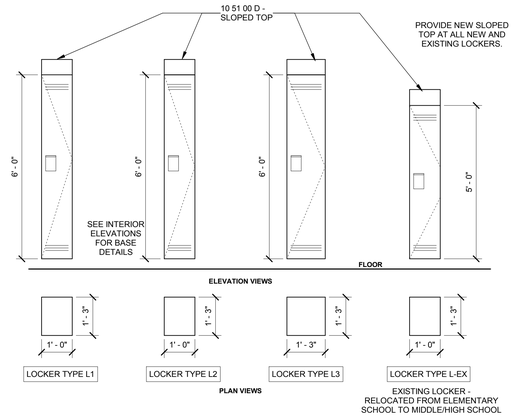
UG2 URINAL

SCALE 1/4" = 1'-0"



SG1 TYP. ACCESSIBLE SINK

SCALE 1/4" = 1'-0"



ALL NEW LOCKERS PROVIDED AND INSTALLED BY 10 51 00 CONTRACTOR.
ALL RELOCATED EXISTING LOCKERS SHALL BE REMOVED, RELOCATED AND INSTALLED BY 10 51 00 CONTRACTOR.

1 LOCKER TYPES

SCALE 1/2" = 1'-0"
AS REFERENCED BY:

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CONSULTANT:

MANAWA

MANAWA ELEMENTARY SCHOOL - ALTERATIONS
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PART 2 - MANAWA MIDDLE / HIGH SCHOOL
515 E. 4th STREET
MANAWA, WI 54949

MARK	DATE

ISSUED: 6 JUN 2019
PROJECT NO: 18268
CAD DWG FILE:
DRAWN BY: Author
CHECKED BY: Checker

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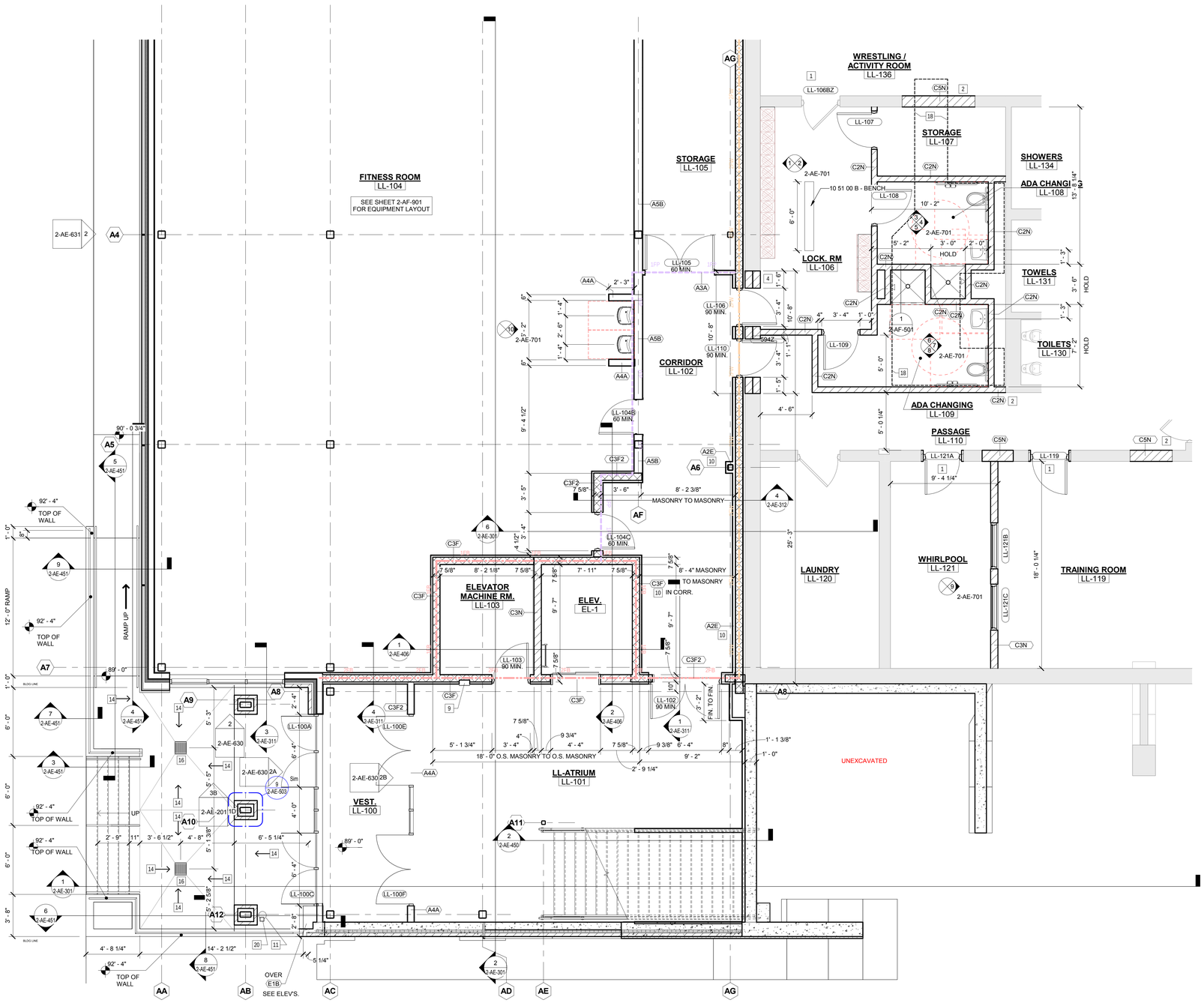
SHEET TITLE:
TOILET RM STDS, LOCKER TYPES

SHEET NUMBER:
2-AE-401

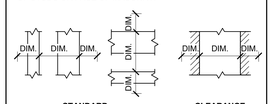


1 LOWER LEVEL - ENLARGED PLAN

SCALE 1/4" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-101

WALL DIMENSION KEY

NOTE:
ALL WALLS ARE DIMENSIONED TO FACE OF STUD OR FACE OF MASONRY. CLEARANCE DIMENSIONS ARE FROM FACE OF STUDS OR FACE OF MASONRY.



FLOOR PLAN LEGEND

- X — DENOTES WINDOW TYPE. SEE SHEET AE-630 & AE-631
- NIC — DENOTES ITEM NOT IN CONTRACT - BY OWNER
- XXXX — DENOTES WALL TYPE - SEE SHEET AE-501 FOR EXTERIOR AND AE-502 FOR INTERIOR WALLS

PLAN NOTES KEY

NO.	DESCRIPTION
1	SEE DOOR & FRAME SCHEDULE FOR WORK AT THIS DOOR
2	TOOTH IN NEW CMU INTO EXISTING COURSING
3	04 20 00 A2 - PROVIDE SOLID BULLNOSE CAP
4	ENLARGE EXISTING OPENING - SEE STRUCTURAL
5	INSTALL RESILIENT CHANNEL ON SIDE OF WALL WITH THIS #5 NOTATION
6	ROOF DRAIN AND OVERFLOW ROOF DRAIN LEADERS - SEE PLBG DRAWINGS
7	ROOF DRAIN LEADER - SEE PLBG DRAWINGS
8	ROOF OVERFLOW DRAIN LEADER - SEE PLBG DRAWINGS
9	10 44 00 - FIRE EXTINGUISHER IN SEMI-RECESSED CABINET
10	EXTEND MTL STUD/FURRING AND GYP WALL MIN. 4" ABOVE CEILING.
11	33 41 11 B - DOWNSPOUT RECIEVER
12	10 51 00 - RELOCATED LOCKERS FROM SOUTH WALL OF CORRIDOR E-101
13	FINISHED WALL LENGTH SHALL MATCH CASEWORK LENGTH
14	SLOPE EXTERIOR STOOPS AND SLABS FOR DRAINAGE MAX. 2% TO COMPLY WITH ADA.
15	TOP OF WALL TO MATCH TOP OF CASEWORK. PROVIDE 5/8" GYP. BD. CAP
16	33 41 11 - SITE DRAIN
17	09 21 16 F - PROVIDE ABUSE RESISTANT GYPSUM BOARD AT THE EXPOSED AREAS OF THIS WALL.
18	03 33 00 - NEW CONCRETE SLAB AT AREA OF REMOVED SLAB. MATCH EXISTING THICKNESS. SLOPE TO DRAIN, IF REQUIRED. REFER TO PLUMBING DRAWINGS.
19	10 51 13 D - NEW SLOPED TOP FOR EXISTING LOCKERS
20	07 71 23 - MANUFACTURED GUTTERS AND DOWNSPOUTS
21	PROVIDE FLOORING, SUB-FLOORING AND STRUCTURAL WOOD JOISTS AS REQUIRED TO PATCH DEMO AREA

KEYNOTE LEGEND

KEY NO.	KEYNOTE TEXT
10 51 00 B -	BENCH

TOILET ROOM & ACCESSORY NOTES

1. ENLARGED PLANS INDICATE TYPICAL DIMENSIONS, LOCATIONS FOR ACCESSORIES AND SPECIALTIES AND REQUIRED CLEARANCES TO BE MAINTAINED. TOILET ROOM AND SINK "TYPES" ARE KEYED ON FLOOR PLANS.
2. REFER TO FLOOR PLAN SHEETS FOR TOILET ROOM AND/OR FIXTURE ORIENTATION, DOOR LOCATION(S), WALL CONSTRUCTION, AND ADDITIONAL EQUIPMENT ITEMS.
3. DIMENSIONS INDICATED ARE TYPICAL UNLESS NOTED OTHERWISE ON DIMENSIONED FLOOR PLAN SHEETS.
4. DIMENSIONS SHOWN FOR ACCESSORIES AND EQUIPMENT ITEMS AND CLEAR FLOOR SPACE ARE FROM FACE OF ROOM FINISH (SUCH AS TILE).
5. "GENERIC" PLUMBING FIXTURES AND ACCESSORIES ARE SHOWN - SEE PLUMBING DRAWINGS AND/OR PROJECT MANUAL FOR SCHEDULED FIXTURES AND ACCESSORIES.

TRUE NORTH / PLAN NORTH

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CONSULTANT:

MANAWA

MANAWA ELEMENTARY SCHOOL - ALTERATIONS
MANAWA MIDDLE/HIGH SCHOOL - ADDITIONS & ALTERATIONS
PART 2 - MANAWA MIDDLE / HIGH SCHOOL
515 E. 4th STREET
MANAWA, WI 54949

MARK	DATE
ISSUED:	6 JUN 2019
PROJECT NO:	18268
CAD DWG FILE:	
DRAWN BY:	Author
CHECKED BY:	Checker

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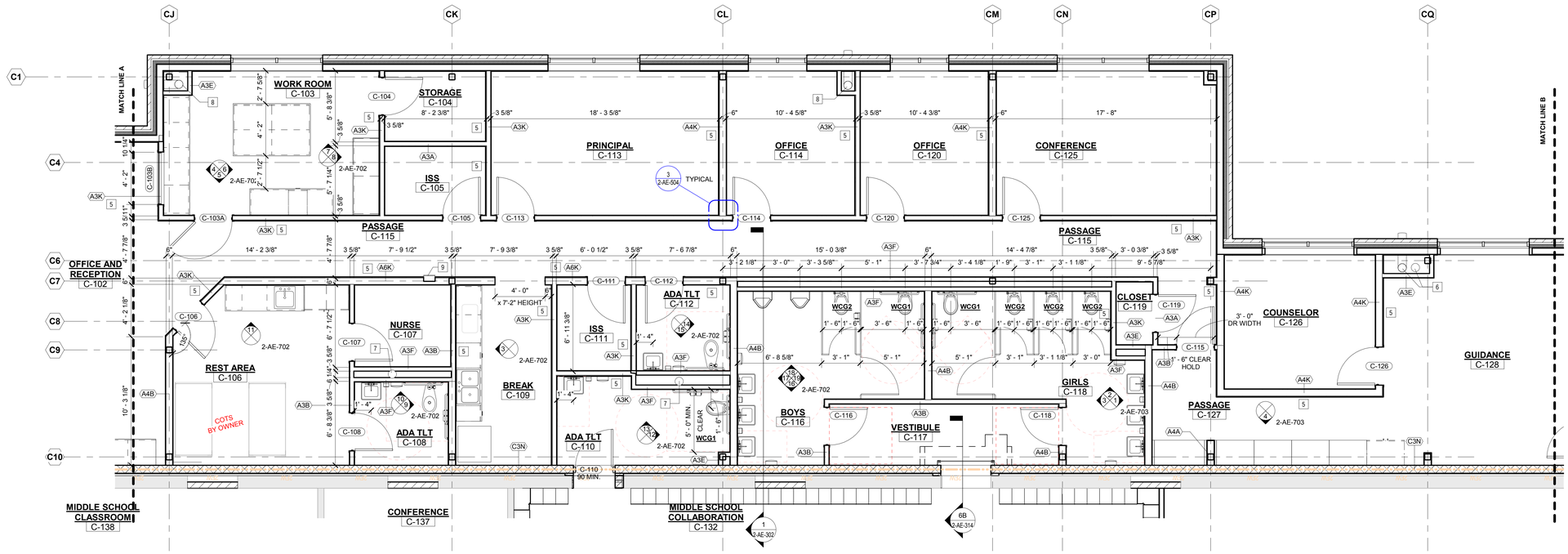
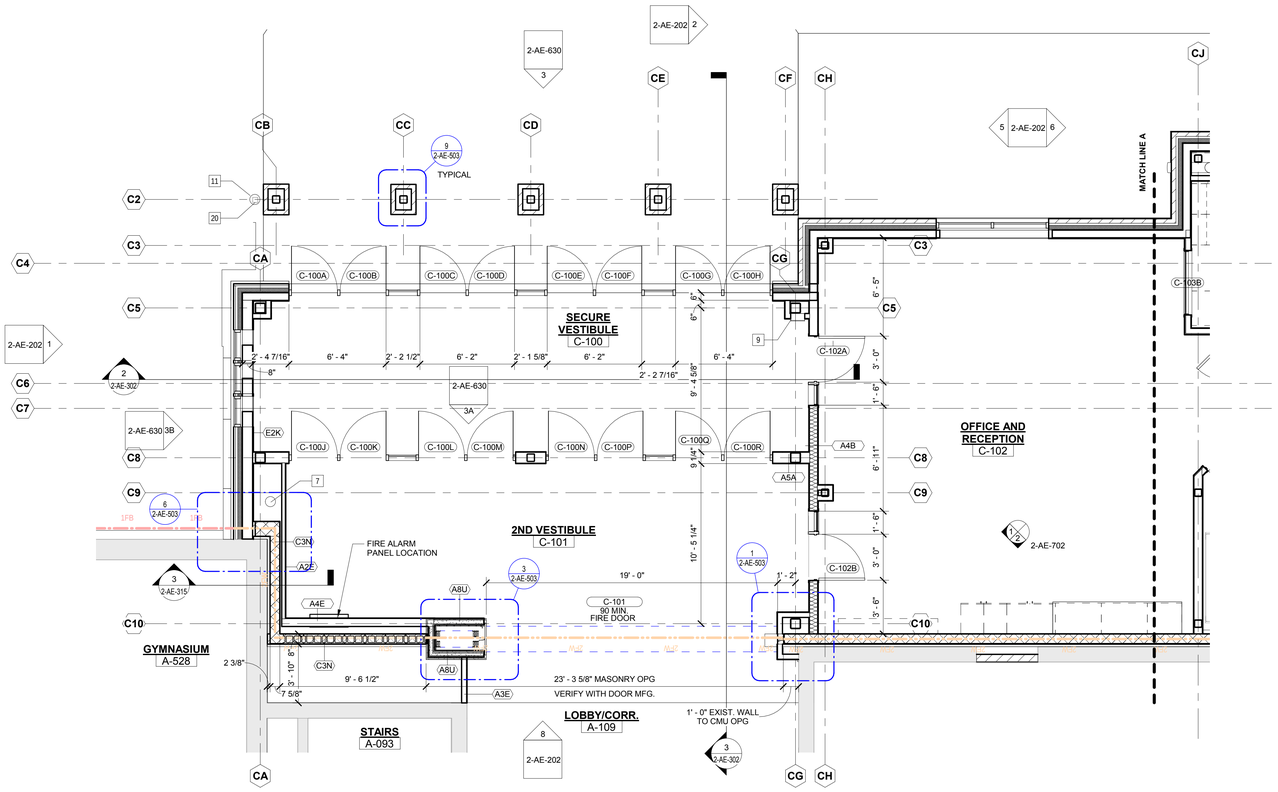
SHEET TITLE:
ENLARGED PLAN - LOWER LEVEL

SHEET NUMBER:
2-AE-402



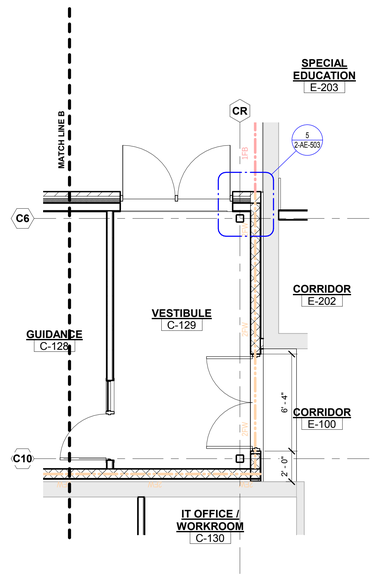
3 AREA C - ENLARGED PLAN 3

SCALE 1/4" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-104



2 AREA C - ENLARGED PLAN 2

SCALE 1/4" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-104

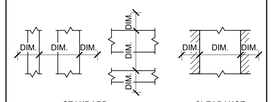


1 AREA C - ENLARGED PLAN 1

SCALE 1/4" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-104

WALL DIMENSION KEY

NOTE:
ALL WALLS ARE DIMENSIONED TO FACE OF STUD OR FACE OF MASONRY. CLEARANCE DIMENSIONS ARE FROM FACE OF STUDS OR FACE OF MASONRY.



STANDARD DIMENSIONING | CLEARANCE DIMENSIONING

FLOOR PLAN LEGEND

X	DENOTES WINDOW TYPE. SEE SHEET AE-630 & AE-631
NIC	DENOTES ITEM NOT IN CONTRACT - BY OWNER
XXXX	DENOTES WALL TYPE - SEE SHEET AE-501 FOR EXTERIOR AND AE-502 FOR INTERIOR WALLS

PLAN NOTES KEY

NO.	DESCRIPTION
1	SEE DOOR & FRAME SCHEDULE FOR WORK AT THIS DOOR
2	TOOTH IN NEW CMU INTO EXISTING COURSING
3	04 20 00 A2 - PROVIDE SOLID BULLNOSE CAP
4	ENLARGE EXISTING OPENING - SEE STRUCTURAL
5	INSTALL RESILIENT CHANNEL ON SIDE OF WALL WITH THIS #5 NOTATION
6	ROOF DRAIN AND OVERFLOW ROOF DRAIN LEADERS - SEE PLBG DRAWINGS
7	ROOF DRAIN LEADER - SEE PLBG DRAWINGS
8	ROOF OVERFLOW DRAIN LEADER - SEE PLBG DRAWINGS
9	10 44 00 - FIRE EXTINGUISHER IN SEMI-RECESSED CABINET
10	EXTEND MTL STUD/FURRING AND GYP WALL MIN. 4" ABOVE CEILING.
11	33 41 11 B - DOWNSPOUT RECIEVER
12	10 51 00 - RELOCATED LOCKERS FROM SOUTH WALL OF CORRIDOR E-101
13	FINISHED WALL LENGTH SHALL MATCH CASEWORK LENGTH
14	SLOPE EXTERIOR STOOPS AND SLABS FOR DRAINAGE MAX. 2% TO COMPLY WITH ADA.
15	TOP OF WALL TO MATCH TOP OF CASEWORK. PROVIDE 5/8" GYP. BD. CAP
16	33 41 11 - SITE DRAIN
17	09 21 16 F - PROVIDE ABUSE RESISTANT GYPSUM BOARD AT THE EXPOSED AREAS OF THIS WALL
18	03 33 00 - NEW CONCRETE SLAB AT AREA OF REMOVED SLAB. MATCH EXISTING THICKNESS. SLOPE TO DRAIN, IF REQUIRED. REFER TO PLUMBING DRAWINGS.
19	10 51 13 D - NEW SLOPED TOP FOR EXISTING LOCKERS
20	07 71 23 - MANUFACTURED GUTTERS AND DOWNSPOUTS
21	PROVIDE FLOORING, SUB-FLOORING AND STRUCTURAL WOOD JOISTS AS REQUIRED TO PATCH DEMO AREA

TOILET ROOM & ACCESSORY NOTES

1. ENLARGED PLANS INDICATE TYPICAL DIMENSIONS, LOCATIONS FOR ACCESSORIES AND SPECIALTIES AND REQUIRED CLEARANCES TO BE MAINTAINED. TOILET ROOM AND SINK "TYPES" ARE KEYED ON FLOOR PLANS.
2. REFER TO FLOOR PLAN SHEETS FOR TOILET ROOM AND/OR FIXTURE ORIENTATION, DOOR LOCATION(S), WALL CONSTRUCTION, AND ADDITIONAL EQUIPMENT ITEMS.
3. DIMENSIONS INDICATED ARE TYPICAL UNLESS NOTED OTHERWISE ON DIMENSIONED FLOOR PLAN SHEETS.
4. DIMENSIONS SHOWN FOR ACCESSORIES AND EQUIPMENT ITEMS AND CLEAR FLOOR SPACE ARE FROM FACE OF ROOM FINISH (SUCH AS TILE).
5. "GENERIC" PLUMBING FIXTURES AND ACCESSORIES ARE SHOWN - SEE PLUMBING DRAWINGS AND/OR PROJECT MANUAL FOR SCHEDULED FIXTURES AND ACCESSORIES.

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PART 2 - MANAWA MIDDLE / HIGH SCHOOL
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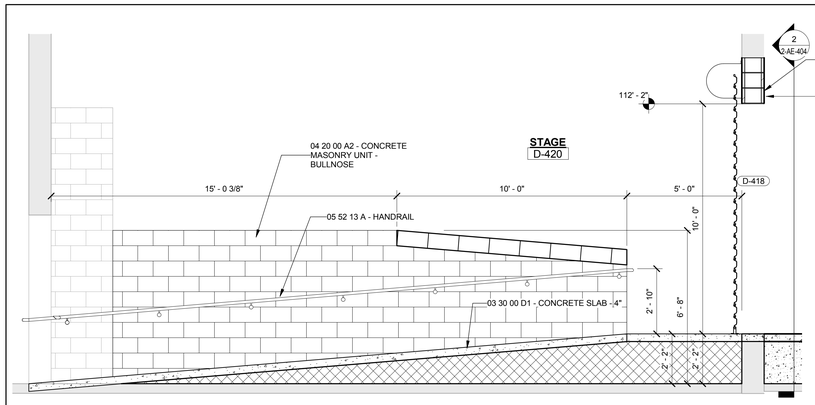
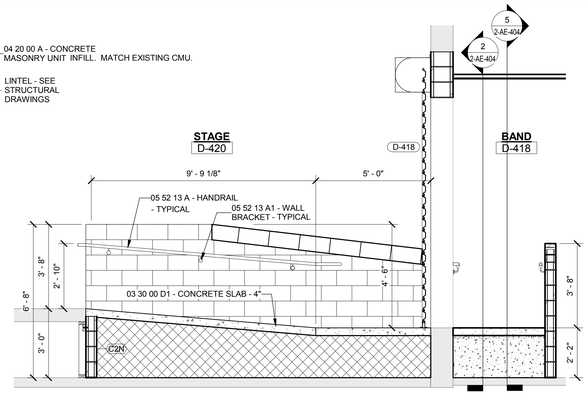
SHEET TITLE:
ENLARGED PLANS AREA C

SHEET NUMBER:
2-AE-403



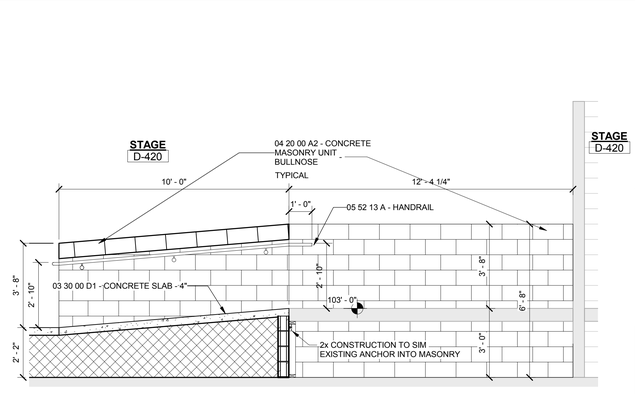
8 STAGE D-425 SECTION 4

SCALE 3/8" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-404



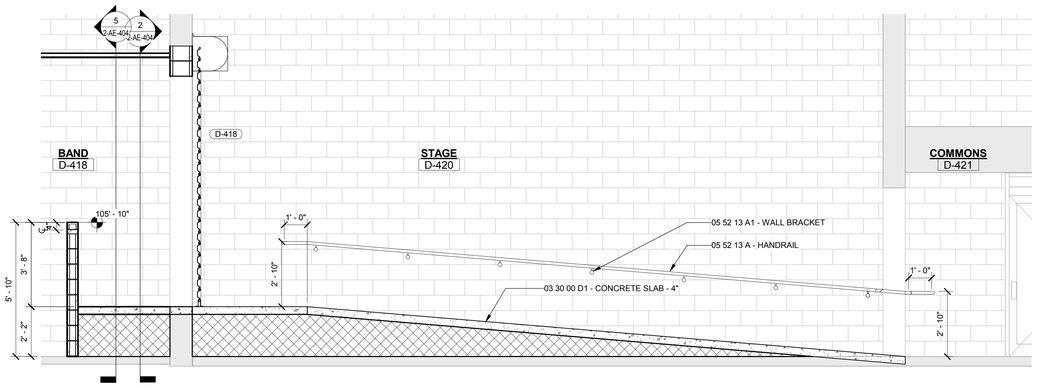
7 STAGE D-425 SECTION 3

SCALE 3/8" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-404



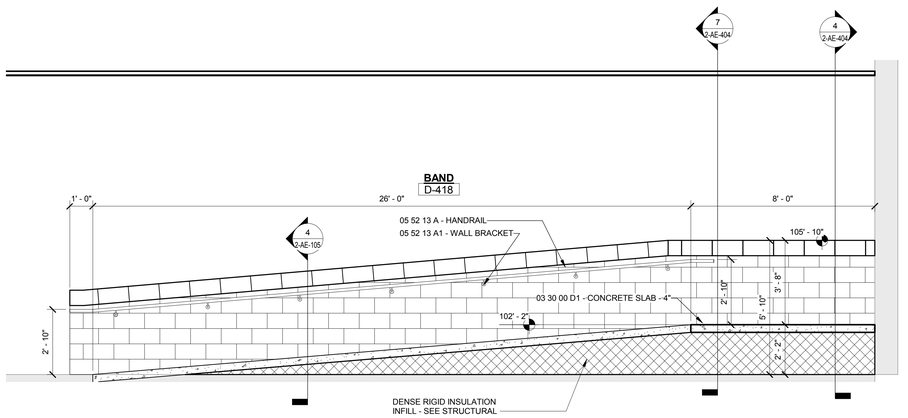
6 STAGE D-425 SECTION 2

SCALE 3/8" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-404



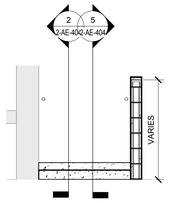
4 STAGE D-425 SECTION 1

SCALE 3/8" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-404



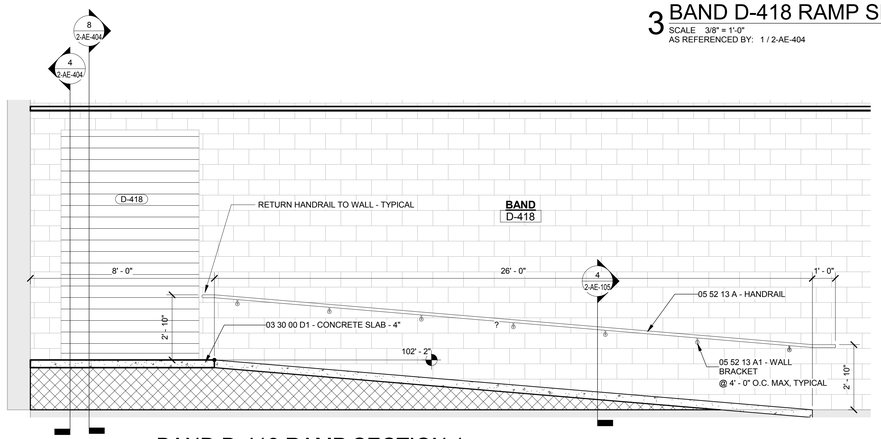
5 BAND D-418 RAMP SECTION 2

SCALE 3/8" = 1'-0"
AS REFERENCED BY: 4 / 2-AE-105



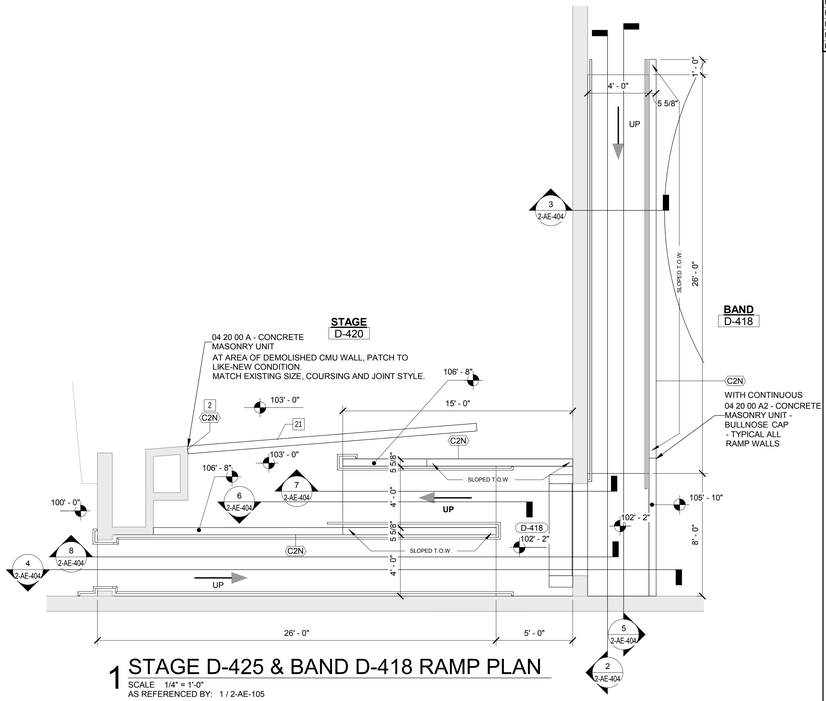
3 BAND D-418 RAMP SECTION 3

SCALE 3/8" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-404



2 BAND D-418 RAMP SECTION 1

SCALE 3/8" = 1'-0"
AS REFERENCED BY: 4 / 2-AE-105

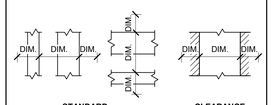


1 STAGE D-425 & BAND D-418 RAMP PLAN

SCALE 1/4" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-105

WALL DIMENSION KEY

NOTE:
ALL WALLS ARE DIMENSIONED TO FACE OF STUD OR FACE OF MASONRY. CLEARANCE DIMENSIONS ARE FROM FACE OF STUDS OR FACE OF MASONRY.



STANDARD DIMENSIONING | CLEARANCE DIMENSIONING

FLOOR PLAN LEGEND

- X — DENOTES WINDOW TYPE. SEE SHEET AE-630 & AE-631
- NIC — DENOTES ITEM NOT IN CONTRACT - BY OWNER
- XXXX — DENOTES WALL TYPE - SEE SHEET AE-501 FOR EXTERIOR AND AE-502 FOR INTERIOR WALLS

PLAN NOTES KEY

NO.	DESCRIPTION
1	SEE DOOR & FRAME SCHEDULE FOR WORK AT THIS DOOR
2	TOOTH IN NEW CMU INTO EXISTING COURSING
3	04 20 00 A2 - PROVIDE SOLID BULLNOSE CAP
4	ENLARGE EXISTING OPENING - SEE STRUCTURAL
5	INSTALL RESILIENT CHANNEL ON SIDE OF WALL WITH THIS #5 NOTATION
6	ROOF DRAIN AND OVERFLOW ROOF DRAIN LEADERS - SEE PLBG DRAWINGS
7	ROOF DRAIN LEADER - SEE PLBG DRAWINGS
8	ROOF OVERFLOW DRAIN LEADER - SEE PLBG DRAWINGS
9	10 44 00 - FIRE EXTINGUISHER IN SEMI-RECESSED CABINET
10	EXTEND MTL STUD/FURRING AND GYP WALL MIN. 4" ABOVE CEILING.
11	33 41 11 B - DOWNSPOUT RECIEVER
12	10 51 00 - RELOCATED LOCKERS FROM SOUTH WALL OF CORRIDOR E-101
13	FINISHED WALL LENGTH SHALL MATCH CASEWORK LENGTH
14	SLOPE EXTERIOR STOOPS AND SLABS FOR DRAINAGE MAX. 2% TO COMPLY WITH ADA.
15	TOP OF WALL TO MATCH TOP OF CASEWORK. PROVIDE 5/8" GYP. BD. CAP
16	33 41 11 - SITE DRAIN
17	09 21 16 F - PROVIDE ABUSE RESISTANT GYPSUM BOARD AT THE EXPOSED AREAS OF THIS WALL.
18	03 33 00 - NEW CONCRETE SLAB AT AREA OF REMOVED SLAB. MATCH EXISTING THICKNESS. SLOPE TO DRAIN, IF REQUIRED. REFER TO PLUMBING DRAWINGS.
19	10 51 13 D - NEW SLOPED TOP FOR EXISTING LOCKERS
20	07 71 23 - MANUFACTURED GUTTERS AND DOWNSPOUTS
21	PROVIDE FLOORING, SUB-FLOORING AND STRUCTURAL WOOD JOISTS AS REQUIRED TO PATCH DEMO AREA

KEYNOTE LEGEND

KEY NO.	KEYNOTE TEXT
03 30 00 D1 -	CONCRETE SLAB - 4"
04 20 00 A2 -	CONCRETE MASONRY UNIT - BULLNOSE
04 20 00 A -	CONCRETE MASONRY UNIT
05 52 13 A1 -	WALL BRACKET
05 52 13 A -	HANDRAIL

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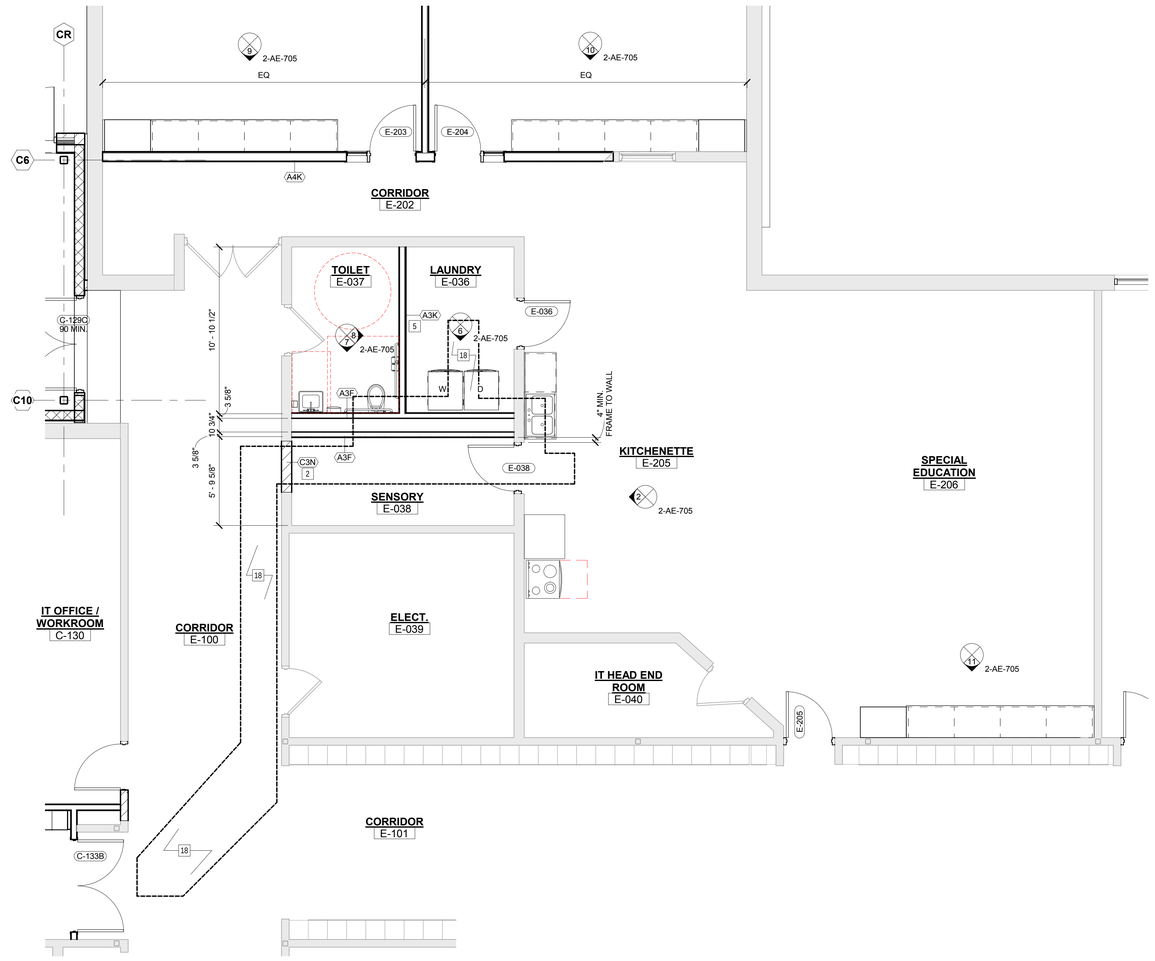
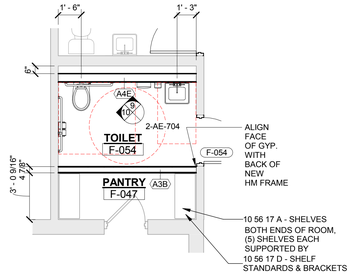
SHEET TITLE:
ENLARGED BAND AND STAGE RAMP PLANS & SECTIONS

SHEET NUMBER:
2-AE-404



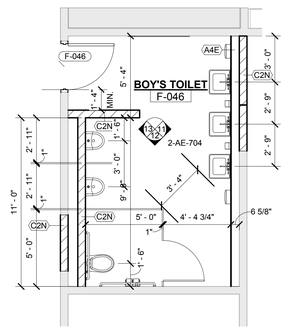
5 AREA E - ENL. PLAN 1

SCALE 1/4" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-106



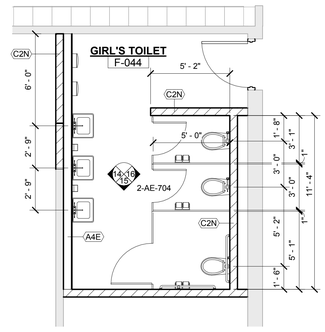
3 ENLARGED F-054

SCALE 1/4" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-107



2 ENLARGED F-046

SCALE 1/4" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-107



1 ENLARGED F-044

SCALE 1/4" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-107

WALL DIMENSION KEY

NOTE:
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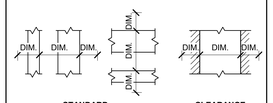

STANDARD DIMENSIONING

CLEARANCE DIMENSIONING

FLOOR PLAN LEGEND

X — DENOTES WINDOW TYPE. SEE SHEET AE-630 & AE-631

NIC — DENOTES ITEM NOT IN CONTRACT - BY OWNER

XXXX — DENOTES WALL TYPE - SEE SHEET AE-501 FOR EXTERIOR AND AE-502 FOR INTERIOR WALLS

PLAN NOTES KEY

NO.	DESCRIPTION
1	SEE DOOR & FRAME SCHEDULE FOR WORK AT THIS DOOR
2	TOOTH IN NEW CMU INTO EXISTING COURSING
3	04 20 00 A2 - PROVIDE SOLID BULLNOSE CAP
4	ENLARGE EXISTING OPENING - SEE STRUCTURAL
5	INSTALL RESILIENT CHANNEL ON SIDE OF WALL WITH THIS #5 NOTATION
6	ROOF DRAIN AND OVERFLOW ROOF DRAIN LEADERS - SEE PLBG DRAWINGS
7	ROOF DRAIN LEADER - SEE PLBG DRAWINGS
8	ROOF OVERFLOW DRAIN LEADER - SEE PLBG DRAWINGS
9	10 44 00 - FIRE EXTINGUISHER IN SEMI-RECESSED CABINET
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11	33 41 11 B - DOWNSPOUT RECIEVER
12	10 51 00 - RELOCATED LOCKERS FROM SOUTH WALL OF CORRIDOR E-101
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TOILET ROOM & ACCESSORY NOTES

1. ENLARGED PLANS INDICATE TYPICAL DIMENSIONS, LOCATIONS FOR ACCESSORIES AND SPECIALTIES AND REQUIRED CLEARANCES TO BE MAINTAINED. TOILET ROOM AND SINK "TYPES" ARE KEYED ON FLOOR PLANS.
2. REFER TO FLOOR PLAN SHEETS FOR TOILET ROOM AND/OR FIXTURE ORIENTATION, DOOR LOCATION(S), WALL CONSTRUCTION, AND ADDITIONAL EQUIPMENT ITEMS.
3. DIMENSIONS INDICATED ARE TYPICAL UNLESS NOTED OTHERWISE ON DIMENSIONED FLOOR PLAN SHEETS.
4. DIMENSIONS SHOWN FOR ACCESSORIES AND EQUIPMENT ITEMS AND CLEAR FLOOR SPACE ARE FROM FACE OF ROOM FINISH (SUCH AS TILE).
5. "GENERIC" PLUMBING FIXTURES AND ACCESSORIES ARE SHOWN - SEE PLUMBING DRAWINGS AND/OR PROJECT MANUAL FOR SCHEDULED FIXTURES AND ACCESSORIES.

PLAN NORTH / TRUE NORTH

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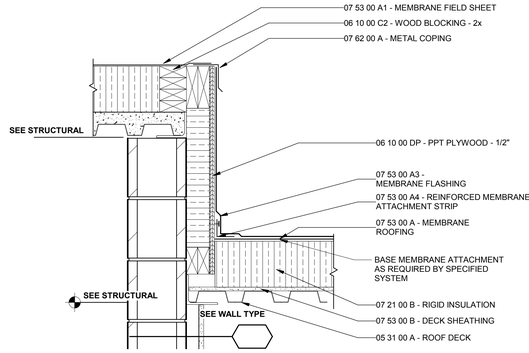
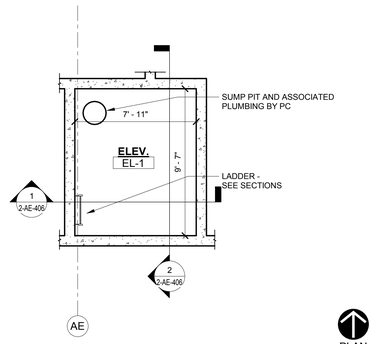
SHEET TITLE:
ENLARGED PLANS AREAS E & F

SHEET NUMBER:
2-AE-405



4 ELEVATOR SHAFT CAP DETAIL

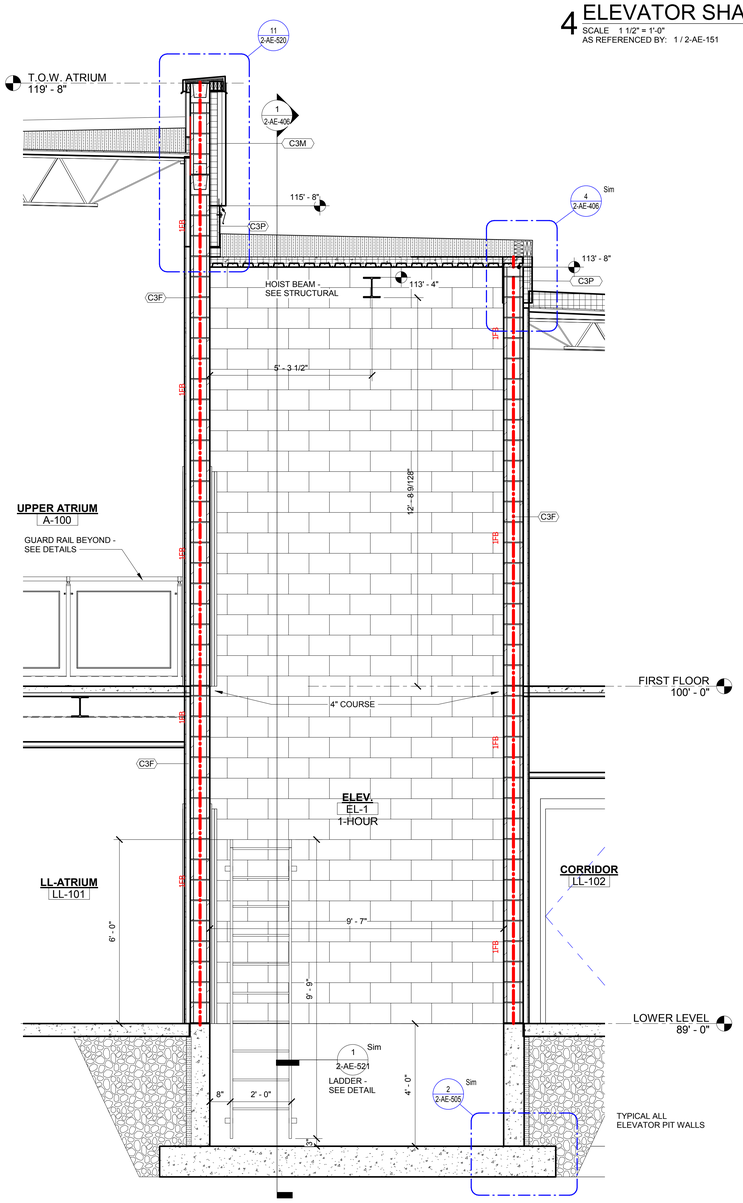
SCALE 1 1/2" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-151



3 ELEVATOR PIT PLAN

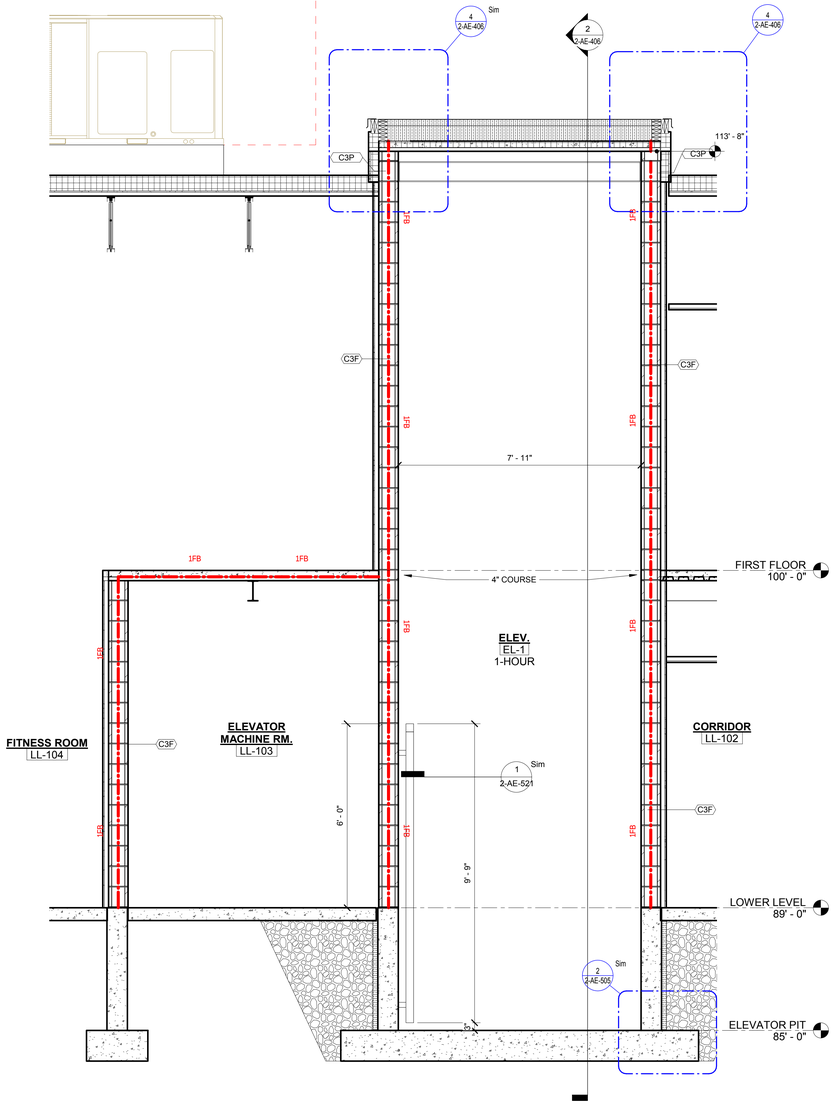
SCALE 1/4" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-406

PLAN NORTH



2 ELEVATOR N-S SECTION

SCALE 1/2" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-102



1 ELEVATOR E-W SECTION

SCALE 1/2" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-102

WALL DIMENSION KEY

NOTE:
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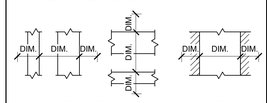

FLOOR PLAN LEGEND

X	DENOTES WINDOW TYPE. SEE SHEET AE-630 & AE-631
NIC	DENOTES ITEM NOT IN CONTRACT - BY OWNER
XXXX	DENOTES WALL TYPE - SEE SHEET AE-501 FOR EXTERIOR AND AE-502 FOR INTERIOR WALLS

STRUCTURAL COORDINATION NOTES

COORDINATE WITH STRUCTURAL ENGINEERING FOR THE FOLLOWING:

1. ALL FOOTING AND FOUNDATIONS.
2. ALL STOOP CONSTRUCTION
3. ALL WALL GROUTING / REINFORCING AND BOND BEAM LOCATIONS.
4. ALL BRICK LEDGE HEIGHTS AND LOCATIONS. ALSO REFER TO ARCHITECTURAL ELEVATIONS.
5. AREAS REQUIRING EXISTING STRUCTURAL REINFORCING.
6. DOWELED CONNECTION REQUIREMENTS BETWEEN EXISTING AND NEW CONCRETE SLABS.

KEYNOTE LEGEND

KEY NO.	KEYNOTE TEXT
05 31 00 A -	ROOF DECK
06 10 00 C2 -	WOOD BLOCKING - 2x
06 10 00 DP -	PPT PLYWOOD
07 21 00 B -	RIGID INSULATION
07 53 00 A1 -	MEMBRANE FIELD SHEET
07 53 00 A3 -	MEMBRANE FLASHING
07 53 00 A4 -	REINFORCED MEMBRANE ATTACHMENT STRIP
07 53 00 A -	MEMBRANE ROOFING
07 53 00 B -	DECK SHEATHING
07 62 00 A -	METAL COPING

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CONSULTANT:

MANAWA

MANAWA ELEMENTARY SCHOOL - ALTERATIONS
MANAWA MIDDLE/HIGH SCHOOL - ADDITIONS & ALTERATIONS
PART 2 - MANAWA MIDDLE / HIGH SCHOOL
515 E. 4th STREET
MANAWA, WI 54949

MARK	DATE
ISSUED:	6 JUN 2019
PROJECT NO:	18268
CAD DWG FILE:	
DRAWN BY:	Author
CHECKED BY:	Checker

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SHEET TITLE:
ELEVATOR PLANS AND SECTIONS

SHEET NUMBER:
2-AE-406

KEYNOTE LEGEND	
KEY NO.	KEYNOTE TEXT
03 30 00 S -	CONCRETE FOR METAL PAN STAIR
05 12 00 H -	HSS SECTION
05 51 00 A1 -	METAL PAN STAIRS
05 51 00 B2 -	HANDRAIL
05 51 00 E -	WALL BRACKET
05 52 13	PIPE AND TUBE RAILINGS
09 91 23 A -	PAINT

7 DETAIL

SCALE 1 1/2" = 1'-0"
AS REFERENCED BY: 4 / 2-AE-450

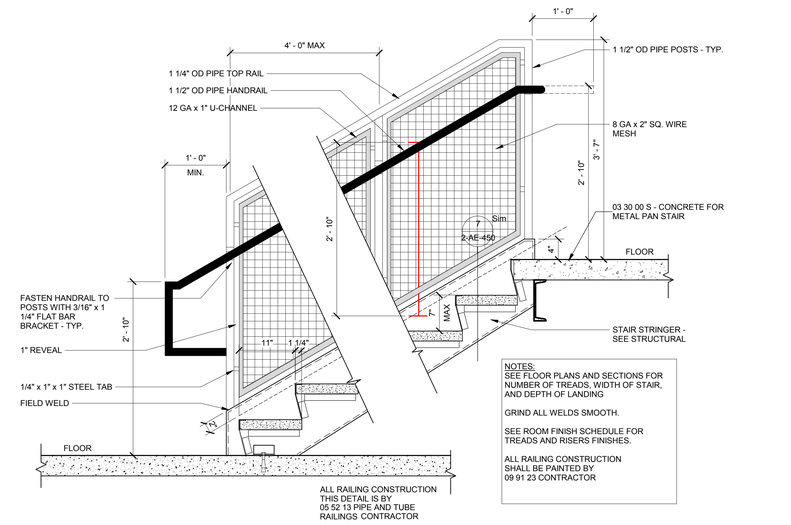
5 Metals - 5 Steel Handrail Return--RENAME

6 HANDRAIL RETURN

SCALE 3" = 1'-0"
AS REFERENCED BY:

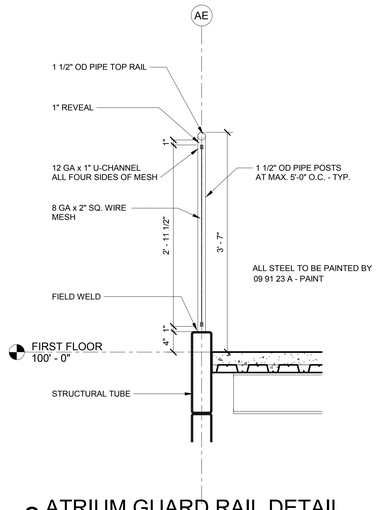
5 STEEL HANDRAIL

SCALE 3" = 1'-0"
AS REFERENCED BY:



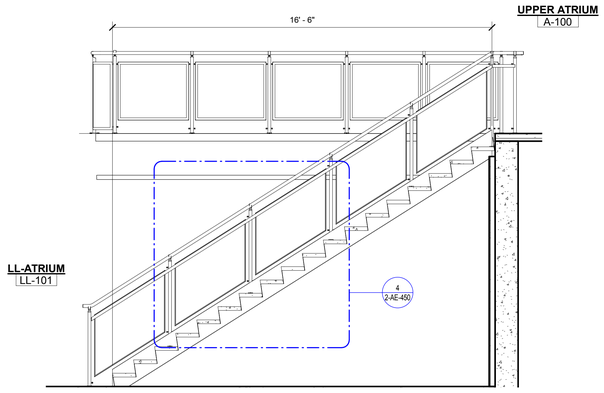
4 ATRIUM STAIR SECTION

SCALE 1" = 1'-0"
AS REFERENCED BY: 2 / 2-AE-450



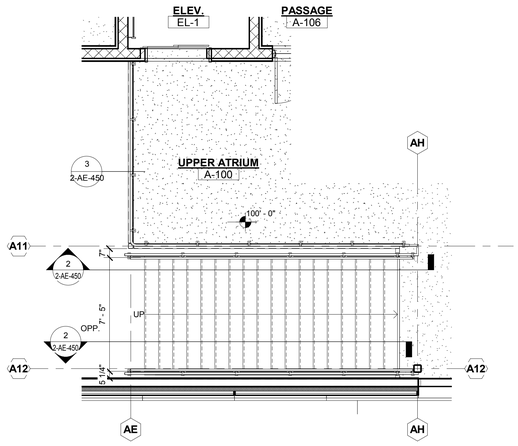
3 ATRIUM GUARD RAIL DETAIL

SCALE 1" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-450



2 ATRIUM STAIR SECTION 1

SCALE 3/8" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-402



1 AREA A - LL - ENL. STAIR PLAN

SCALE 1/4" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-102

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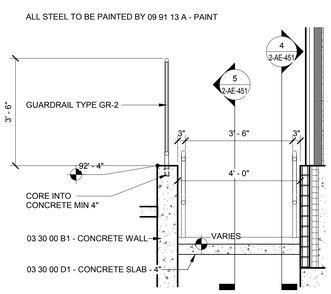
SHEET TITLE:

STAIR PLANS AND SECTIONS

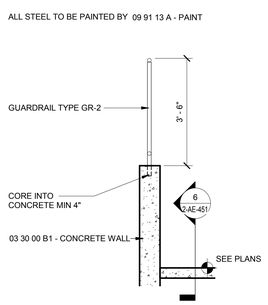
SHEET NUMBER:

2-AE-450



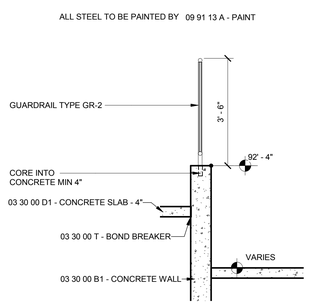
9 S.W. EXTERIOR RAMP

SCALE 1/2" = 1'-0"
AS REFERENCED BY: 1B / 2-AE-201



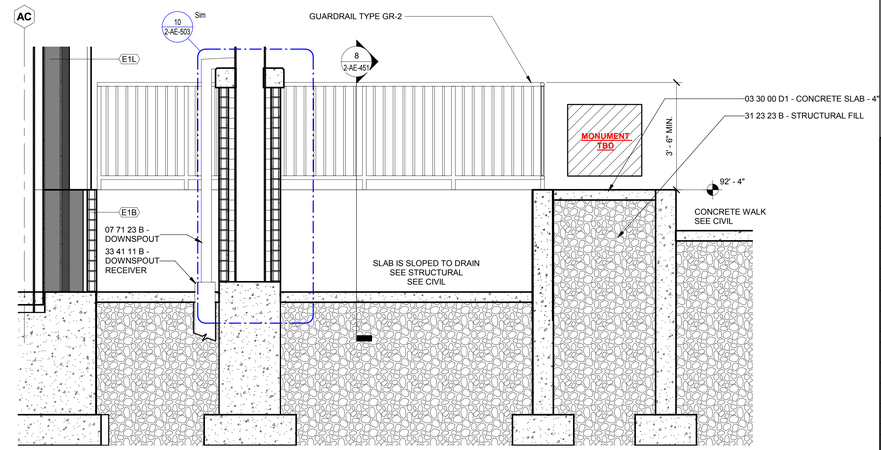
8 S.W. STAIR SECTION 4

SCALE 1/2" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-402



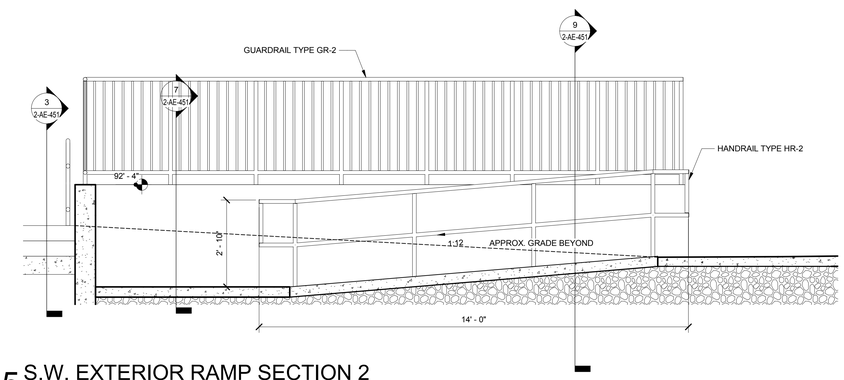
7 S.W. STAIR SECTION 3

SCALE 1/2" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-402



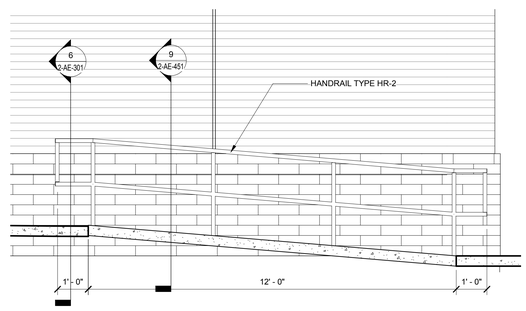
6 S.W. ENTRY WALL ELEVATION 2

SCALE 1/2" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-402



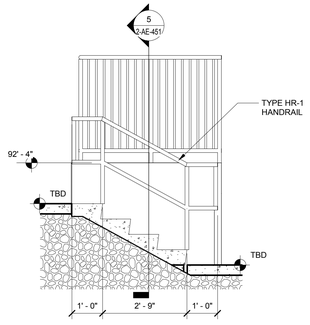
5 S.W. EXTERIOR RAMP SECTION 2

SCALE 1/2" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-402



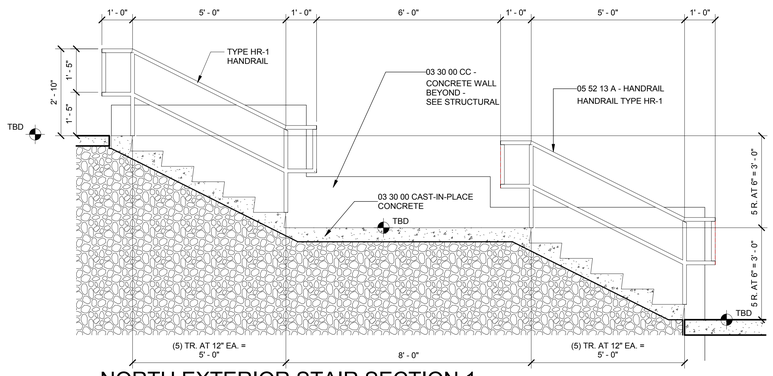
4 S.W. EXTERIOR RAMP SECTION 1

SCALE 1/2" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-313



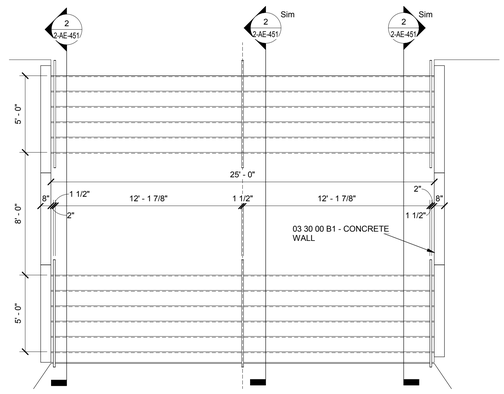
3 S.W. EXTERIOR STAIR SECTION 1

SCALE 1/2" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-402



2 NORTH EXTERIOR STAIR SECTION 1

SCALE 1/2" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-451



1 ENLARGED NORTH EXTERIOR STAIRS

SCALE 1/4" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-104

PLAN NORTH

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KEYNOTE LEGEND

KEY NO.	KEYNOTE TEXT
03 30 00	CAST-IN-PLACE CONCRETE
03 30 00 B1 -	CONCRETE WALL
03 30 00 CC -	
03 30 00 D1 -	CONCRETE SLAB - 4"
03 30 00 T -	BOND BREAKER
05 52 13 A -	HANDRAIL
07 71 23 B -	DOWNSPOUT
09 91 13 A -	PAINT
31 23 23 B -	STRUCTURAL FILL
33 41 11 B -	DOWNSPOUT RECEIVER

PLAN NOTES KEY

NO.	DESCRIPTION
1	SEE DOOR & FRAME SCHEDULE FOR WORK AT THIS DOOR
2	TOOTH IN NEW CMU INTO EXISTING COURSING
3	04 20 00 A2 - PROVIDE SOLID BULLNOSE CAP
4	ENLARGE EXISTING OPENING - SEE STRUCTURAL
5	INSTALL RESILIENT CHANNEL ON SIDE OF WALL WITH THIS #5 NOTATION
6	ROOF DRAIN AND OVERFLOW ROOF DRAIN LEADERS - SEE PLBG DRAWINGS
7	ROOF DRAIN LEADER - SEE PLBG DRAWINGS
8	ROOF OVERFLOW DRAIN LEADER - SEE PLBG DRAWINGS
9	10 44 00 - FIRE EXTINGUISHER IN SEMI-RECESSED CABINET
10	EXTEND MTL STUD/FURRING AND GYP WALL MIN. 4" ABOVE CEILING.
11	33 41 11 B - DOWNSPOUT RECIEVER
12	10 51 00 - RELOCATED LOCKERS FROM SOUTH WALL OF CORRIDOR E-101
13	FINISHED WALL LENGTH SHALL MATCH CASEWORK LENGTH
14	SLOPE EXTERIOR STOOPS AND SLABS FOR DRAINAGE MAX. 2% TO COMPLY WITH ADA.
15	TOP OF WALL TO MATCH TOP OF CASEWORK. PROVIDE 5/8" GYP. BD. CAP
16	33 41 11 - SITE DRAIN
17	09 21 16 F - PROVIDE ABUSE RESISTANT GYPSUM BOARD AT THE EXPOSED AREAS OF THIS WALL.
18	03 33 00 - NEW CONCRETE SLAB AT AREA OF REMOVED SLAB. MATCH EXISTING THICKNESS. SLOPE TO DRAIN, IF REQUIRED. REFER TO PLUMBING DRAWINGS.
19	10 51 13 D - NEW SLOPED TOP FOR EXISTING LOCKERS
20	07 71 23 - MANUFACTURED GUTTERS AND DOWNSPOUTS
21	PROVIDE FLOORING, SUB-FLOORING AND STRUCTURAL WOOD JOISTS AS REQUIRED TO PATCH DEMO AREA

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CAD DWG FILE:	
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CHECKED BY:	Checker

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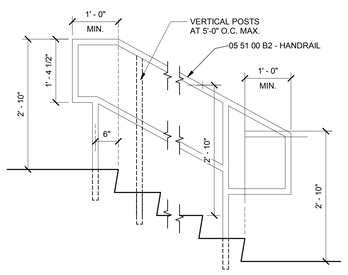
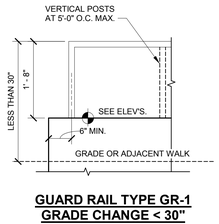
SHEET TITLE:
STAIR PLANS AND SECTIONS

SHEET NUMBER:
2-AE-451

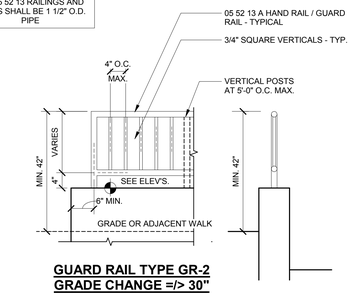


STAIR HANDRAIL TYPE HR-1

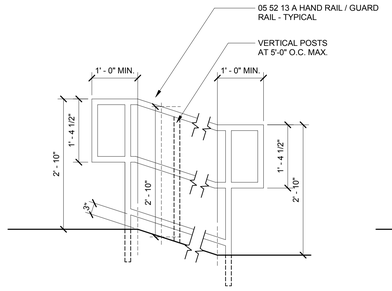


GUARD RAIL TYPE GR-1
GRADE CHANGE < 30"

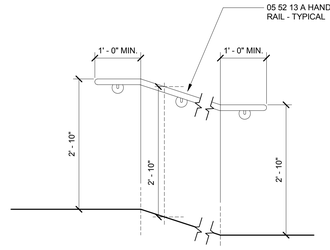
NOTE:
ALL 05 52 13 RAILINGS AND POSTS SHALL BE 1 1/2" O.D. PIPE



GUARD RAIL TYPE GR-2
GRADE CHANGE =/> 30"



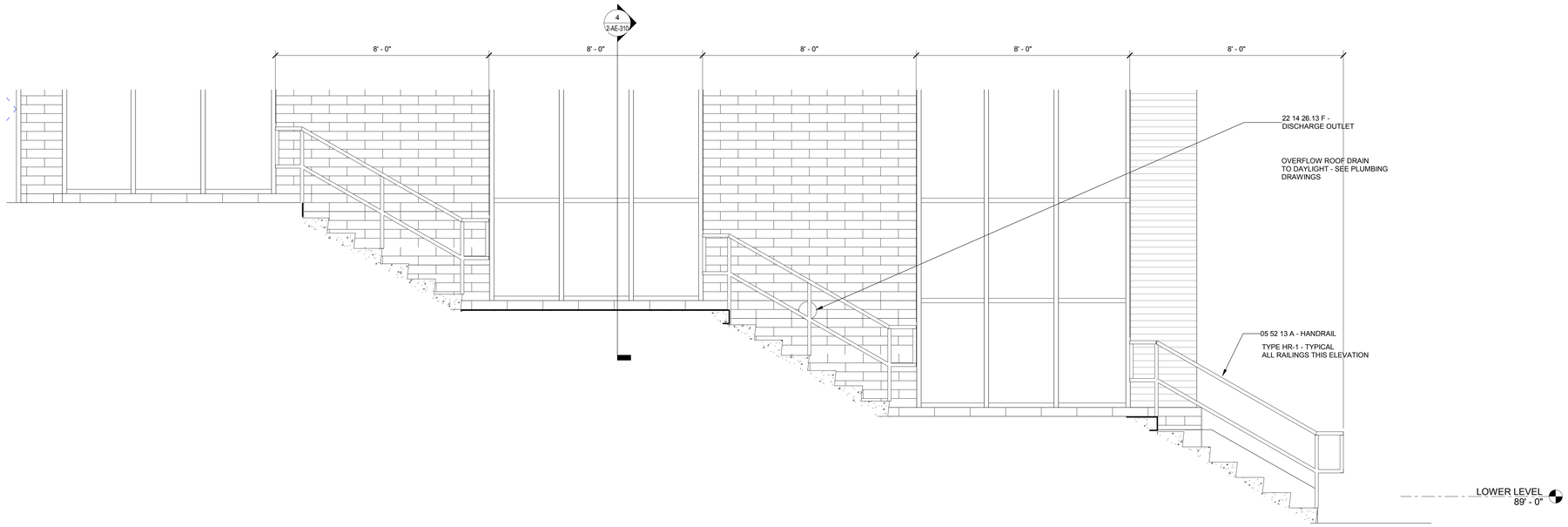
HANDRAIL TYPE HR-2
AT RAMPS



WALL HAND RAIL TYPE HR-3
AT RAMPS

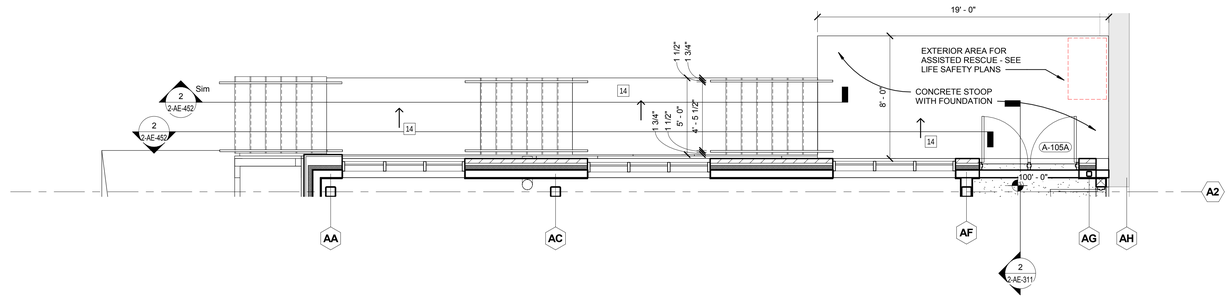
3 TYPICAL EXTERIOR RAILINGS

SCALE 3/4" = 1'-0"
AS REFERENCED BY:



2 WEST EXTERIOR STAIRS 1 - LOOKING SOUTH

SCALE 1/2" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-101



1 WEST EXTERIOR STAIRS

SCALE 1/4" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-102

PLAN NORTH

KEYNOTE LEGEND

KEY NO.	KEYNOTE TEXT
05 51 00 B2 -	HANDRAIL
05 52 13 A -	HANDRAIL
22 14 26.13 F -	DISCHARGE OUTLET

PLAN NOTES KEY

NO.	DESCRIPTION
1	SEE DOOR & FRAME SCHEDULE FOR WORK AT THIS DOOR
2	TOOTH IN NEW CMU INTO EXISTING COURSING
3	04 20 00 A2 - PROVIDE SOLID BULLNOSE CAP
4	ENLARGE EXISTING OPENING - SEE STRUCTURAL
5	INSTALL RESILIENT CHANNEL ON SIDE OF WALL WITH THIS #5 NOTATION
6	ROOF DRAIN AND OVERFLOW ROOF DRAIN LEADERS - SEE PLBG DRAWINGS
7	ROOF DRAIN LEADER - SEE PLBG DRAWINGS
8	ROOF OVERFLOW DRAIN LEADER - SEE PLBG DRAWINGS
9	10 44 00 - FIRE EXTINGUISHER IN SEMI-RECESSED CABINET
10	EXTEND MTL STUD/FURRING AND GYP WALL MIN. 4" ABOVE CEILING.
11	33 41 11 B - DOWNSPOUT RECIEVER
12	10 51 00 - RELOCATED LOCKERS FROM SOUTH WALL OF CORRIDOR E-101
13	FINISHED WALL LENGTH SHALL MATCH CASEWORK LENGTH
14	SLOPE EXTERIOR STOOPS AND SLABS FOR DRAINAGE MAX. 2% TO COMPLY WITH ADA.
15	TOP OF WALL TO MATCH TOP OF CASEWORK. PROVIDE 5/8" GYP. BD. CAP
16	33 41 11 - SITE DRAIN
17	09 21 16 F - PROVIDE ABUSE RESISTANT GYPSUM BOARD AT THE EXPOSED AREAS OF THIS WALL.
18	03 33 00 - NEW CONCRETE SLAB AT AREA OF REMOVED SLAB. MATCH EXISTING THICKNESS. SLOPE TO DRAIN, IF REQUIRED, REFER TO PLUMBING DRAWINGS.
19	10 51 13 D - NEW SLOPED TOP FOR EXISTING LOCKERS
20	07 71 23 - MANUFACTURED GUTTERS AND DOWNSPOUTS
21	PROVIDE FLOORING, SUB-FLOORING AND STRUCTURAL WOOD JOISTS AS REQUIRED TO PATCH DEMO AREA

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SHEET TITLE:
STAIR PLANS AND SECTIONS

SHEET NUMBER:
2-AE-452

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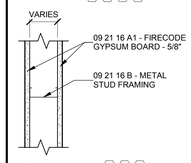
A#A — SEE SPECIFIC WALL TYPES BELOW

TOP OF WALL SEE: (T1) (T2) (T3) (T4)



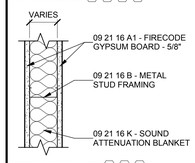
BOTTOM OF WALL SEE: (B1) (B2) (B3)

(A0A) - EXISTING METAL STUD
(A1A) - 1 5/8" METAL STUD
(A2A) - 2 1/2" METAL STUD
(A3A) - 3 5/8" METAL STUD
(A4A) - 6" METAL STUD
(A5A) - 8" METAL STUD

NOTE: X-HR RATED WALLS, USE UL DES. XXXX

A#B — SEE SPECIFIC WALL TYPES BELOW

TOP OF WALL SEE: (T1) (T2) (T3) (T4)



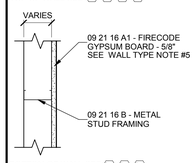
BOTTOM OF WALL SEE: (B1) (B2) (B3)

(A0B) - EXISTING METAL STUD
(A1B) - 1 5/8" METAL STUD
(A2B) - 2 1/2" METAL STUD
(A3B) - 3 5/8" METAL STUD
(A4B) - 6" METAL STUD
(A5B) - 8" METAL STUD

NOTE: X-HR RATED WALLS, USE UL DES. XXXX

A#E — SEE SPECIFIC WALL TYPES BELOW

TOP OF WALL SEE: (T1) (T2) (T3) (T4)

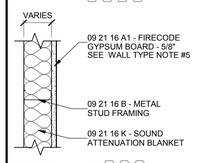


BOTTOM OF WALL SEE: (B1) (B2) (B3)

(A0E) - EXISTING METAL STUD
(A1E) - 1 5/8" METAL STUD
(A2E) - 2 1/2" METAL STUD
(A3E) - 3 5/8" METAL STUD
(A4E) - 6" METAL STUD
(A5E) - 8" METAL STUD

A#F — SEE SPECIFIC WALL TYPES BELOW

TOP OF WALL SEE: (T1) (T2) (T3) (T4)

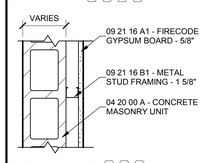


BOTTOM OF WALL SEE: (B1) (B2) (B3)

(A0F) - EXISTING METAL STUD
(A1F) - 1 5/8" METAL STUD
(A2F) - 2 1/2" METAL STUD
(A3F) - 3 5/8" METAL STUD
(A4F) - 6" METAL STUD
(A5F) - 8" METAL STUD

C#F — SEE SPECIFIC WALL TYPES BELOW

TOP OF WALL SEE: (T1) (T2) (T3) (T4)



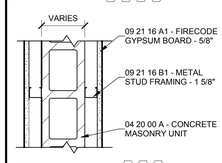
BOTTOM OF WALL SEE: (B1) (B2) (B3)

(C0F) - EXISTING CONCRETE BLOCK
(C1F) - 4" NOMINAL CONCRETE BLOCK
(C2F) - 6" NOMINAL CONCRETE BLOCK
(C3F) - 8" NOMINAL CONCRETE BLOCK
(C4F) - 10" NOMINAL CONCRETE BLOCK
(C5F) - 12" NOMINAL CONCRETE BLOCK
(C6F) - 14" NOMINAL CONCRETE BLOCK
(C7F) - 16" NOMINAL CONCRETE BLOCK

NOTE: 2-HR RATED WALLS, USE UL DES. U905

C#F2 — SEE SPECIFIC WALL TYPES BELOW

TOP OF WALL SEE: (T1) (T2) (T3) (T4)



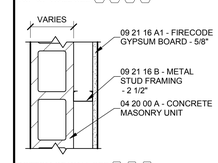
BOTTOM OF WALL SEE: (B1) (B2) (B3)

(C0F2) - EXISTING CONCRETE BLOCK
(C1F2) - 4" NOMINAL CONCRETE BLOCK
(C2F2) - 6" NOMINAL CONCRETE BLOCK
(C3F2) - 8" NOMINAL CONCRETE BLOCK
(C4F2) - 10" NOMINAL CONCRETE BLOCK
(C5F2) - 12" NOMINAL CONCRETE BLOCK
(C6F2) - 14" NOMINAL CONCRETE BLOCK
(C7F2) - 16" NOMINAL CONCRETE BLOCK

NOTE: 2-HR RATED WALLS, USE UL DES. U905

C#G — SEE SPECIFIC WALL TYPES BELOW

TOP OF WALL SEE: (T1) (T2) (T3) (T4)



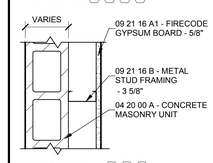
BOTTOM OF WALL SEE: (B1) (B2) (B3)

(C0G) - EXISTING CONCRETE BLOCK
(C1G) - 4" NOMINAL CONCRETE BLOCK
(C2G) - 6" NOMINAL CONCRETE BLOCK
(C3G) - 8" NOMINAL CONCRETE BLOCK
(C4G) - 10" NOMINAL CONCRETE BLOCK
(C5G) - 12" NOMINAL CONCRETE BLOCK
(C6G) - 14" NOMINAL CONCRETE BLOCK
(C7G) - 16" NOMINAL CONCRETE BLOCK

NOTE: 2-HR RATED WALLS, USE UL DES. U905

C#H — SEE SPECIFIC WALL TYPES BELOW

TOP OF WALL SEE: (T1) (T2) (T3) (T4)

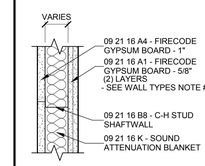


BOTTOM OF WALL SEE: (B1) (B2) (B3)

(C0H) - EXISTING CONCRETE BLOCK
(C1H) - 4" NOMINAL CONCRETE BLOCK
(C2H) - 6" NOMINAL CONCRETE BLOCK
(C3H) - 8" NOMINAL CONCRETE BLOCK
(C4H) - 10" NOMINAL CONCRETE BLOCK
(C5H) - 12" NOMINAL CONCRETE BLOCK
(C6H) - 14" NOMINAL CONCRETE BLOCK
(C7H) - 16" NOMINAL CONCRETE BLOCK

NOTE: 2-HR RATED WALLS, USE UL DES. U905

A#U — SEE SPECIFIC WALL TYPES BELOW

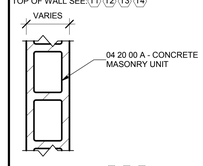


(A8M) - 4" C-H METAL STUD

NOTE: 2-HR RATED WALLS, USE UL DES. U497

C#N — SEE SPECIFIC WALL TYPES BELOW

TOP OF WALL SEE: (T1) (T2) (T3) (T4)



BOTTOM OF WALL SEE: (B1) (B2) (B3)

(C0N) - EXISTING CONCRETE BLOCK
(C1N) - 4" NOMINAL CONCRETE BLOCK
(C2N) - 6" NOMINAL CONCRETE BLOCK
(C3N) - 8" NOMINAL CONCRETE BLOCK
(C4N) - 10" NOMINAL CONCRETE BLOCK
(C5N) - 12" NOMINAL CONCRETE BLOCK
(C6N) - 14" NOMINAL CONCRETE BLOCK
(C7N) - 16" NOMINAL CONCRETE BLOCK

NOTE: 2-HR RATED WALLS, USE UL DES. U905

WALL PRIORITY LEGEND

PRIORITY	#	PLAN GRAPHIC	PARTITION TYPE
HIGHEST	1	2PW 2PW	2 HOUR - FIRE WALL
	2	2PB 2PB	2 HOUR - FIRE BARRIER
MEDIUM	3	1FB 1FB	1 HOUR - FIRE BARRIER
LOWEST	4	1FP 1FP	1 HOUR - FIRE PARTITION

WALL TO LIMIT THE TRANSFER OF SMOKE, ODORS AND GLAZING FOR BORROWED LIGHTS ARE NOT RATED)

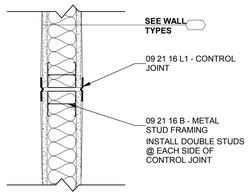
NOTE: PARTITIONS WITH A HIGHER PRIORITY # TAKE PRECEDENCE OVER PARTITIONS WITH A LOWER PRIORITY # - SEE AE-501 FOR DETAILS

WALL TYPE NOTES

1. 09 21 16 - IDENTIFY ALL RATED WALLS WITH A LABEL INDICATING RATING. LOCATE 8" ABOVE THE CEILING AT 10'-0" O.C. MAX. USE 1 1/2" LETTERS BRIGHTLY INDICATED ON A CONTRASTING BACKGROUND. MINIMUM (1) LABEL / STENCIL PER ROOM / WALL RUN. IF NO CEILING, LOCATE LABEL AT 9'-0" AFF.
2. ALL OPENINGS IN RATED WALLS SHALL BE PROVIDED WITH OPENING PROTECTION AS REQUIRED BY CODE.
3. SEE CODE PLANS FOR LOCATION OF WALLS/ROOMS REQUIRED TO BE RATED.
4. FOR ALL UL DESIGN NUMBERS REFER TO THE FIRE RESISTANCE DIRECTORY: UNDERWRITERS LABORATORIES, LATEST EDITION AND/OR SHEET GI-501
5. SEE PROJECT MANUAL, 09 21 16 GYPSUM BOARD ASSEMBLIES, FOR BOARD MATERIALS AT SPECIFIC LOCATIONS THAT ARE REQUIRED TO BE DIFFERENT THAN THIS KEY NOTED MATERIAL.
6. ANY / ALL WALL TYPES SHOWING SOUND ATTENUATION BLANKET INSULATION SHALL BE CONSIDERED AN "ACOUSTICAL WALL".
7. SEE EXTERIOR ELEVATIONS AND/OR SPECIFICATIONS FOR METAL PANEL STYLE, COLOR AND PANEL ORIENTATION.
8. SEE EXTERIOR ELEVATIONS AND/OR SPECIFICATIONS FOR DECORATIVE CMU STYLE AND COLOR.
9. ALL EXTERIOR CMU SHALL BE RUNNING BOND.
10. ALL EXTERIOR CMU MORTAR JOINTS SHALL BE CONCAVE.
11. ALL INTERIOR CMU COURSING SHALL MATCH EXISTING.
12. ALL INTERIOR CMU MORTAR JOINST SHALL BE CONCAVE.
13. ALL INTERIOR EXPOSED CMU CORNERS SHALL BE BULL-NOSE CORNERS.

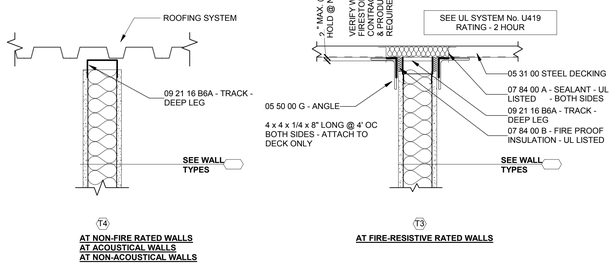
KEYNOTE LEGEND

KEY NO.	KEYNOTE TEXT
04 20 00 A -	CONCRETE MASONRY UNIT
05 31 00	STEEL DECKING
05 31 00 A -	ROOF DECK
05 50 00 G -	ANGLE
07 84 00 A -	SEALANT - UL LISTED
07 84 00 B -	FIRE PROOF INSULATION - UL LISTED
07 92 00 A1 -	SEALANT - BOTH SIDES
07 92 00 A -	SEALANT
09 21 16 A1 -	FIRECODE GYPSUM BOARD - 5/8"
09 21 16 A4 -	FIRECODE GYPSUM BOARD - 1"
09 21 16 A -	FIRECODE GYPSUM BOARD
09 21 16 B1 -	METAL STUD FRAMING - 1 5/8"
09 21 16 B6A -	TRACK - DEEP LEG
09 21 16 B8 -	C-H STUD SHAFTWALL
09 21 16 B -	METAL STUD FRAMING
09 21 16 C2 -	FURRING CHANNELS - 7/8"
09 21 16 K -	SOUND ATTENUATION BLANKET
09 21 16 L1 -	CONTROL JOINT
09 21 16 M -	GYPSUM SUSPENSION SYSTEM
09 51 00 A -	SUSPENDED ACOUSTICAL CEILING
09 51 00 B -	SUSPENDED CEILING GRID



6 GYP. BD. CONTROL JOINT

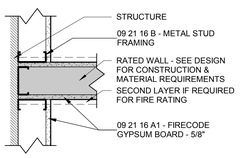
SCALE 1 1/2" = 1'-0"
AS REFERENCED BY:



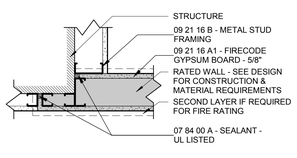
System UL No. HW-D-0040 calls for 3M Firedam Spray and allows 25% compression or extension. (3/8" @ full 2" height) Other sealant products will require different top of wall to metal deck dimension - as little as 3/4" and allow different percentage of movement.

5 TOP OF INTERIOR WALL DETAILS

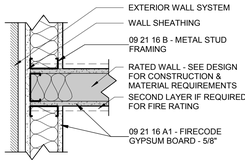
SCALE 1 1/2" = 1'-0"
AS REFERENCED BY:



INTERSECTION AT CONC. OR MASONRY

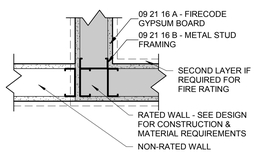


INTERSECTION AT CONC. OR MASONRY



INTERSECTION AT EXTERIOR WALL

REFER TO EXTERIOR WALL TYPES FOR MATERIALS

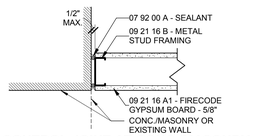


INTERSECTION AT STUD WALL

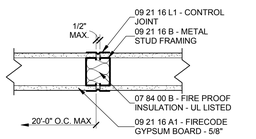
RATED WALLS APPEAR SHADED

3 RATED WALL INTERSECTIONS

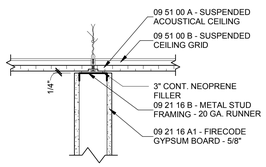
SCALE 1 1/2" = 1'-0"
AS REFERENCED BY:



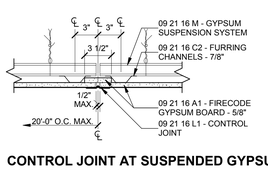
CONTROL JOINT AT CONC./MASONRY OR EXISTING WALL



CONTROL JOINT



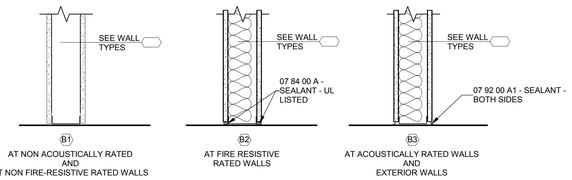
WALL HEAD AT SUSPENDED CEILING



CONTROL JOINT AT SUSPENDED GYPSUM BOARD CEILING SYSTEM

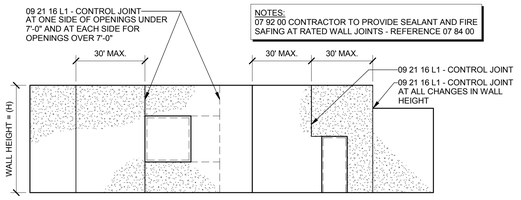
2 GYPSUM BOARD JOINT DETAILS

SCALE 1 1/2" = 1'-0"
AS REFERENCED BY:



4 BASE OF METAL STUD WALLS

SCALE 1 1/2" = 1'-0"
AS REFERENCED BY:



ELEVATION

1 GYPSUM BOARD CONTROL JOINT LOCATIONS

SCALE 3/16" = 1'-0"

FOR BIDS
NOT FOR CONSTRUCTION

Hoffman
Planning, Design & Construction, Inc.
800.236.2370 | hoffman.net

CONSULTANT:

MANAWA ELEMENTARY SCHOOL - ALTERATIONS
MANAWA MIDDLE/HIGH SCHOOL - ADDITIONS & ALTERATIONS
PART 2 - MANAWA MIDDLE / HIGH SCHOOL
515 E. 4th STREET
MANAWA, WI 54949

MARK	DATE
ISSUED:	6 JUN 2019
PROJECT NO:	18268
CAD DWG FILE:	
DRAWN BY:	Author
CHECKED BY:	Checker

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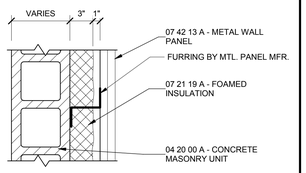
SHEET TITLE:
INTERIOR WALL TYPES AND DETAILS

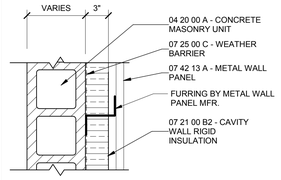
SHEET NUMBER:
2-AE-501

C#K — SEE SPECIFIC WALL TYPES BELOW



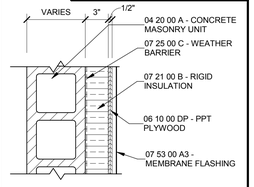
- C1K 8" CMU WALL
- C2K 10" CMU WALL
- C3K 12" CMU WALL
- C4K 14" CMU WALL

C#M — SEE SPECIFIC WALL TYPES BELOW



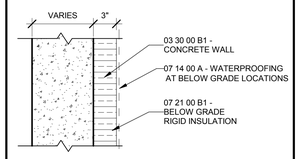
- C3M 8" CMU WALL
- C4M 10" CMU WALL
- C5M 12" CMU WALL

C#P — SEE SPECIFIC WALL TYPES BELOW



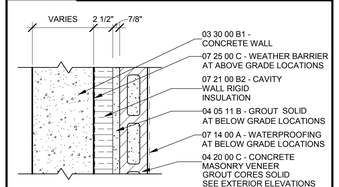
- C3N 8" CMU WALL
- C4N 10" CMU WALL
- C5N 12" CMU WALL

D#N — SEE SPECIFIC WALL TYPES BELOW



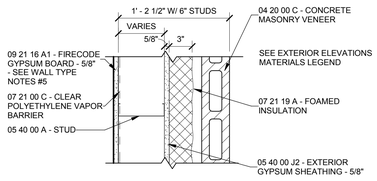
- D2N 8" CONCRETE WALL
- D3N 10" CONCRETE WALL
- D4N 12" CONCRETE WALL
- D5N 13" CONCRETE WALL
- D6N 14" CONCRETE WALL
- D7N 15" CONCRETE WALL

D#M — SEE SPECIFIC WALL TYPES BELOW



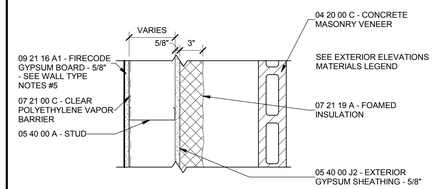
- D2M 8" CONCRETE WALL
- D3M 10" CONCRETE WALL
- D4M 12" CONCRETE WALL
- D5M 13" CONCRETE WALL
- D6M 14" CONCRETE WALL
- D7M 15" CONCRETE WALL

E#A — SEE SPECIFIC WALL TYPES BELOW



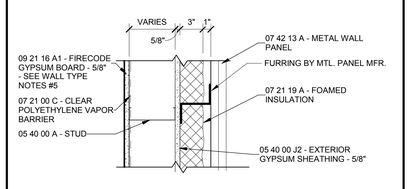
- E0A EXISTING METAL STUD
- E1A 6" METAL STUD
- E2A 8" METAL STUD

E#B — SEE SPECIFIC WALL TYPES BELOW



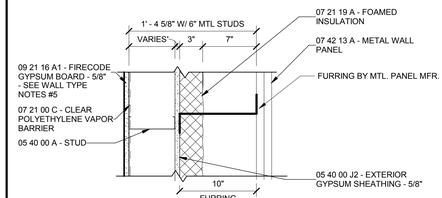
- E0B EXISTING METAL STUD
- E1B 6" METAL STUD
- E2B 8" METAL STUD

E#K — SEE SPECIFIC WALL TYPES BELOW



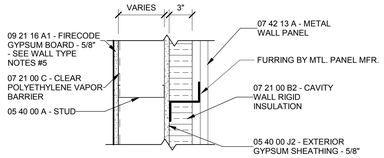
- E0K EXISTING METAL STUD
- E1K 6" METAL STUD
- E2K 8" METAL STUD

E#L — SEE SPECIFIC WALL TYPES BELOW



- E0L EXISTING METAL STUD
- E1L 6" METAL STUD
- E2L 8" METAL STUD

E#N — SEE SPECIFIC WALL TYPES BELOW



- E0N EXISTING METAL STUD
- E1N 6" METAL STUD
- E2N 8" METAL STUD

NOTE:
AT ALL EXTERIOR WALLS WITH SPRAY FOAM INSULATION, THE PROPERTIES OF THE SPRAY INSULATION SHALL ALLOW IT TO ACT AS THE WEATHER BARRIER / "WATER RESISTIVE" BARRIER TO MEET OR EXCEED THE REQUIREMENTS OF 2015 IBC SECTION 1404.2.

WALL PRIORITY LEGEND

PRIORITY	#	PLAN GRAPHIC	PARTITION TYPE
HIGHEST	1	2FW 2FW	2 HOUR - FIRE WALL
	2	2FB 2FB	2 HOUR - FIRE BARRIER
MEDIUM	3	1FB 1FB	1 HOUR - FIRE BARRIER
LOWEST	4	1FP 1FP	1 HOUR - FIRE PARTITION

WALL TO LIMIT THE TRANSFER OF SMOKE (DOORS AND GLAZING FOR BORROWED LIGHTS ARE NOT RATED)

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WALL TYPE NOTES

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4. FOR ALL UL DESIGN NUMBERS REFER TO THE FIRE RESISTANCE DIRECTORY: UNDERWRITERS LABORATORIES, LATEST EDITION AND/OR SHEET GI-501
5. SEE PROJECT MANUAL 09 21 16 GYPSUM BOARD ASSEMBLIES, FOR BOARD MATERIALS AT SPECIFIC LOCATIONS THAT ARE REQUIRED TO BE DIFFERENT THAN THIS KEY NOTED MATERIAL.
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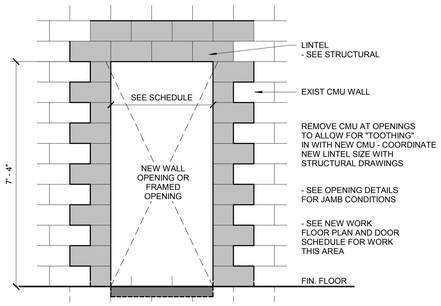
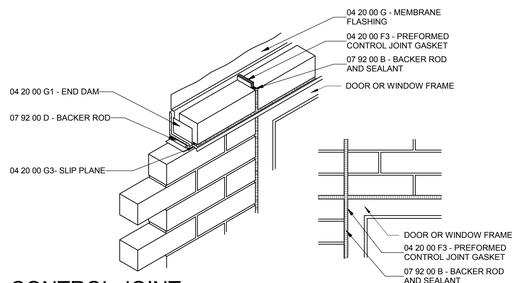
8. SEE EXTERIOR ELEVATIONS AND/OR SPECIFICATIONS FOR DECORATIVE CMU STYLE AND COLOR.
9. ALL EXTERIOR CMU SHALL BE RUNNING BOND.
10. ALL EXTERIOR CMU MORTAR JOINTS SHALL BE CONCAVE.
11. ALL INTERIOR CMU COURSING SHALL MATCH EXISTING.
12. ALL INTERIOR CMU MORTAR JOINST SHALL BE CONCAVE.
13. ALL INTERIOR EXPOSED CMU CORNERS SHALL BE BULL-NOSE CORNERS.

KEYNOTE LEGEND

KEY NO.	KEYNOTE TEXT
03 30 00 B1 -	CONCRETE WALL
04 05 11 B -	GROUT
04 20 00 A5 -	CONCRETE MASONRY UNIT - SASH BLOCK
04 20 00 A -	CONCRETE MASONRY UNIT
04 20 00 C -	CONCRETE MASONRY VENEER
04 20 00 F3 -	PREFORMED CONTROL JOINT GASKET
04 20 00 F -	CONTROL JOINT
04 20 00 G1 -	END DAM
04 20 00 G3-	SLIP PLANE
04 20 00 G -	MEMBRANE FLASHING
05 40 00 A -	STUD
05 40 00 J2 -	EXTERIOR GYPSUM SHEATHING - 5/8"
06 10 00 DP -	PPT PLYWOOD
07 14 00 A -	WATERPROOFING
07 21 00 B1 -	BELOW GRADE RIGID INSULATION
07 21 00 B2 -	CAVITY WALL RIGID INSULATION
07 21 00 B -	RIGID INSULATION
07 21 00 C -	CLEAR POLYETHYLENE VAPOR BARRIER
07 21 19 A -	FOAMED INSULATION
07 25 00 C -	WEATHER BARRIER
07 42 13 A -	METAL WALL PANEL
07 53 00 A3 -	MEMBRANE FLASHING
07 84 00 A -	SEALANT - UL LISTED
07 84 00 B -	FIRE PROOF INSULATION - UL LISTED
07 92 00 B -	BACKER ROD AND SEALANT
07 92 00 D -	BACKER ROD
09 21 16 A1 -	FIRECODE GYPSUM BOARD - 5/8"

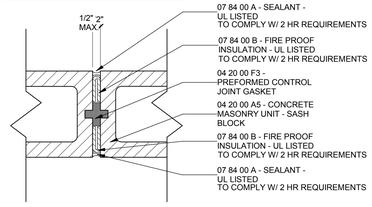


5 DOOR CUT-IN TO CMU WALL
N.T.S.

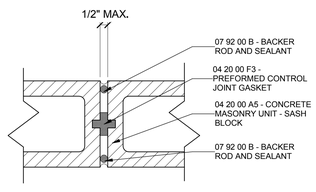


4 CONTROL JOINT
N.T.S.

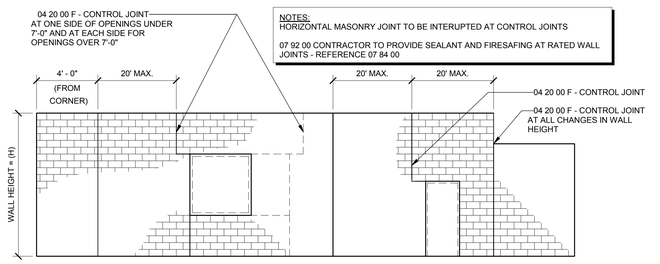
NOTE:
CONTROL JOINT TO BE IN ACCORDANCE WITH U.L. TESTED SYSTEM. CONTRACTOR TO SUBMIT U.L. ASSEMBLY # PROVIDED.



3 RATED CMU CONTROL JOINT DETAIL
SCALE 3" = 1'-0"
AS REFERENCED BY:



2 NON-RATED CMU CONTROL JOINT
SCALE 3" = 1'-0"
AS REFERENCED BY:



ELEVATION

1 INTERIOR & EXTERIOR MASONRY CONTROL JOINT LOCATIONS
SCALE 1/4" = 1'-0"
AS REFERENCED BY:

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CONSULTANT:

MANAWA ELEMENTARY SCHOOL - ALTERATIONS
MANAWA MIDDLE/HIGH SCHOOL - ADDITIONS & ALTERATIONS
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515 E. 4th STREET
MANAWA, WI 54949

MARK	DATE
ISSUED:	6 JUN 2019
PROJECT NO:	18268
CAD DWG FILE:	
DRAWN BY:	Author
CHECKED BY:	Checker

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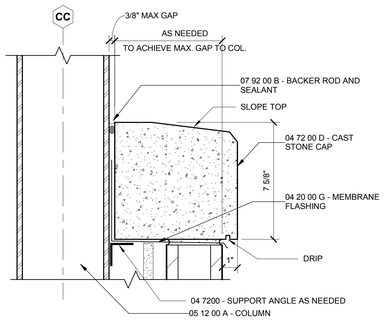
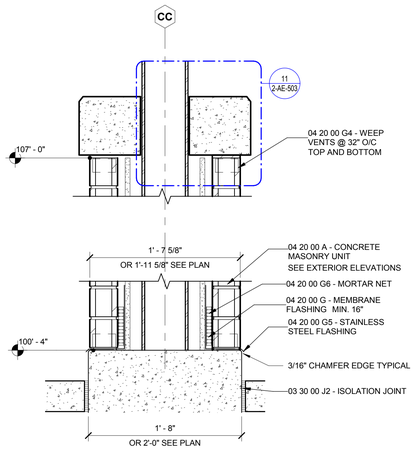
SHEET TITLE:
EXTERIOR WALL TYPES. INT. & EXT. WALL DETAILS

SHEET NUMBER:
2-AE-502



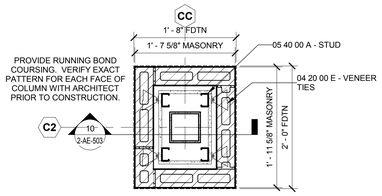
11 COLUMN CAP DETAIL

SCALE 3" = 1'-0"
AS REFERENCED BY: 10 / 2-AE-503



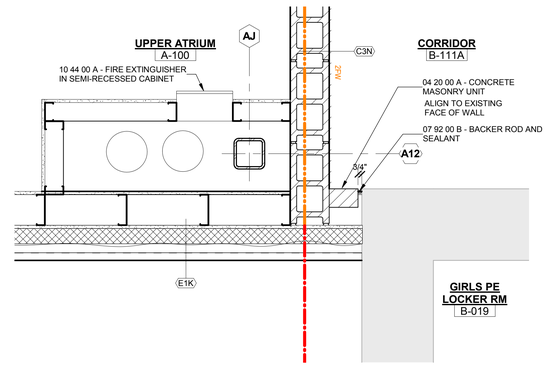
10 COL. SURROUND SECTION

SCALE 1 1/2" = 1'-0"
AS REFERENCED BY: 6 / 2-AE-451



9 TYP. COL. SURROUND PLAN DETAIL

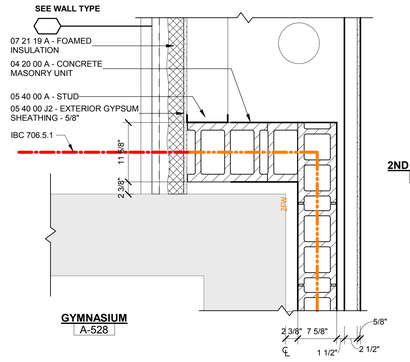
SCALE 1" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-402

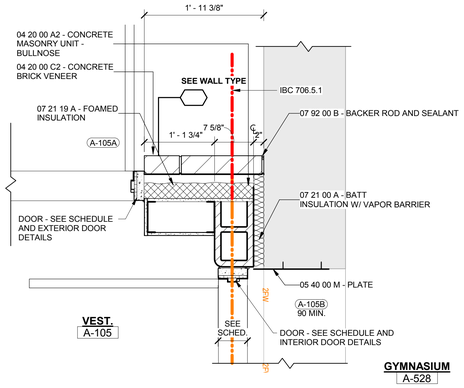


8 AREA A FIREWALL PLAN DETAIL

SCALE 1" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-102

NORTH





6 AREA C - FIRE WALL PLAN DETAIL

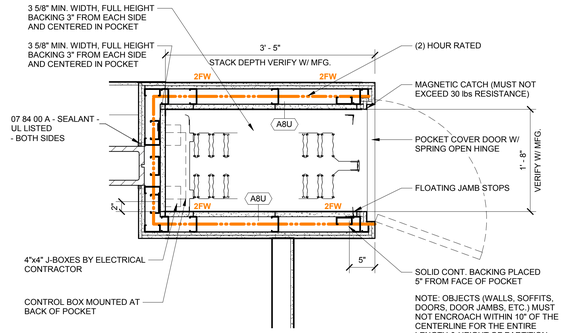
SCALE 1" = 1'-0"
AS REFERENCED BY: 2 / 2-AE-403

NORTH

5 AREA A - FIRE WALL PLAN DETAIL

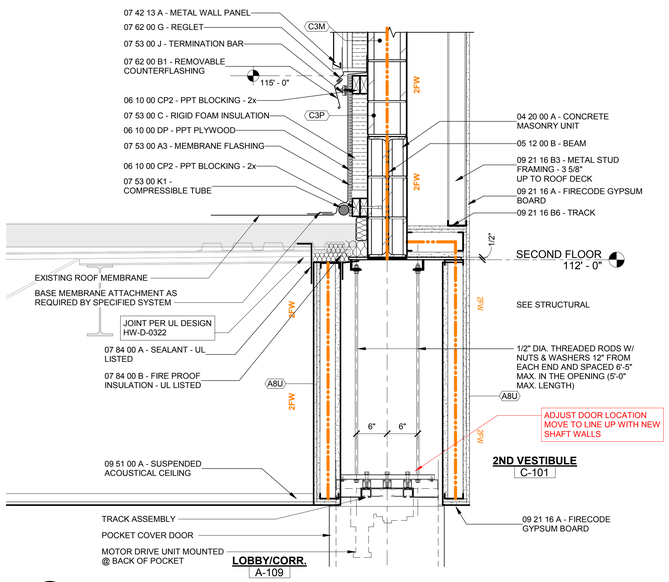
SCALE 1" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-102

NORTH



3 DOOR C-101 WEST END JAMB DETAIL

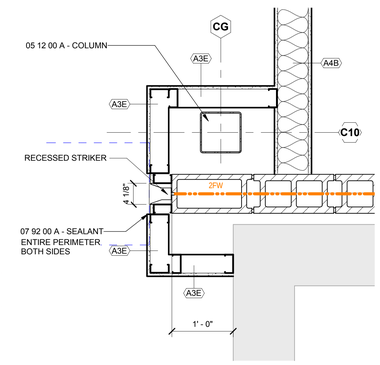
SCALE 1" = 1'-0"
AS REFERENCED BY: 2 / 2-AE-403



NORTH

2 DOOR C-101 HEAD DETAIL

SCALE 1" = 1'-0"
AS REFERENCED BY: 2 / 2-AE-315



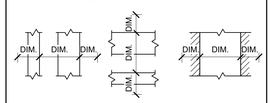
1 DOOR C-101 EAST END JAMB DETAIL

SCALE 1" = 1'-0"
AS REFERENCED BY: 2 / 2-AE-403

NORTH

WALL DIMENSION KEY

NOTE:
ALL WALLS ARE DIMENSIONED TO FACE OF STUD OR FACE OF MASONRY. CLEARANCE DIMENSIONS ARE FROM FACE OF STUDS OR FACE OF MASONRY.



STANDARD DIMENSIONING | CLEARANCE DIMENSIONING

FLOOR PLAN LEGEND

X	DENOTES WINDOW TYPE. SEE SHEET AE-630 & AE-631
NIC	DENOTES ITEM NOT IN CONTRACT - BY OWNER
XXXX	DENOTES WALL TYPE - SEE SHEET AE-501 FOR EXTERIOR AND AE-502 FOR INTERIOR WALLS

KEYNOTE LEGEND

KEY NO.	KEYNOTE TEXT
03 30 00 J2 -	ISOLATION JOINT
04 20 00 A2 -	CONCRETE MASONRY UNIT - BULLNOSE
04 20 00 A -	CONCRETE MASONRY UNIT
04 20 00 C2 -	CONCRETE BRICK VENEER
04 20 00 E -	VENEER TIES
04 20 00 G4 -	WEEP VENTS @ 32" O/C
04 20 00 G5 -	STAINLESS STEEL FLASHING
04 20 00 G6 -	MORTAR NET
04 20 00 G -	MEMBRANE FLASHING
04 72 00 D -	CAST STONE CAP
05 12 00 A -	COLUMN
05 12 00 B -	BEAM
05 40 00 A -	STUD
05 40 00 J2 -	EXTERIOR GYPSUM SHEATHING - 5/8"
05 40 00 M -	PLATE
06 10 00 CP2 -	PPT BLOCKING - 2x
06 10 00 DP -	PPT PLYWOOD
07 21 00 A -	BATT INSULATION
07 21 19 A -	FOAMED INSULATION
07 42 13 A -	METAL WALL PANEL
07 53 00 A3 -	MEMBRANE FLASHING
07 53 00 C -	RIGID FOAM INSULATION
07 53 00 J -	TERMINATION BAR
07 53 00 K1 -	COMPRESSIBLE TUBE
07 62 00 B1 -	REMOVABLE COUNTERFLASHING
07 62 00 G -	REGLET
07 84 00 A -	SEALANT - UL LISTED
07 84 00 B -	FIRE PROOF INSULATION - UL LISTED
07 92 00 A -	SEALANT
07 92 00 B -	BACKER ROD AND SEALANT
09 21 16 A -	FIRECODE GYPSUM BOARD
09 21 16 B3 -	METAL STUD FRAMING - 3 5/8"
09 21 16 B6 -	TRACK
09 51 00 A -	SUSPENDED ACOUSTICAL CEILING
10 44 00 A -	FIRE EXTINGUISHER IN SEMI-RECESSED CABINET

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MANAWA

MANAWA ELEMENTARY SCHOOL - ALTERATIONS
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PART 2 - MANAWA MIDDLE / HIGH SCHOOL
515 E. 4th STREET
MANAWA, WI 54949

MARK	DATE
ISSUED:	6 JUN 2019
PROJECT NO:	18268
CAD DWG FILE:	
DRAWN BY:	Author
CHECKED BY:	Checker

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SHEET TITLE:

BLDG PLAN DETAILS

SHEET NUMBER:

2-AE-503

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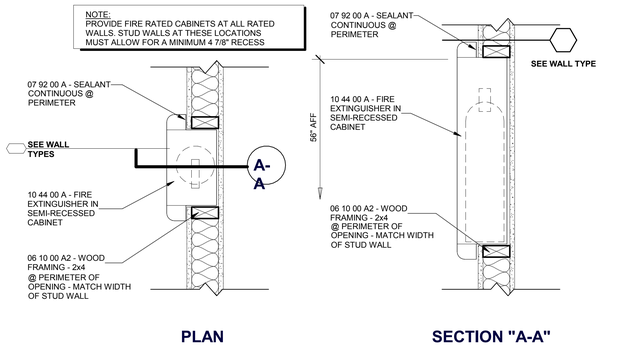
KEYNOTE LEGEND	
KEY NO.	KEYNOTE TEXT
04 20 00 A -	CONCRETE MASONRY UNIT
06 10 00 A2 -	WOOD FRAMING - 2x4
06 10 00 C1 -	WOOD BLOCKING - 1x
06 10 00 CP2 -	PPT BLOCKING - 2x
06 10 00 D4 -	PLYWOOD SUBFLOORING
07 92 00 A1 -	SEALANT - BOTH SIDES
07 92 00 A -	SEALANT
08 11 13 B -	STEEL DOOR FRAME
10 44 00 A -	FIRE EXTINGUISHER IN SEMI-RECESSED CABINET
10 51 00 A -	METAL LOCKERS
10 51 00 B -	BENCH
10 51 00 D -	SLOPED TOP



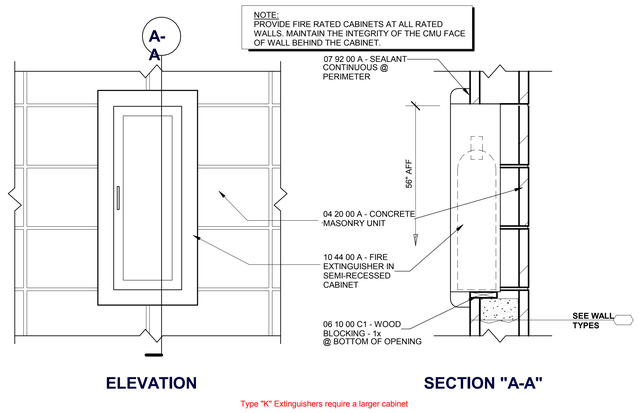
Type "K" Extinguishers (kitchen) require a larger cabinet, will not fit in 2x4 wall w/ single layer of gypsum

10 FE B001

10 Specialties - 10 Fire Exting. Cab Stud--RENAME

5 FIRE EXTINGUISHER CABINET DETAIL

SCALE 1 1/2" = 1'-0"
AS REFERENCED BY:



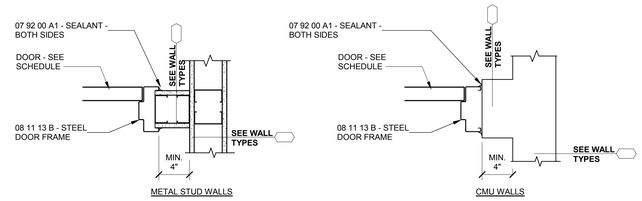
Type "K" Extinguishers require a larger cabinet

10 FE A001

10 Specialties - 10 Fire Exting. Cab CMU--RENAME

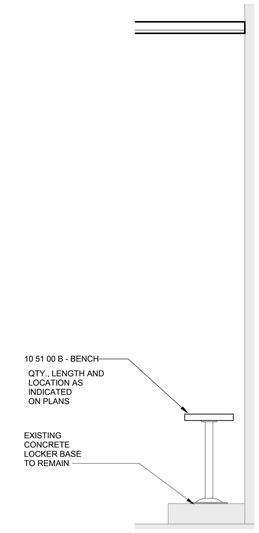
4 FIRE EXTINGUISHER CABINET DETAIL

SCALE 1 1/2" = 1'-0"
AS REFERENCED BY:



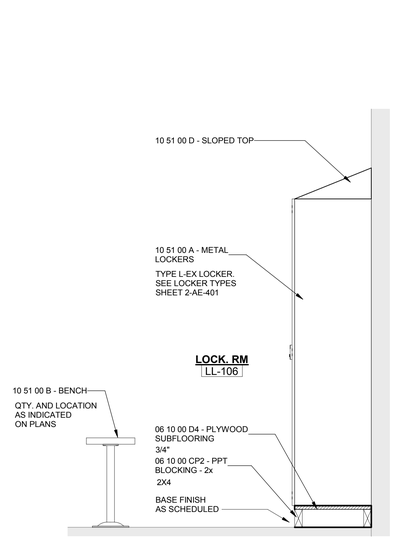
3 HM FRAME AT WALL INTERSECTION

SCALE 1 1/2" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-104



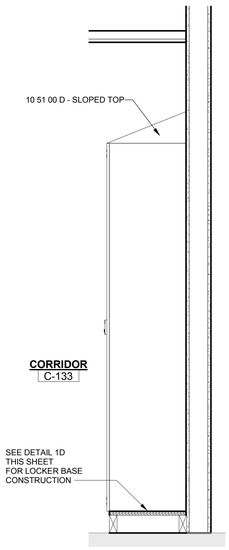
2 BENCH DETAIL

SCALE 1" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-104



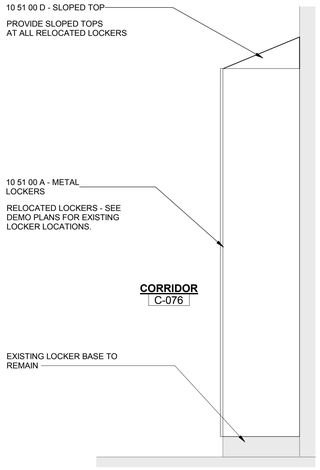
1D LL-106 RELOCATED LOCKERS

SCALE 1" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-701



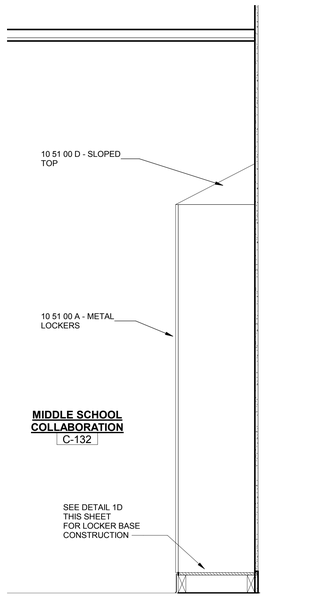
1C NEW LOCKER DETAIL

SCALE 1" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-104



1B RELOCATED LOCKER DETAIL

SCALE 1" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-104



1A LOCKER DETAIL 1

SCALE 1" = 1'-0"
AS REFERENCED BY: 15 / 2-AE-701

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CONSULTANT:

MANAWA

MANAWA ELEMENTARY SCHOOL - ALTERATIONS
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MARK	DATE
ISSUED:	6 JUN 2019
PROJECT NO:	18268
CAD DWG FILE:	
DRAWN BY:	Author
CHECKED BY:	Checker

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SHEET TITLE:

STANDARD DETAILS

SHEET NUMBER:

2-AE-504

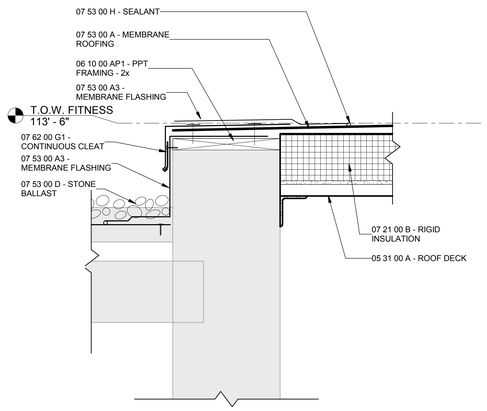
STRUCTURAL COORDINATION NOTES

COORDINATE WITH STRUCTURAL ENGINEERING FOR THE FOLLOWING:

1. ALL FOOTING AND FOUNDATIONS.
2. ALL STOOP CONSTRUCTION
3. ALL WALL GROUTING / REINFORCING AND BOND BEAM LOCATIONS.
4. ALL BRICK LEDGE HEIGHTS AND LOCATIONS. ALSO REFER TO ARCHITECTURAL ELEVATIONS.
5. AREAS REQUIRING EXISTING STRUCTURAL REINFORCING.
6. DOWELED CONNECTION REQUIREMENTS BETWEEN EXISTING AND NEW CONCRETE SLABS.

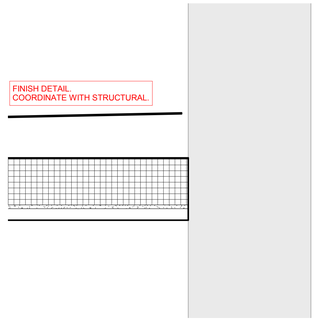
KEYNOTE LEGEND

KEY NO.	KEYNOTE TEXT
03 30 00 A -	CONCRETE FOUNDATION
03 30 00 B -	FOUNDATION WALL
03 30 00 C -	FOOTING
03 30 00 D7 -	VAPOR BARRIER
03 30 00 D -	CONCRETE SLAB
03 30 00 J2 -	ISOLATION JOINT
04 20 00 A -	CONCRETE MASONRY UNIT
04 20 00 G2 -	FLASHING MASTIC
04 20 00 G4 -	WEEP VENTS @ 32" O/C
04 20 00 G5 -	STAINLESS STEEL FLASHING
04 20 00 G6 -	MORTAR NET
04 20 00 G -	MEMBRANE FLASHING
05 31 00 A -	ROOF DECK
05 40 00 A -	STUD
06 10 00 AP1 -	PPT FRAMING - 2x
06 10 00 F2 -	SILL SEAL-CONTINUOUS
07 14 00 A -	WATERPROOFING
07 21 00 B1 -	BELOW GRADE RIGID INSULATION
07 21 00 B -	RIGID INSULATION
07 21 19 A -	FOAMED INSULATION
07 53 00 A3 -	MEMBRANE FLASHING
07 53 00 A -	MEMBRANE ROOFING
07 53 00 D -	STONE BALLAST
07 53 00 H -	SEALANT
07 62 00 G1 -	CONTINUOUS CLEAT
33 46 00 B -	GRANULAR FILL



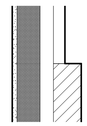
6B DETAIL AT ROOF INFILL - SOUTH SIDE

SCALE 1 1/2" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-151



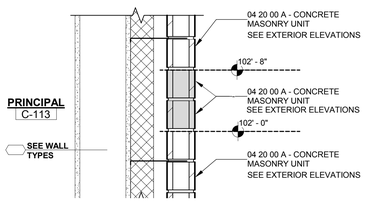
6A DETAIL AT ROOF INFILL - NORTH SIDE

SCALE 1 1/2" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-151



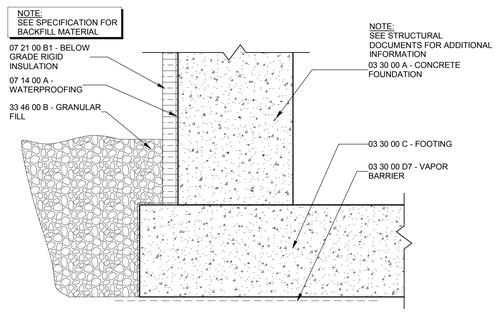
5 MTL PNL TO MSNRY. TRANS. DETAIL

SCALE 1 1/2" = 1'-0"
AS REFERENCED BY: 2 / 2-AE-314



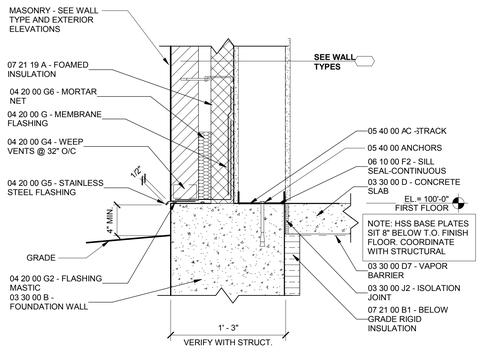
3 HORIZ. BANDING DETAIL

SCALE 1 1/2" = 1'-0"
AS REFERENCED BY: 2 / 2-AE-314



2 ELEVATOR PIT DETAIL

SCALE 1 1/2" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-406



1 METAL STUD WALL BASE 1

SCALE 1 1/2" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-314

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MANAWA MIDDLE/HIGH SCHOOL - ADDITIONS & ALTERATIONS
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CAD DWG FILE:	
DRAWN BY:	Author
CHECKED BY:	Checker

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SHEET TITLE:

WALL DETAILS

SHEET NUMBER:

2-AE-505

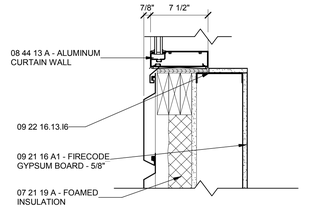
STRUCTURAL COORDINATION NOTES

COORDINATE WITH STRUCTURAL ENGINEERING FOR THE FOLLOWING:

1. ALL FOOTING AND FOUNDATIONS.
2. ALL STOOP CONSTRUCTION
3. ALL WALL GROUTING / REINFORCING AND BOND BEAM LOCATIONS.
4. ALL BRICK LEDGE HEIGHTS AND LOCATIONS. ALSO REFER TO ARCHITECTURAL ELEVATIONS.
5. AREAS REQUIRING EXISTING STRUCTURAL REINFORCING.
6. DOWELED CONNECTION REQUIREMENTS BETWEEN EXISTING AND NEW CONCRETE SLABS.

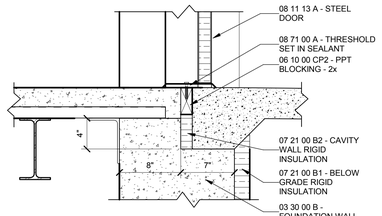
KEYNOTE LEGEND

KEY NO.	KEYNOTE TEXT
03 30 00 B -	FOUNDATION WALL
03 30 00 D2 -	CONCRETE SLAB - 5"
03 30 00 D7 -	VAPOR BARRIER
03 30 00 J2 -	ISOLATION JOINT
04 05 11 B -	GROUT
04 20 00	UNIT MASONRY
04 20 00 A -	CONCRETE MASONRY UNIT
04 20 00 G2 -	FLASHING MASTIC
04 20 00 G4 -	WEEP VENTS @ 32" O/C
04 20 00 G5 -	STAINLESS STEEL FLASHING
04 20 00 G6 -	MORTAR NET
04 20 00 G -	MEMBRANE FLASHING
06 10 00 AP3 -	PPT FRAMING - 2x6
06 10 00 CP2 -	PPT BLOCKING - 2x
07 14 00	FLUID-APPLIED WATERPROOFING
07 14 00 B -	PROTECTION BOARD
07 21 00 B1 -	BELOW GRADE RIGID INSULATION
07 21 00 B2 -	CAVITY WALL RIGID INSULATION
07 21 00 H -	CEMENTITIOUS PROTECTION BOARD
07 21 19 A -	FOAMED INSULATION
07 25 00 C -	WEATHER BARRIER
07 42 13 D -	METAL FLASHING
07 62 00	SHEET METAL FLASHING AND TRIM
08 11 13 A -	STEEL DOOR
08 43 13 M -	BRAKE METAL TRIM
08 44 13 A -	ALUMINUM CURTAIN WALL
08 71 00 A -	THRESHOLD SET IN SEALANT
09 21 16 A1 -	FIRECODE GYPSUM BOARD - 5/8"
09 22 16.13.I6	
32 13 13 D -	CONCRETE STAIRS

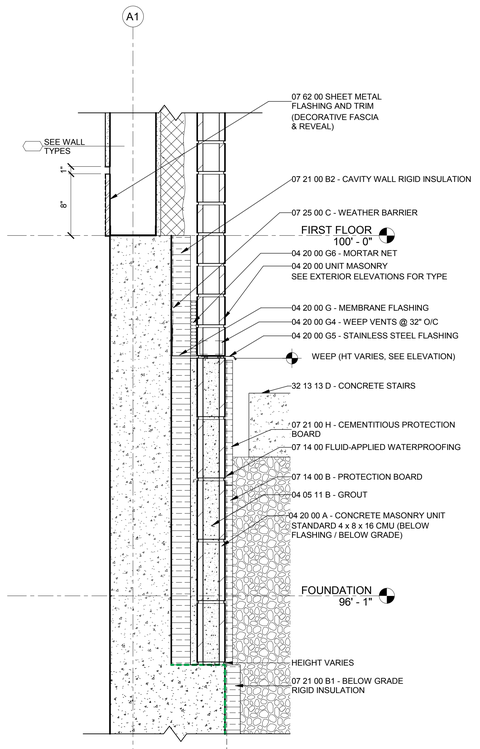


5 WALL DETAIL 2
SCALE 1 1/2" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-310

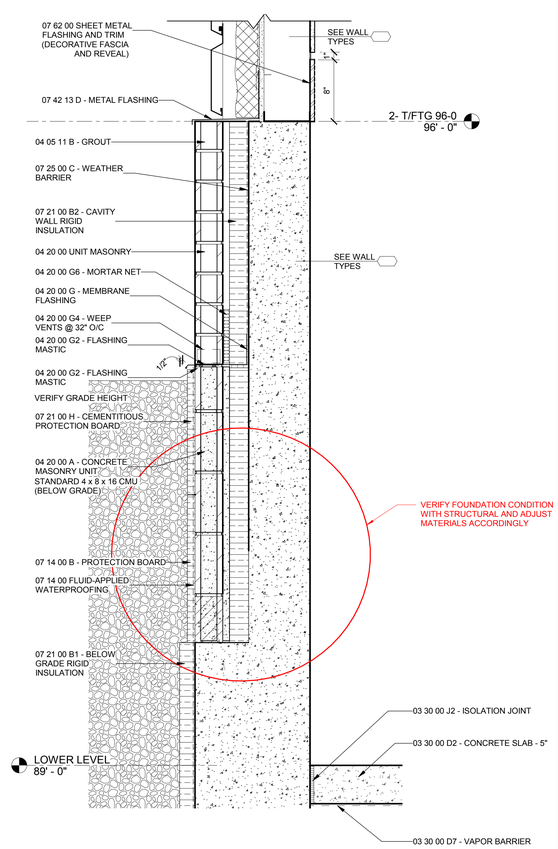
4 Detail 9
SCALE 1 1/2" = 1'-0"
AS REFERENCED BY: 4 / 2-AE-310



3 WALL DETAIL 11
SCALE 1 1/2" = 1'-0"
AS REFERENCED BY: 2 / 2-AE-311



2 WALL DETAIL 4
SCALE 1 1/2" = 1'-0"
AS REFERENCED BY: 3 / 2-AE-310



1 WALL DETAIL 1
SCALE 1 1/2" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-310

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CONSULTANT:

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MANAWA, WI 54949

MARK	DATE
ISSUED:	6 JUN 2019
PROJECT NO:	18268
CAD DWG FILE:	
DRAWN BY:	Author
CHECKED BY:	Checker

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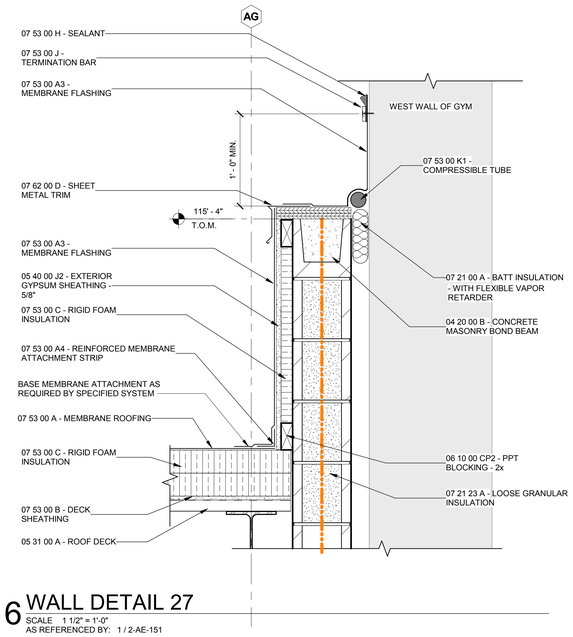
SHEET TITLE:

WALL DETAILS

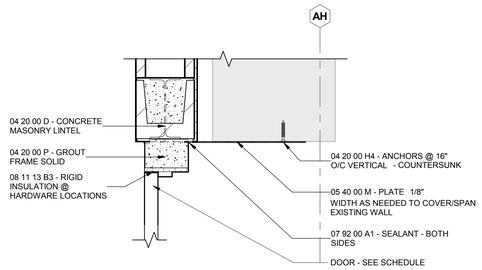
SHEET NUMBER:

2-AE-506



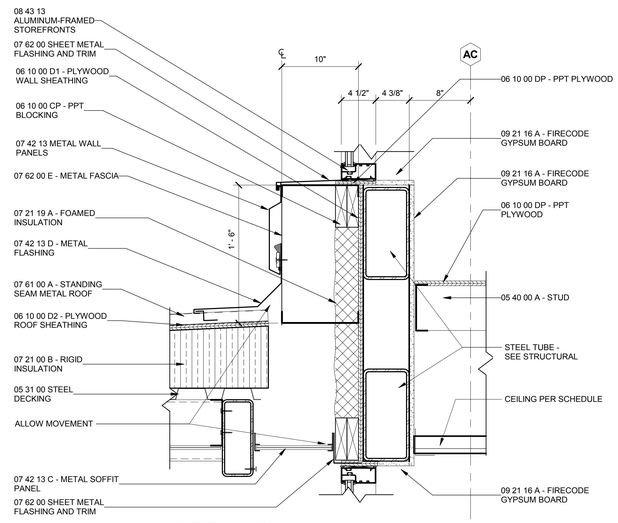
6 WALL DETAIL 27

SCALE 1 1/2" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-151



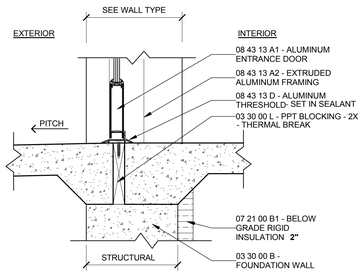
5 HEAD DETAIL

SCALE 1 1/2" = 1'-0"
AS REFERENCED BY: 2 / 2-AE-313



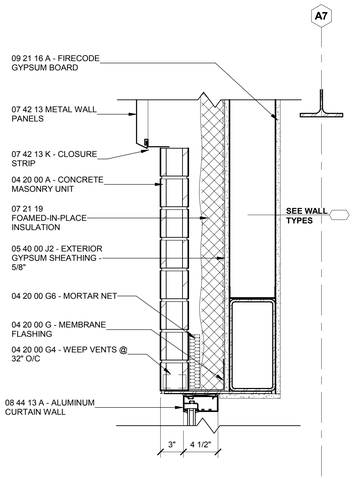
4 WALL DETAIL 29

SCALE 1 1/2" = 1'-0"
AS REFERENCED BY: 3 / 2-AE-311



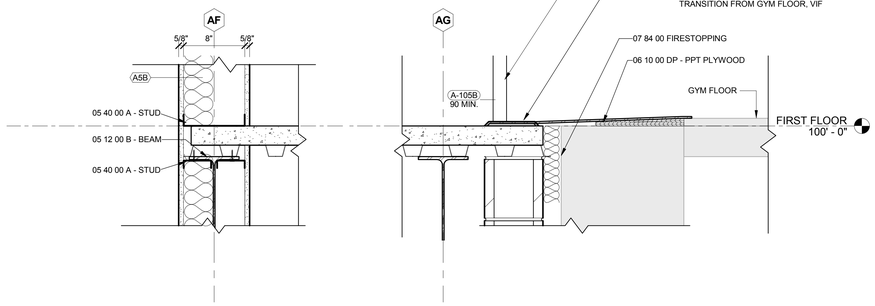
3 DOOR SILL DETAIL

SCALE 1 1/2" = 1'-0"
AS REFERENCED BY: 3 / 2-AE-311



2 WALL DETAIL 15

SCALE 1 1/2" = 1'-0"
AS REFERENCED BY: 3 / 2-AE-310



1 WALL DETAIL 25

SCALE 1 1/2" = 1'-0"
AS REFERENCED BY: 2 / 2-AE-313

STRUCTURAL COORDINATION NOTES

COORDINATE WITH STRUCTURAL ENGINEERING FOR THE FOLLOWING:

1. ALL FOOTING AND FOUNDATIONS.
2. ALL STOOP CONSTRUCTION
3. ALL WALL GROUTING / REINFORCING AND BOND BEAM LOCATIONS.
4. ALL BRICK LEDGE HEIGHTS AND LOCATIONS. ALSO REFER TO ARCHITECTURAL ELEVATIONS.
5. AREAS REQUIRING EXISTING STRUCTURAL REINFORCING.
6. DOWELED CONNECTION REQUIREMENTS BETWEEN EXISTING AND NEW CONCRETE SLABS.

KEYNOTE LEGEND

KEY NO.	KEYNOTE TEXT
03 30 00 B -	FOUNDATION WALL
03 30 00 L -	PPT BLOCKING - 2X
04 20 00 A -	CONCRETE MASONRY UNIT
04 20 00 B -	CONCRETE MASONRY BOND BEAM
04 20 00 D -	CONCRETE MASONRY LINTEL
04 20 00 G4 -	WEEP VENTS @ 32" O/C
04 20 00 G6 -	MORTAR NET
04 20 00 G -	MEMBRANE FLASHING
04 20 00 H4 -	ANCHORS @ 16" O/C VERTICAL
04 20 00 P -	GROUT FRAME SOLID
05 12 00 B -	BEAM
05 31 00	STEEL DECKING
05 31 00 A -	ROOF DECK
05 40 00	COLD-FORMED METAL FRAMING
05 40 00 A -	STUD
05 40 00 J2 -	EXTERIOR GYPSUM SHEATHING - 5/8"
05 40 00 M -	PLATE
06 10 00 CP2 -	PPT BLOCKING - 2x
06 10 00 CP -	PPT BLOCKING
06 10 00 D1 -	PLYWOOD WALL SHEATHING
06 10 00 D2 -	PLYWOOD ROOF SHEATHING
06 10 00 DP -	PPT PLYWOOD
07 21 00 A -	BATT INSULATION
07 21 00 B1 -	BELOW GRADE RIGID INSULATION
07 21 00 B -	RIGID INSULATION
07 21 19	FOAMED-IN-PLACE INSULATION
07 21 19 A -	FOAMED INSULATION
07 21 23 A -	LOOSE GRANULAR INSULATION
07 42 13	METAL WALL PANELS
07 42 13 C -	METAL SOFFIT PANEL
07 42 13 D -	METAL FLASHING
07 42 13 K -	CLOSURE STRIP
07 53 00 A3 -	MEMBRANE FLASHING
07 53 00 A4 -	REINFORCED MEMBRANE ATTACHMENT STRIP
07 53 00 A -	MEMBRANE ROOFING
07 53 00 B -	DECK SHEATHING
07 53 00 C -	RIGID FOAM INSULATION
07 53 00 H -	SEALANT
07 53 00 J -	TERMINATION BAR
07 53 00 K1 -	COMPRESSIBLE TUBE
07 61 00 A -	STANDING SEAM METAL ROOF
07 62 00	SHEET METAL FLASHING AND TRIM
07 62 00 D -	SHEET METAL TRIM
07 62 00 E -	METAL FASCIA
07 84 00	FIRESTOPPING
07 92 00 A1 -	SEALANT - BOTH SIDES
08 11 13 B3 -	RIGID INSULATION @ HARDWARE LOCATIONS
08 43 13	ALUMINUM-FRAMED STOREFRONTS
08 43 13 A1 -	ALUMINUM ENTRANCE DOOR
08 43 13 A2 -	EXTRUDED ALUMINUM FRAMING
08 43 13 D -	ALUMINUM THRESHOLD
08 44 13 A -	ALUMINUM CURTAIN WALL
08 71 00 A -	THRESHOLD SET IN SEALANT
09 21 16 A -	FIRECODE GYPSUM BOARD

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CONSULTANT:

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MARK	DATE
ISSUED:	6 JUN 2019
PROJECT NO:	18268
CAD DWG FILE:	
DRAWN BY:	Author
CHECKED BY:	Checker

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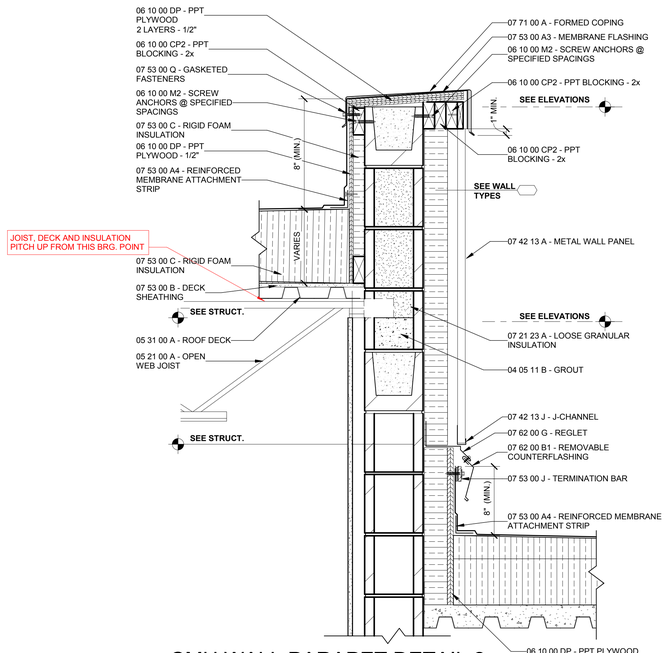
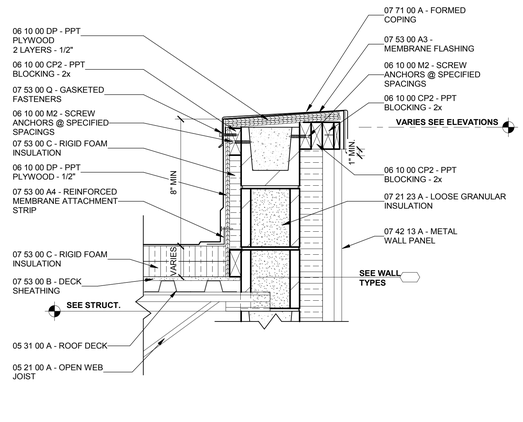
SHEET TITLE:
WALL DETAILS

SHEET NUMBER:
2-AE-507



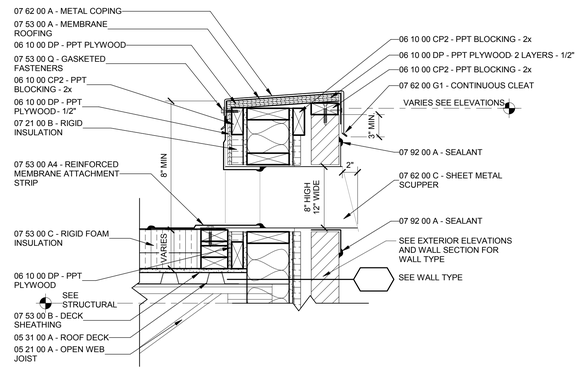
11 CMU WALL PARAPET DETAIL 2

SCALE 1 1/2" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-151



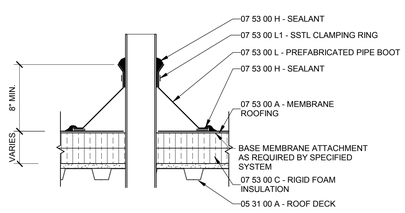
10 CMU WALL PARAPET DETAIL 1

SCALE 1 1/2" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-151



9 SCUPPER DETAIL

SCALE 1 1/2" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-202



8 ROOF PENETRATION DETAIL - 2

SCALE 1 1/2" = 1'-0"
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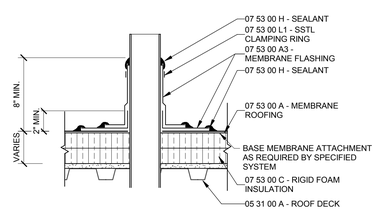

7 ROOF PENETRATION DETAIL - 1

SCALE 1 1/2" = 1'-0"
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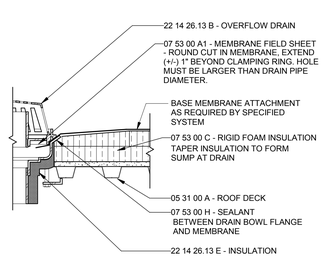
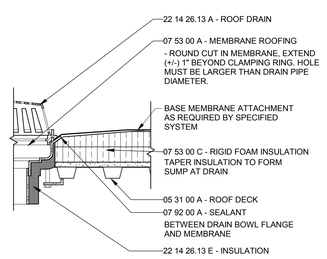


6 ROOF OVER FLOW DRAIN

SCALE 1 1/2" = 1'-0"
AS REFERENCED BY:



5 ROOF DRAIN

SCALE 1 1/2" = 1'-0"
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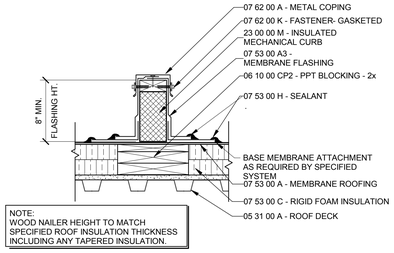

4 SUPPORT CURB

SCALE 1 1/2" = 1'-0"
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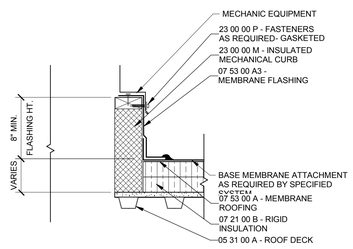
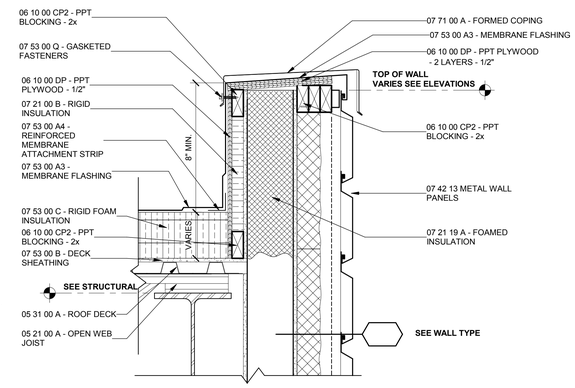


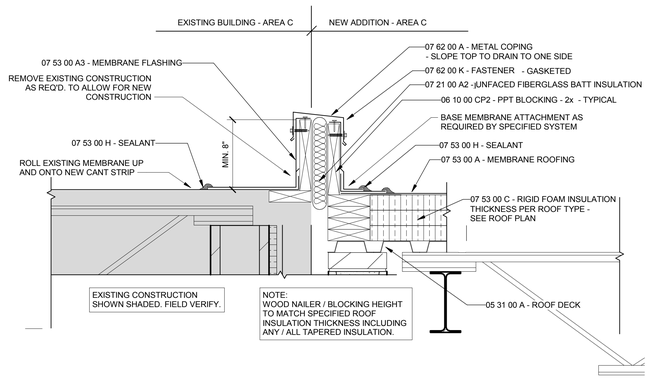
3 MECHANICAL CURB

SCALE 1 1/2" = 1'-0"
AS REFERENCED BY:



2 PARAPET AT MTL STUD & MTL PANEL VENEER

SCALE 1 1/2" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-151



1 ROOF EXPANSION JOINT DETAIL

SCALE 1 1/2" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-152

KEYNOTE LEGEND

KEY NO.	KEYNOTE TEXT
04 05 11 B -	GROUT
05 21 00 A -	OPEN WEB JOIST
05 31 00 A -	ROOF DECK
06 10 00 CP2 -	PPT BLOCKING - 2x
06 10 00 DP -	PPT PLYWOOD
06 10 00 M2 -	SCREW ANCHORS @ SPECIFIED SPACINGS
07 21 00 A2 -	UNFACED FIBERGLASS BATT INSULATION
07 21 00 B -	RIGID INSULATION
07 21 19 A -	FOAMED INSULATION
07 21 23 A -	LOOSE GRANULAR INSULATION
07 42 13	METAL WALL PANELS
07 42 13 A -	METAL WALL PANEL
07 42 13 J -	J-CHANNEL
07 53 00 A1 -	MEMBRANE FIELD SHEET
07 53 00 A3 -	MEMBRANE FLASHING
07 53 00 A4 -	REINFORCED MEMBRANE ATTACHMENT STRIP
07 53 00 A -	MEMBRANE ROOFING
07 53 00 B -	DECK SHEATHING
07 53 00 C -	RIGID FOAM INSULATION
07 53 00 H -	SEALANT
07 53 00 J -	TERMINATION BAR
07 53 00 L1 -	SSTL CLAMPING RING
07 53 00 L -	PREFABRICATED PIPE BOOT
07 53 00 Q -	GASKETED FASTENERS
07 62 00 A -	METAL COPING
07 62 00 B1 -	REMOVABLE COUNTERFLASHING
07 62 00 C -	SHEET METAL SCUPPER
07 62 00 G -	REGLET
07 62 00 G1 -	CONTINUOUS CLEAT
07 62 00 K -	FASTENER
07 71 00 A -	FORMED COPING
07 92 00 A -	SEALANT
22 14 26.13 A -	ROOF DRAIN
22 14 26.13 B -	OVERFLOW DRAIN
22 14 26.13 E -	INSULATION
23 00 00 M -	INSULATED MECHANICAL CURB
23 00 00 P -	FASTENERS AS REQUIRED

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ISSUED: 6 JUN 2019
PROJECT NO: 18268
CAD DWG FILE:
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SHEET TITLE:
ROOF DETAILS 1

SHEET NUMBER:
2-AE-520

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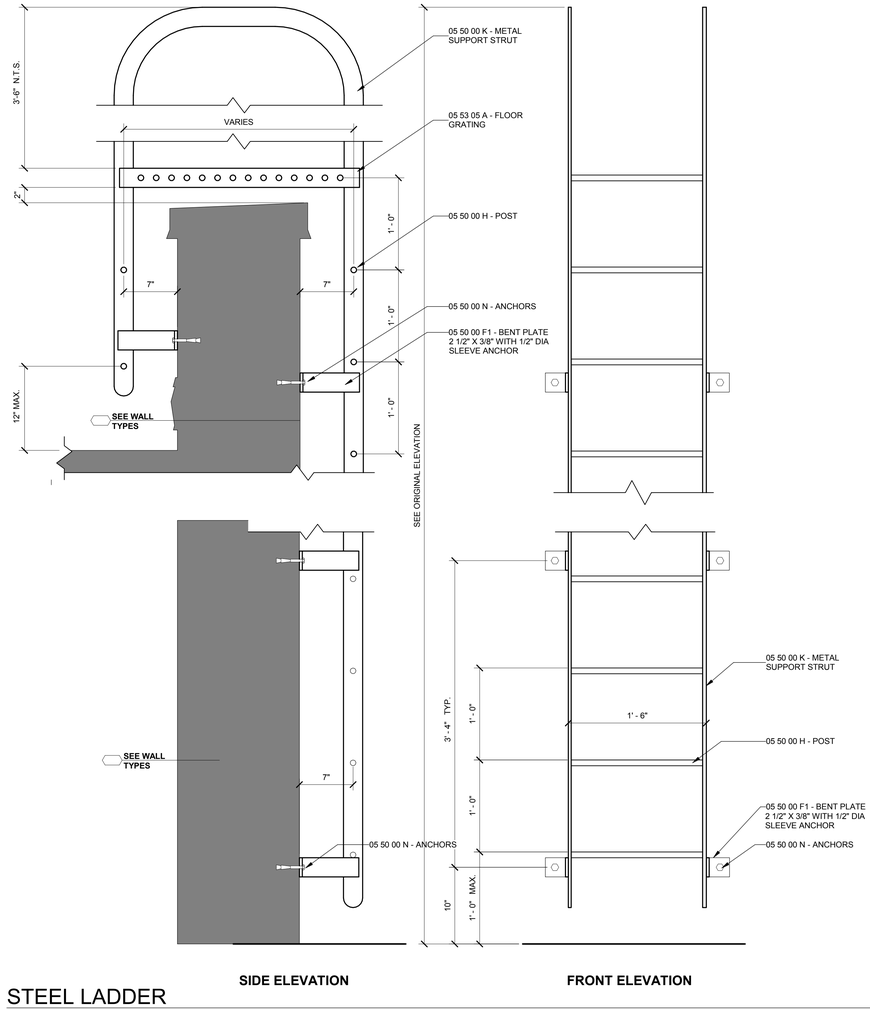
KEYNOTE LEGEND	
KEY NO.	KEYNOTE TEXT
05 50 00 F1 -	BENT PLATE
05 50 00 H -	POST
05 50 00 K -	METAL SUPPORT STRUT
05 50 00 N -	ANCHORS
05 53 05 A -	FLOOR GRATING



1 STEEL LADDER

SCALE 1 1/2" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-151

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CHECKED BY:	Checker

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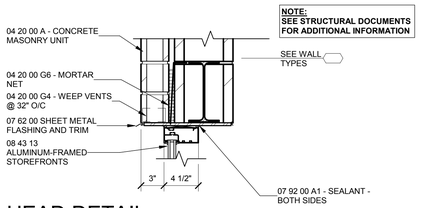
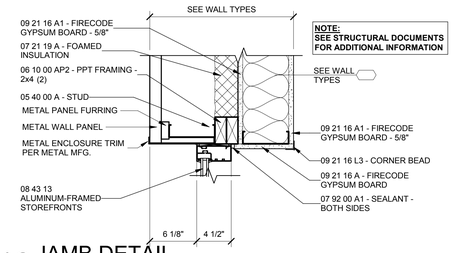
SHEET TITLE:
ROOF DETAILS 2

SHEET NUMBER:
2-AE-521



19 HEAD DETAIL

SCALE 1 1/2" = 1'-0"
AS REFERENCED BY: 2D / 2-AE-630



18 JAMB DETAIL

SCALE 1 1/2" = 1'-0"
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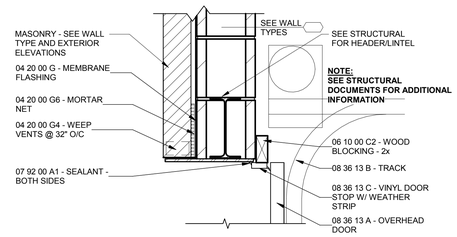

17 HEAD DETAIL

SCALE 1 1/2" = 1'-0"
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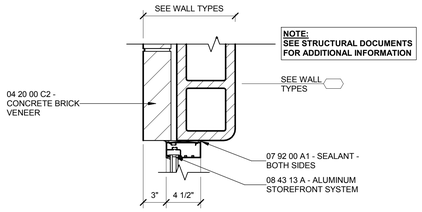
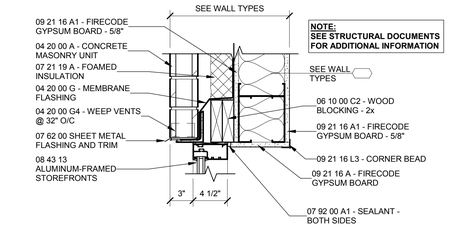


15 JAMB DETAIL

SCALE 1 1/2" = 1'-0"
AS REFERENCED BY: 2D / 2-AE-630



14 HEAD DETAIL

SCALE 1 1/2" = 1'-0"
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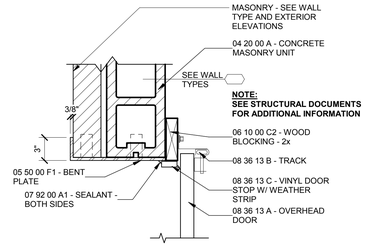
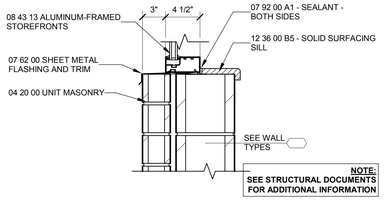


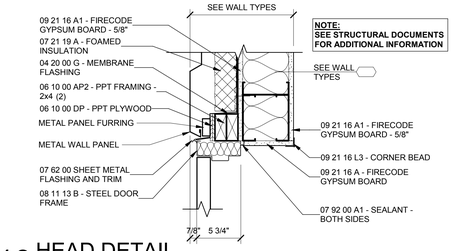
13 JAMB DETAIL

SCALE 1 1/2" = 1'-0"
AS REFERENCED BY:



11 SILL DETAIL

SCALE 1 1/2" = 1'-0"
AS REFERENCED BY: 2D / 2-AE-630



10 HEAD DETAIL

SCALE 1 1/2" = 1'-0"
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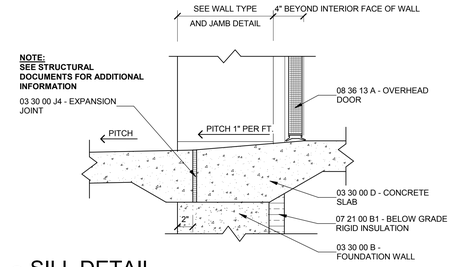
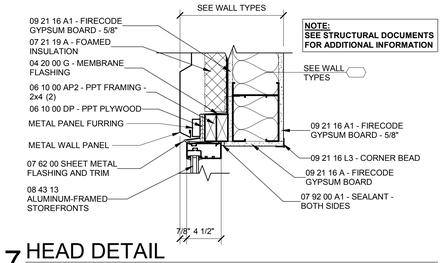


9 SILL DETAIL

SCALE 1 1/2" = 1'-0"
AS REFERENCED BY:



7 HEAD DETAIL

SCALE 1 1/2" = 1'-0"
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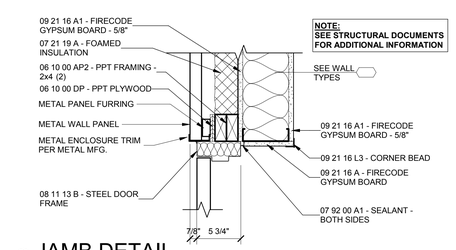

6 JAMB DETAIL

SCALE 1 1/2" = 1'-0"
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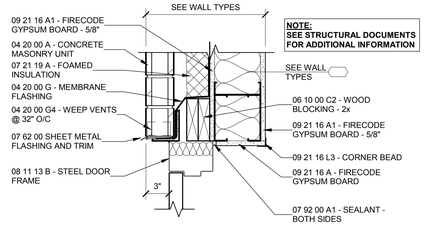
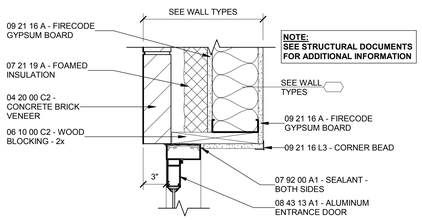


5 HEAD DETAIL

SCALE 1 1/2" = 1'-0"
AS REFERENCED BY: 2 / 2-AE-311



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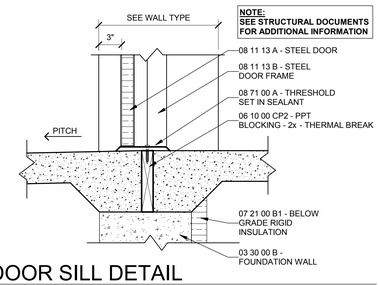

2 DOOR SILL DETAIL

SCALE 1 1/2" = 1'-0"
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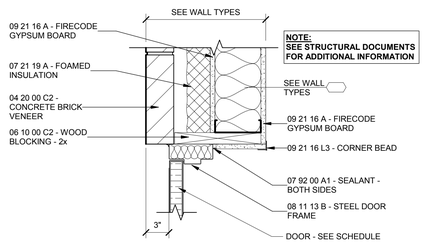

1 JAMB DETAIL

SCALE 1 1/2" = 1'-0"
AS REFERENCED BY:

KEYNOTE LEGEND

KEY NO.	KEYNOTE TEXT
03 30 00 B -	FOUNDATION WALL
03 30 00 D -	CONCRETE SLAB
03 30 00 J4 -	EXPANSION JOINT
04 20 00	UNIT MASONRY
04 20 00 A -	CONCRETE MASONRY UNIT
04 20 00 C2 -	CONCRETE BRICK VENEER
04 20 00 G4 -	WEEP VENTS @ 32" O/C
04 20 00 G6 -	MORTAR NET
04 20 00 G -	MEMBRANE FLASHING
05 40 00 A -	STUD
05 50 00 F1 -	BENT PLATE
06 10 00 AP2 -	PPT FRAMING - 2x4
06 10 00 C2 -	WOOD BLOCKING - 2x
06 10 00 CP2 -	PPT BLOCKING - 2x
06 10 00 DP -	PPT PLYWOOD
07 21 00 B1 -	BELOW GRADE RIGID INSULATION
07 21 19 A -	FOAMED INSULATION
07 62 00	SHEET METAL FLASHING AND TRIM
07 92 00 A1 -	SEALANT - BOTH SIDES
08 11 13 A -	STEEL DOOR
08 11 13 B -	STEEL DOOR FRAME
08 36 13 A -	OVERHEAD DOOR
08 36 13 B -	TRACK
08 36 13 C -	VINYL DOOR STOP W/ WEATHER STRIP
08 43 13	ALUMINUM-FRAMED STOREFRONTS
08 43 13 A1 -	ALUMINUM ENTRANCE DOOR
08 43 13 A -	ALUMINUM STOREFRONT SYSTEM
08 71 00 A -	THRESHOLD SET IN SEALANT
09 21 16 A1 -	FIRECODE GYPSUM BOARD - 5/8"
09 21 16 A -	FIRECODE GYPSUM BOARD
09 21 16 L3 -	CORNER BEAD
12 36 00 B5 -	SOLID SURFACING SILL

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CONSULTANT:

MANAWA

MANAWA ELEMENTARY SCHOOL - ALTERATIONS
MANAWA MIDDLE/HIGH SCHOOL - ADDITIONS & ALTERATIONS
PART 2 - MANAWA MIDDLE / HIGH SCHOOL
515 E. 4th STREET
MANAWA, WI 54949

MARK	DATE
ISSUED:	6 JUN 2019
PROJECT NO:	18268
CAD DWG FILE:	
DRAWN BY:	Author
CHECKED BY:	Checker

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SHEET TITLE:
EXTERIOR DOOR DETAILS

SHEET NUMBER:
2-AE-530

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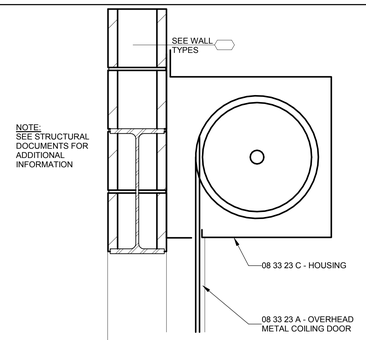

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SCALE 1 1/2" = 1'-0"
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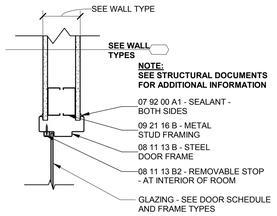

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SCALE 1 1/2" = 1'-0"
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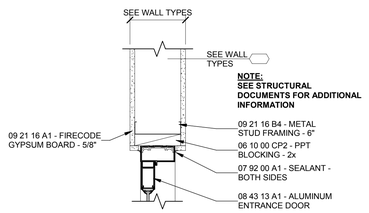

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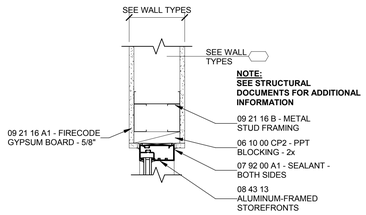

17 HEAD DETAIL
SCALE 1 1/2" = 1'-0"
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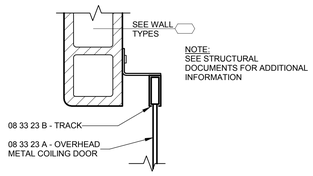

16 JAMB DETAIL
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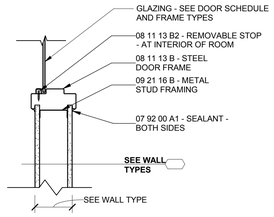

15 JAMB DETAIL
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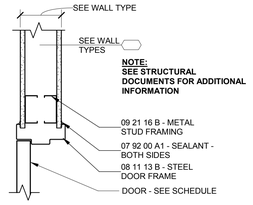

14 HEAD DETAIL
SCALE 1 1/2" = 1'-0"
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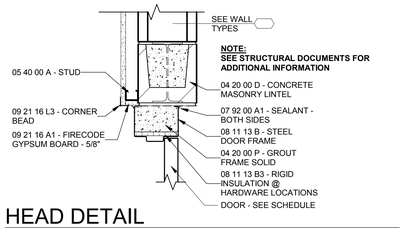

13 HEAD DETAIL
SCALE 1 1/2" = 1'-0"
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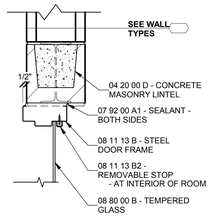

12 HEAD DETAIL
SCALE 1 1/2" = 1'-0"
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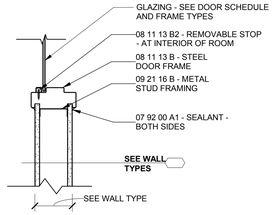

11 SILL DETAIL
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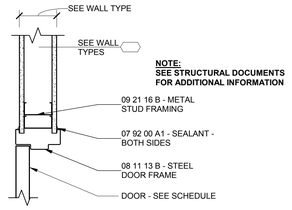

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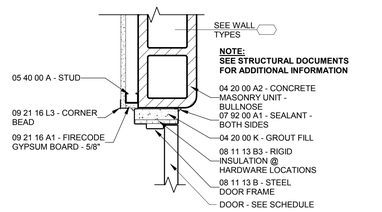

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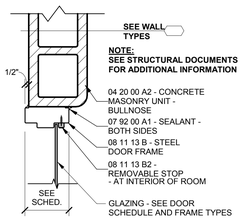

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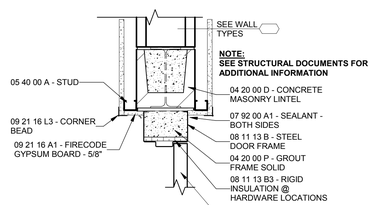

7 HEAD DETAIL
SCALE 1 1/2" = 1'-0"
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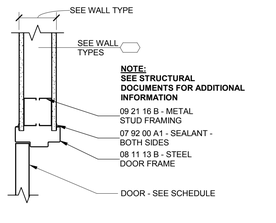

6 HEAD DETAIL
SCALE 1 1/2" = 1'-0"
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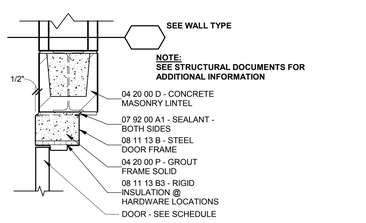

5 HEAD DETAIL
SCALE 1 1/2" = 1'-0"
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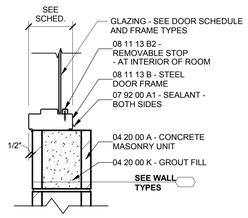

4 SILL DETAIL
SCALE 1 1/2" = 1'-0"
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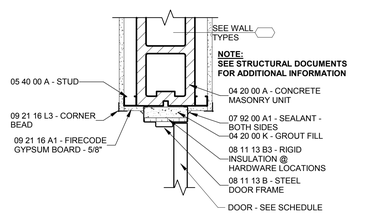

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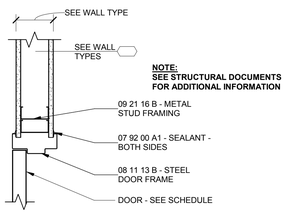

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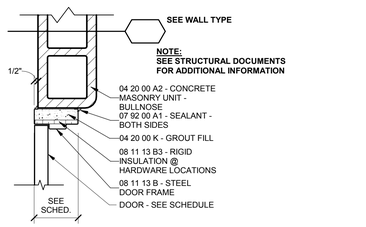

1 JAMB DETAIL
SCALE 1 1/2" = 1'-0"
AS REFERENCED BY:

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CONSULTANT:

MANAWA

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MANAWA MIDDLE/HIGH SCHOOL - ADDITIONS & ALTERATIONS
PART 2 - MANAWA MIDDLE / HIGH SCHOOL
515 E. 4th STREET
MANAWA, WI 54949

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ISSUED:	6 JUN 2019
PROJECT NO:	18268
CAD DWG FILE:	
DRAWN BY:	Author
CHECKED BY:	Checker

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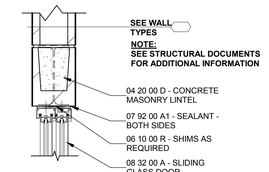
SHEET TITLE:
INTERIOR DOOR DETAILS

SHEET NUMBER:
2-AE-531



17 HEAD DETAIL

SCALE 1 1/2" = 1'-0"
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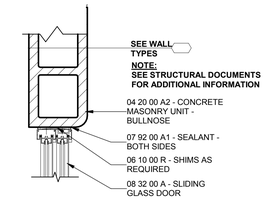

13 JAMB DETAIL

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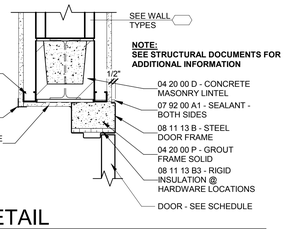

10 HEAD DETAIL

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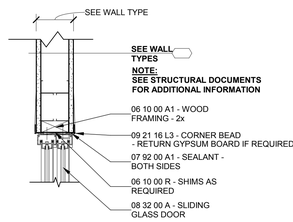

9 HEAD DETAIL

SCALE 1 1/2" = 1'-0"
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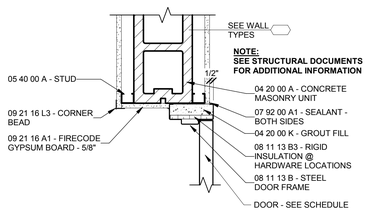

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SCALE 1 1/2" = 1'-0"
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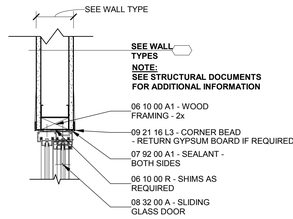

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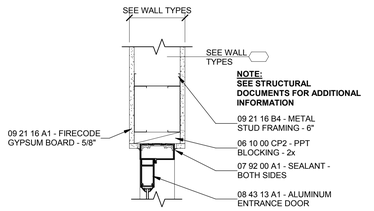

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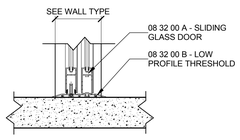

1 DOOR SILL DETAIL

SCALE 1 1/2" = 1'-0"
AS REFERENCED BY:

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CONSULTANT:

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MANAWA, WI 54949

MARK	DATE

ISSUED: 6 JUN 2019
PROJECT NO: 18268
CAD DWG FILE:
DRAWN BY: Author
CHECKED BY: Checker

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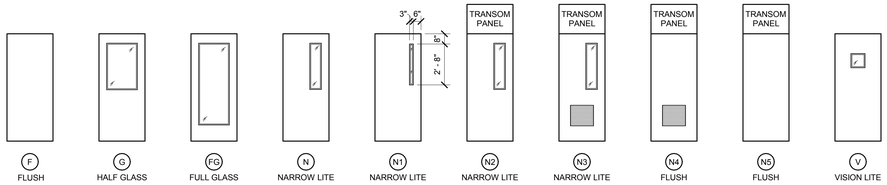
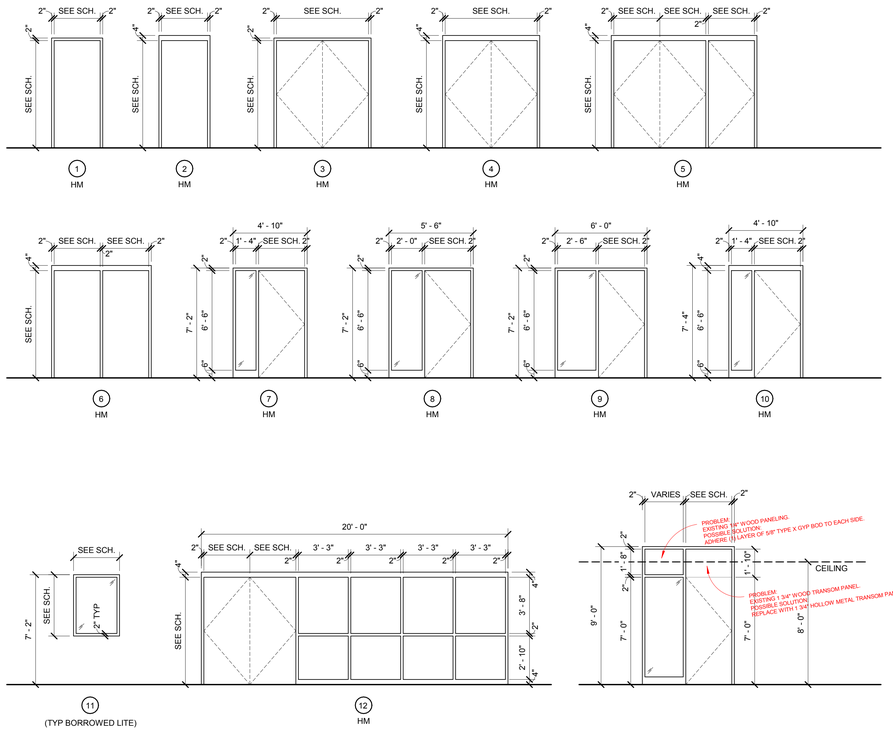
SHEET TITLE:
INTERIOR DOOR DETAILS

SHEET NUMBER:
2-AE-532



1 DOOR TYPES

SCALE 1/4" = 1'-0"
AS REFERENCED BY: DOOR SCHEDULE



2 FRAME TYPES

SCALE 1/4" = 1'-0"
AS REFERENCED BY: DOOR SCHEDULE

DOOR SCHEDULE

DOOR NO.	DOOR QTY	DOOR WIDTH	DOOR HEIGHT	DOOR TYPE	DOOR MATERIAL	FRAME DEPTH	FRAME TYPE	FRAME MATERIAL	DETAILS HEAD	DETAILS JAMB	DETAILS SILL	FIRE RATING	HARDWARE GROUP	REMARKS
A-093A	1	3' - 0"	7' - 0"	N2	WD	5 3/4"	--	--	--	--	--		1	REPLACE DOOR AND TRANSOM PANEL
A-093B	1	3' - 0"	7' - 0"	N2	WD	5 3/4"	--	--	--	--	--		1	REPLACE DOOR AND TRANSOM PANEL
A-095A	1	3' - 0"	7' - 0"	N2	WD	5 3/4"	--	--	--	--	--		1	REPLACE DOOR AND TRANSOM PANEL
A-095B	1	3' - 0"	7' - 0"	N2	WD	5 3/4"	--	--	--	--	--		1	REPLACE DOOR AND TRANSOM PANEL
A-100A	2	3' - 0"	7' - 0"	N1	WD	5 3/4"	4	HM	7/2-EA-603	3/2-EA-603	--	60 MIN.	19	
A-100B	3	3' - 0"	7' - 0"	N1	WD	5 3/4"	5	HM	5/2-EA-603	1/2-EA-603	--	90 MIN.	27	
A-102	2	3' - 1"	7' - 0"	F	WD	5 3/4"	4	HM	2/2-AE-323	5/2-AE-130	1/2-AE-323	90 MIN.	19	
A-104	2	3' - 0"	7' - 0"	F	WD	8 1/4"	3	HM	6/2-EA-603	2/2-EA-603	--	60 MIN.	27	
A-105A	2	3' - 0"	7' - 0"	F	HM	5 3/4"	6	HM	2/2-EA-602	1/2-EA-602	7/2-EA-321		18	
A-105B	2	3' - 1"	7' - 0"	F	WD	5 3/4"	4	HM	2/2-AE-323	5/2-AE-130	1/2-AE-323	90 MIN.	19	
B-004A	1	3' - 0"	7' - 0"	N3	WD	5 3/4"	--	--	--	--	--		1	REPLACE DOOR AND TRANSOM PANEL
B-004B	1	3' - 0"	7' - 0"	N3	WD	5 3/4"	--	--	--	--	--		1	REPLACE DOOR AND TRANSOM PANEL
B-179	1	3' - 4"	7' - 0"	N5	WD	5 3/4"	--	--	--	--	--		1	REPLACE DOOR AND TRANSOM PANEL
C-066A	1	3' - 0"	7' - 0"	F	WD	5 3/4"	--	--	--	--	--		1	REPLACE DOOR AND TRANSOM PANEL
C-066B	1	3' - 0"	7' - 0"	F	WD	5 3/4"	--	--	--	--	--		1	REPLACE DOOR AND TRANSOM PANEL
C-066C	1	3' - 0"	7' - 0"	N3	WD	5 3/4"	--	--	--	--	--		1	REPLACE DOOR AND TRANSOM PANEL
C-067A	1	3' - 0"	7' - 0"	N2	WD	5 3/4"	--	--	--	--	--		1	REPLACE DOOR AND TRANSOM PANEL
C-067B	1	3' - 0"	7' - 0"	N3	WD	5 3/4"	--	--	--	--	--		1	REPLACE DOOR AND TRANSOM PANEL
C-071	1	3' - 4"	7' - 0"	N4	WD	5 3/4"	--	--	--	--	--		1	REPLACE DOOR AND TRANSOM PANEL
C-072	1	3' - 0"	7' - 0"	N4	WD	5 3/4"	--	--	--	--	--		1	REPLACE DOOR AND TRANSOM PANEL
C-075	1	3' - 0"	7' - 0"	F	WD	5 3/4"	--	--	--	--	--		1	REPLACE DOOR AND TRANSOM PANEL
C-076	2	3' - 0"	7' - 0"	N	WD	5 7/8"	3	HM	6/2-EA-603	2/2-EA-603	--		26	
C-100A	1	3' - 0"	7' - 0"	FG	AL	4 1/2"	SF13	AL	5/2-AE-323	6/2-AE-602	4/2-AE-323		12	
C-100B	1	3' - 0"	7' - 0"	FG	AL	4 1/2"	SF13	AL	5/2-AE-323	6/2-AE-602	4/2-AE-323		12	
C-100C	1	3' - 0"	7' - 0"	FG	AL	4 1/2"	SF13	AL	5/2-AE-323	6/2-AE-602	4/2-AE-323		12	
C-100D	1	3' - 0"	7' - 0"	FG	AL	4 1/2"	SF13	AL	5/2-AE-323	6/2-AE-602	4/2-AE-323		12	
C-100E	1	3' - 0"	7' - 0"	FG	AL	4 1/2"	SF13	AL	5/2-AE-323	6/2-AE-602	4/2-AE-323		12	
C-100F	1	3' - 0"	7' - 0"	FG	AL	4 1/2"	SF13	AL	5/2-AE-323	6/2-AE-602	4/2-AE-323		12	
C-100G	1	3' - 0"	7' - 0"	FG	AL	4 1/2"	SF13	AL	5/2-AE-323	6/2-AE-602	4/2-AE-323		12	
C-100H	1	3' - 0"	7' - 0"	FG	AL	4 1/2"	SF13	AL	5/2-AE-323	6/2-AE-602	4/2-AE-323		20	
C-100J	1	3' - 0"	7' - 0"	FG	AL	4 1/2"	SF12	AL	17/2-AE-603	18/2-AE-603	--		12	
C-100K	1	3' - 0"	7' - 0"	FG	AL	4 1/2"	SF12	AL	17/2-AE-603	18/2-AE-603	--		12	
C-100L	1	3' - 0"	7' - 0"	FG	AL	4 1/2"	SF12	AL	17/2-AE-603	18/2-AE-603	--		12	
C-100M	1	3' - 0"	7' - 0"	FG	AL	4 1/2"	SF12	AL	17/2-AE-603	18/2-AE-603	--		12	
C-100N	1	3' - 0"	7' - 0"	FG	AL	4 1/2"	SF12	AL	17/2-AE-603	18/2-AE-603	--		12	
C-100P	1	3' - 0"	7' - 0"	FG	AL	4 1/2"	SF12	AL	17/2-AE-603	18/2-AE-603	--		12	
C-100Q	1	3' - 0"	7' - 0"	FG	AL	4 1/2"	SF12	AL	17/2-AE-603	18/2-AE-603	--		12	
C-100R	1	3' - 0"	7' - 0"	FG	AL	4 1/2"	SF12	AL	17/2-AE-603	18/2-AE-603	--		20	
C-101		19' - 0"	8' - 0"	VG	ST		--	--	1&3/2-AE-130	2/2-AE-603	--	90 MIN.	--	
C-102A	1	3' - 0"	7' - 0"	FG	WD	8 1/4"	7	HM	6/2-EA-603	2/2-EA-603	--		21	
C-102B	1	3' - 0"	7' - 0"	FG	WD	8 1/4"	7	HM	6/2-EA-603	2/2-EA-603	--		11	
C-103A	1	3' - 0"	7' - 0"	N	WD	6 3/8"	1	HM	6/2-EA-603	2/2-EA-603	--		10	
C-103B	1	4' - 6"	3' - 6"	--	--	6 3/8"	11	HM	19/2-EA-603	15/2-EA-603	11/2-EA-603		--	
C-104	1	3' - 0"	7' - 0"	F	WD	6 3/8"	1	HM	6/2-EA-603	2/2-EA-603	--		8	
C-105	1	3' - 0"	7' - 0"	F	WD	6 3/8"	1	HM	6/2-EA-603	2/2-EA-603	--		5	
C-106	1	3' - 0"	7' - 0"	G	WD	6 3/8"	1	HM	6/2-EA-603	2/2-EA-603	--		10	
C-107	1	3' - 0"	7' - 0"	F	WD	5 7/8"	1	HM	6/2-EA-603	2/2-EA-603	--		10	
C-108	1	3' - 0"	7' - 0"	F	WD	5 7/8"	1	HM	6/2-EA-603	2/2-EA-603	--		6	
C-110	1	3' - 0"	7' - 0"	F	WD	5 3/4"	2	HM	5/2-EA-603	1/2-EA-603	--	90 MIN.	7	
C-111	1	3' - 0"	7' - 0"	N	WD	8 3/4"	1	HM	6/2-EA-603	2/2-EA-603	--		5	
C-112	1	3' - 0"	7' - 0"	F	WD	8 3/4"	1	HM	6/2-EA-603	2/2-EA-603	--		6	
C-113	1	3' - 0"	7' - 0"	N	WD	6 3/8"	1	HM	6/2-EA-603	2/2-EA-603	--		10	
C-114	1	3' - 0"	7' - 0"	N	WD	6 3/8"	1	HM	6/2-EA-603	2/2-EA-603	--		10	
C-115	1	3' - 0"	7' - 0"	N	WD	5 7/8"	1	HM	6/2-EA-603	2/2-EA-603	--		10	
C-116	1	3' - 0"	7' - 0"	F	WD	5 7/8"	1	HM	6/2-EA-603	2/2-EA-603	--		4	
C-117		4' - 0"	7' - 0"	SS	ST		--	--	16/2-AE-603	20/2-EA-603	--	90 MIN.	--	
C-118	1	3' - 0"	7' - 0"	F	WD	8 1/4"	1	HM	6/2-EA-603	2/2-EA-603	--		4	
C-119	1	3' - 0"	7' - 0"	F	WD	5 7/8"	1	HM	6/2-EA-603	2/2-EA-603	--		8	
C-120	1	3' - 0"	7' - 0"	N	WD	6 3/8"	1	HM	6/2-EA-603	2/2-EA-603	--		10	
C-121A		8' - 0"	7' - 4"	SG	AL		--	--	17/2-AE-604	13/2-AE-604	1/2-AE-604		3	
C-121B	1	3' - 0"	7' - 0"	N2	WD	5 3/4"	--	--	--	--	--		1	REPLACE DOOR AND TRANSOM PANEL
C-122A	1	3' - 0"	7' - 0"	N2	WD	5 3/4"	--	--	--	--	--		1	REPLACE DOOR AND TRANSOM PANEL
C-122B	1	3' - 0"	7' - 0"	N2	WD	5 3/4"	--	--	--	--	--		1	REPLACE DOOR AND TRANSOM PANEL
C-122C		8' - 0"	7' - 4"	SG	AL		--	--	17/2-AE-604	13/2-AE-604	1/2-AE-604		3	
C-123A	1	3' - 0"	7' - 0"	N	WD	5 3/4"	10	HM	5/2-EA-603	1/2-EA-603	--		10	
C-123B		8' - 0"	7' - 4"	SG	AL		--	--	17/2-AE-604	13/2-AE-604	1/2-AE-604		3	
C-124	1	3' - 0"	7' - 0"	N	WD	5 3/4"	2	HM	5/2-EA-603	1/2-EA-603	--		10	
C-125	1	3' - 0"	7' - 0"	N	WD	6 3/8"	1	HM	6/2-EA-603	2/2-EA-603	--		10	
C-126	1	3' - 0"	7' - 0"	F	WD	8 3/4"	1	HM	6/2-EA-603	2/2-EA-603	--		10	
C-128	1	3' - 0"	7' - 0"	F	WD	6 3/8"	8	HM	6/2-EA-603	2/2-EA-603	--		10	
C-129A	1	3' - 5"	7' - 0"	FG	AL	4 1/2"	SF7	AL	7/2-AE-602	3/2-AE-602	4/2-AE-323		20	
C-129B	1	3' - 5"	7' - 0"	FG	AL	4 1/2"	SF7	AL	7/2-AE-602	3/2-AE-602	4/2-AE-323		12	
C-129C	2	3' - 0"	7' - 0"	N	WD	5 3/4"	4	HM	5/2-EA-603	1/2-EA-603	--	90 MIN.	25	
C-130	1	3' - 0"	7' - 0"	N	WD	5 3/4"	2	HM	5/2-EA-603	1/2-EA-603	--		10	
C-131	1	3' - 0"	7' - 0"	N	WD	5 7/8"	9	HM	6/2-EA-603	2/2-EA-603	--		10	
C-133A	2	3' - 0"	7' - 0"	N	WD	8 1/4"	3	HM	6/2-EA-603	2/2-EA-603	--		26	
C-133B	2	3' - 0"	7' - 0"	N	WD	5 7/8"	3	HM	6/2-EA-603	2/2-EA-603	--		26	
C-134	1	3' - 0"	7' - 0"	F	WD	5 3/4"	2	HM	5/2-EA-603	1/2-EA-603	--		8	
C-138	1	3' - 0"	7' - 0"	N	WD	5 7/8"	1	HM	6/2-EA-603	2/2-EA-603	--		10	
C-400	1	3' - 0"	7' - 0"	N3	WD	5 3/4"	--	--	--	--	--		1	REPLACE DOOR AND TRANSOM PANEL
C-400A	2	3' - 0"	7' - 0"	F	WD	5 7/8"	3	HM	6/2-EA-603	2/2-EA-603	--		16	
C-401	1	3' - 0"	7' - 0"	N3	WD	5 3/4"	--	--	--	--	--		1	REPLACE DOOR AND TRANSOM PANEL
C-405	1	3' - 0"	7' - 0"	N2	WD	5 3/4"	--	--	--	--	--		1	REPLACE DOOR AND TRANSOM PANEL
D-418		6' - 0"	10' - 0"	SS	ST		--	--	16/2-AE-603	20/2-EA-603	--		--	
D-421A	1	3' - 0"	7' - 0"	N2	WD	5 3/4"	--	--	--	--	--		1	REPLACE DOOR AND TRANSOM PANEL
D-421B	1	3' - 0"	7' - 0"	N2	WD	5 3/4"	--	--	--	--	--		1	REPLACE DOOR AND TRANSOM PANEL
D-421C	1	3' - 0"	7' - 0"	N2	WD	5 3/4"	--	--	--	--	--		2	REPLACE DOOR AND TRANSOM PANEL/ALT. BID REMOVABLE MULLION
D-421D	1	3' - 0"	7' - 0"	N2	WD	5 3/4"	--	--	--	--	--		1	REPLACE DOOR AND TRANSOM PANEL
E-036	1	3' - 0"	7' - 0"	F	WD	5 3/4"	2	HM	5/2-EA-603	1/2-EA-603	--		8	
E-037	1	3' - 0"	7' - 0"	--	--	5 3/4"	--	--	--	--	--		22	REPLACE EXISTING HARDWARE
E-038	1	3' - 0"	7' - 0"	F	WD	5 3/4"	2	HM	5/2-EA-603	1/2-EA-603	--		10	
E-203	1	3' - 0"	7' - 0"	N	WD	8 3/4"	7	HM	6/2-EA-603	2/2-EA-603	--		10	
E-204	1	3' - 0"	7' - 0"	N	WD	8 3/4"	7	HM	6/2-EA-603	2/2-EA-603	--		10	
E-205	1	3' - 0"	7' - 0"	N2	WD	5 3/4"	--	--	--	--	--		1	REPLACE DOOR AND TRANSOM PANEL
E-207	1	3' - 0"	7' - 0"	N2	WD	5 3/4"	--	--	--	--	--		1	REPLACE DOOR AND TRANSOM PANEL
E-208	1	3' - 0"	7' - 0"	N2	WD	5 3/4"	--	--	--	--	--		1	REPLACE DOOR AND TRANSOM PANEL
E-209	1	3' - 0"	7' - 0"	N2	WD	5 3/4"	--	--	--	--	--		1	REPLACE DOOR AND TRANSOM PANEL
E-216	1	3' - 0"	7' - 0"	N2	WD	5 3/4"	--	--	5/2-EA-603	1/2-EA-603	--		1	REPLACE DOOR AND TRANSOM PANEL
E-217	1	3' - 0"	7' - 0"	N2	WD	5 3/4"	--	--	5/2-EA-603	1/2-EA-603	--		1	REPLACE DOOR AND TRANSOM PANEL
E-219A	1	3' - 0"	7' - 2"	FG	AL	4 1/2"	SF3	AL	2/2-AE-604	18/2-AE-603	--		10	
E-219B	1	3' - 0"	7' - 2"	FG	AL	4 1/2"	SF3	AL	2/2-AE-604	--	--		10	
E-221A	1	3' - 0"	7' - 0"	N2	WD	5 3/4"	--	--	5/2-EA-603	1/2-EA-603	--		1	REPLACE DOOR AND TRANSOM PANEL
E-221B		8' - 0"	7' - 4"	SG	AL		--	--	17/2-AE-604	13/2-AE-604	1/2-AE-604		3	
E-222	1	3' - 0"	7' - 0"	N3	WD	5 3/4"	--	--	--	--	--		1	REPLACE DOOR AND TRANSOM PANEL
E-300	1	3' - 0"	7' - 0"	F	WD	5 3/4"	--	--	--	--	--		1	REPLACE DOOR AND TRANSOM PANEL
E-301	1	3' - 0"	7' - 0"	N2	WD	5 3/4"	--	--	--	--	--		1	REPLACE DOOR AND TRANSOM PANEL
E-302A	1	3' - 0"	7' - 0"	N2	WD	5 3/4"	--	--	--	--	--		1	REPLACE DOOR AND TRANSOM PANEL
E-302B		8' - 0"	7' - 4"	SG	AL		--	--	17/2-AE-604	13/2-AE-604	1/2-AE-604		3	
E-303A	1	3' - 0"	7' - 0"	N2	WD	5 3/4"	--	--	--	--	--		1	REPLACE DOOR AND TRANSOM PANEL
E-303B		8' - 0"	7' - 4"	SG	AL		--	--	17/2-AE-604	13/2-AE-604	1/2-AE-604		3	
F-044	1	3' - 0"	7' - 0"	F	WD	5 3/4"	2	HM	5/2-EA-603	1/2-EA-603	--		4	
F-046	1	3' - 0"	7' - 0"	F	WD	5 3/4"	2	HM	5/2-EA-603	1/2-EA-603	--		4	
F-048	1	3' - 4"	7' - 0"	N4	WD	5 3/4"	--	--	--	--	--		8	REPLACE DOOR AND TRANSOM PANEL
F-054	1	3' - 0"	7' - 0"	F	WD	5 3/4"	2	HM	5/2-EA-603	1/2-EA-603	--		6	
F-055	1	3' - 0"	7' - 0"	N4	WD	5 3/4"	--	--	--	--	--		1	REPLACE DOOR AND TRANSOM PANEL
F-056	1	3' - 0"	7' - 0"	N3	WD	5 3/4"	--	--	--	--	--		1	REPLACE DOOR AND TRANSOM PANEL
F-100	1	3' - 0"	7' - 0"	--	--	5 3/4"	--	--	--	--	--		2	ALT. BID - ADD REMOVABLE MULLION
F-319	2	3' - 0"	7' - 0"	FG	WD	5 3/4"	12	HM	5/2-EA-603	1/2-EA-603	--		15	
F-321	1	3' - 0"	7' - 0"	N2	WD	5 3/4"	--	--	--	--	--		1	REPLACE DOOR AND TRANSOM PANEL
F-331A	2	3' - 0"	7' - 0"	G	WD	5 7/8"	3	HM	6/2-EA-603	2/2-EA-603	--		15	
F-331B	1	4' - 6"	3' - 6"	--	--	5 7/8"	11	HM	19/2-EA-603	15/2-EA-603	11/2-EA-603		--	
F-331C	1	4' - 6"	3' - 6"	--	--	5 7/8"	11	HM	19/2-EA-603	15/2-EA-603	11/2-EA-603		--	
F-331D		10' - 0"	10' - 0"	OH	AL		--	AL	17/2-EA-602	13/2-EA-602	9/2-EA-602		--	
F-332A	2	3' - 0"	7' - 0"	F	WD	5 3/4"	3	HM	5/2-EA-603	1/2-EA-603	--		15	
F-332B		10' - 0"	10' - 0"	OH	AL		--	AL	17/2-EA-602	13/2-EA-602	9/2-EA-602		--	
F-336	1	3' - 0"	7' - 0"	N3	WD	5 3/4"	--	--	--	--	--		1	REPLACE DOOR AND TRANSOM PANEL
LL-100A	1	3' - 0"	7' - 0"	FG	AL	4 1/2"	SF9	AL	14/2-AE-602	3/2-AE-602	4/2-AE-323		20	
LL-100B	1	3' - 0"	7' - 0"	FG	AL	4 1/2"	SF9	AL	14/2-AE-602	--	4/2-AE-323		12	
LL-100C	1	3' - 0"	7' - 0"	FG	AL	4 1/2"	SF9	AL	14/2-AE-602	--	4/2-AE-323		12	
LL-100D	1	3' - 0"	7' - 0"	FG	AL	4 1/2"	SF9	AL	14/2-AE-602	18/2-AE-602	4/2-AE-323		12	
LL-100E	1	6' - 0"	7' - 0"	FG	AL	4 1/2"	SF8	AL	17/2-AE-603	18/2-AE-603	--		14	
LL-100F	1	6' - 0"	7' - 0"	FG	AL	4 1/2"	SF8	AL	17/2-AE-603	18/2-AE-603	--		14	
LL-102	2	3' - 0"	7' - 0"	N1	WD	5 3/4"	4	HM	6/2-EA-604	10/2-AE-604	--	90 MIN.	25	
LL-103	1	3' - 0"	7' - 0"	F	WD	5 3/4"	2	HM	13/2-EA-603	9/2-EA-603	--	90 MIN.	9	
LL-104A	1	3' - 0"	7' - 2"	F	HM	5 3/4"	1	HM	6/2-AE-602	1/2-AE-602	2/2-AE-602		12	
LL-104B	1	3' - 0"	7' - 0"	F	WD	10 1/4"	1	HM	6/2-EA-603	2/2-EA-603	--	60 MIN.	13	
LL-104C	1	3' - 0"	7' - 0"	F	WD	5 3/4"	2	HM	3/2-EA-603	7/2-AE-603	--	60 MIN.	23	
LL-105	2	3' - 0"	7' - 0"	F	WD	5 7/8"	3	HM	6/2-EA-603	2/2-EA-603	--	60 MIN.	17	
LL-106	1	3' - 0"	7' - 0"	F	WD	5 3/4"	2	HM	5/2-EA-603	1/2-EA-603	--	90 MIN.	23	
LL-107	1	3' - 0"	7' - 0"	F	WD	5 3/4"	2	HM	5/2-EA-603	1/2-EA-603	--		8	
LL-108	1	3' - 0"	7' - 0"	F	WD	5 3/4"	2	HM	5/2-EA-603	1/2-EA-603	--		6	
LL-109	1	3' - 0"	7' - 0"	F	WD	5 3/4"	2	HM	5/2-EA-603	1/2-EA-603	--		6	
LL-110	1	3' - 0"	7' - 0"	F	WD	5 3/4"	2	HM	5/2-EA-603	1/2-EA-603	--	90 MIN.	24	
LL-119	1	3' - 0"	7' - 0"	F	WD	5 3/4"	2	HM	5/2-EA-603	1/2-EA-603	--		24	
LL-121A	1	3' - 0"	7' - 0"	F	WD	5 3/4"	2	HM	5/2-EA-603	1/2-EA-603	--		24	
LL-121B	1	4' - 0"	4' - 0"	--	--	5 3/4"	11	HM	12/2-EA-603	8/2-AE-603	4/2-EA-603		--	
LL-121C	1	4' - 0"	4' - 0"	--	--	5 3/4"	11	HM	12/2-EA-603	8/2-AE-603	4/2-EA-603		--	
LL-126	1	3' - 4"	7' - 0"	N2	WD	5 3/4"	--	--	--	--	--		1	REPLACE DOOR AND TRANSOM PANEL
LL-133	1	3' - 0"	7' - 0"	N2	WD	5 3/4"	--	--	--	--	--		1	REPLACE DOOR AND TRANSOM PANEL

GLAZING / SPANDREL PANEL LEGEND

IG-1 INSULATED GLAZING AT:
- EAST FACING WINDOWS,
- SOUTH-FACING WINDOWS,
- WEST-FACING WINDOWS.

IG-2 INSULATED GLAZING AT:
- NORTH FACING WINDOWS,
- SHADED WINDOWS.

IG-7 EXTERIOR SAFETY GLAZING - EXTERIOR DOORS AND SIDELITES.

G-2 INTERIOR GLAZING

G-5 INTERIOR SAFETY GLAZING - INTERIOR DOORS AND SIDELITES, SLIDING GLASS DOORS.

SP-1 SPANDREL PANEL - 1" INSULATED SANDWICH PANEL: EXTERIOR: 1/4" OPAQUE GLASS, GLASS COLOR TO MATCH ADJACENT METAL WALL PANEL. INTERIOR: PREFIN. METAL, COLOR TO MATCH ADJACENT WINDOW FRAME.

GLAZING CONTRACTOR SHALL PROVIDE SAFETY GLAZING AT ALL LOCATIONS REQUIRED BY ALL APPLICABLE CODES AND ORDINANCES.

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Planning, Design & Construction, Inc.
800.236.2370 | hoffman.net

CONSULTANT:

MANAWA

MANAWA ELEMENTARY SCHOOL - ALTERATIONS
MANAWA MIDDLE/HIGH SCHOOL - ADDITIONS & ALTERATIONS
PART 2 - MANAWA MIDDLE / HIGH SCHOOL
515 E. 4th STREET
MANAWA, WI 54949

MARK	DATE
ISSUED:	6 JUN 2019
PROJECT NO:	18268
CAD DWG FILE:	
DRAWN BY:	Author
CHECKED BY:	Checker

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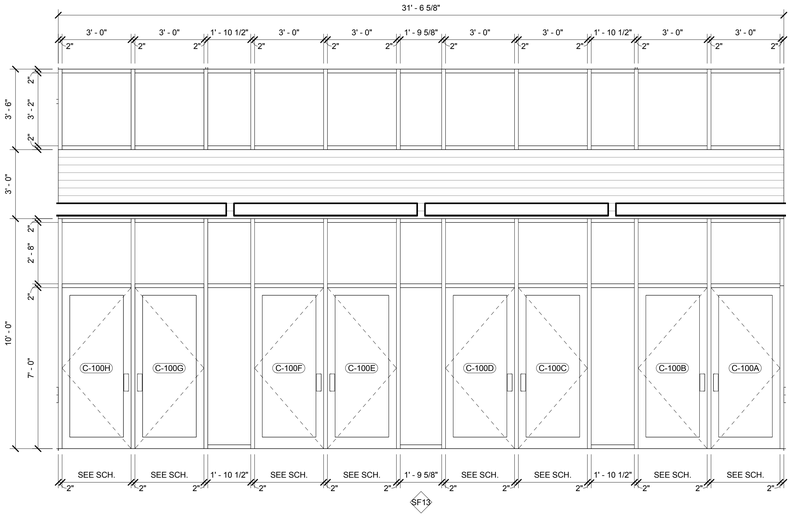
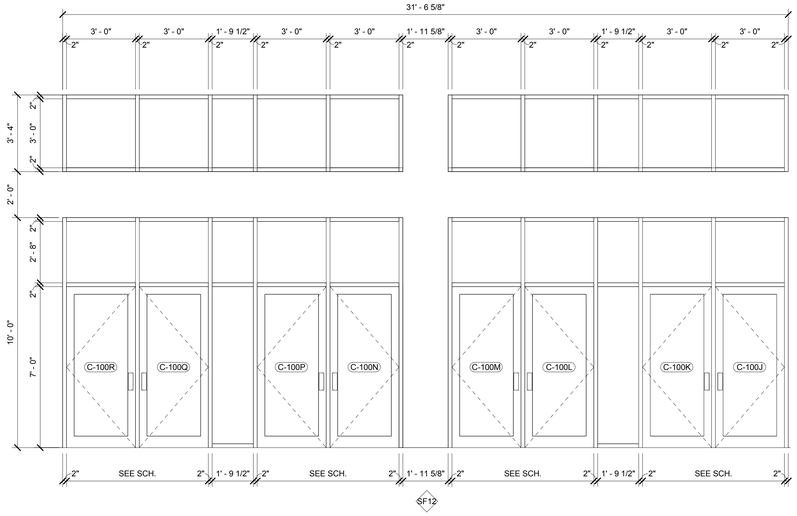
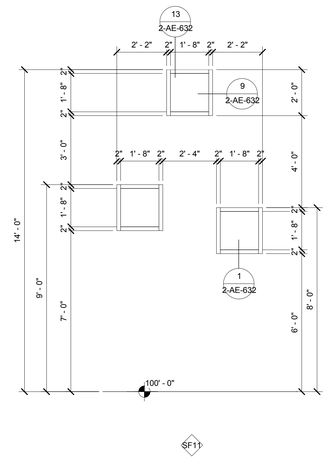
SHEET TITLE:
DOOR SCHEDULE, DOOR & FRAME TYPES

SHEET NUMBER:
2-AE-601

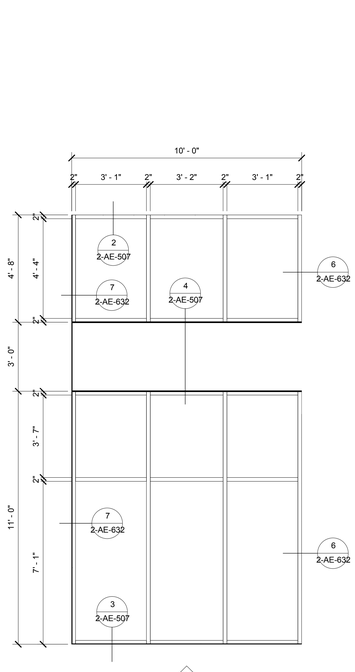


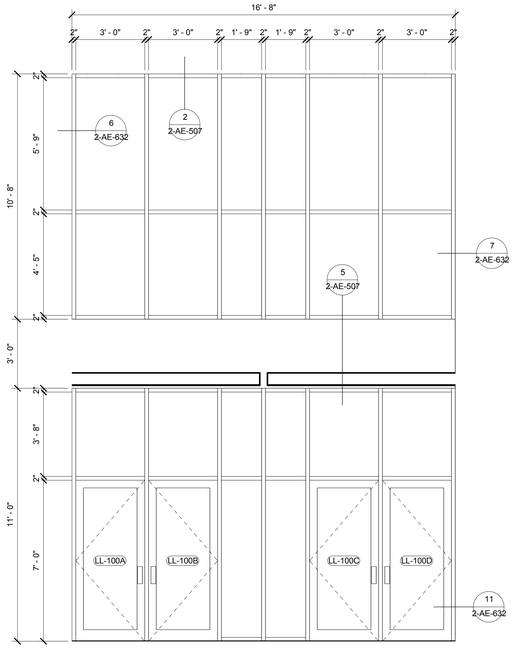


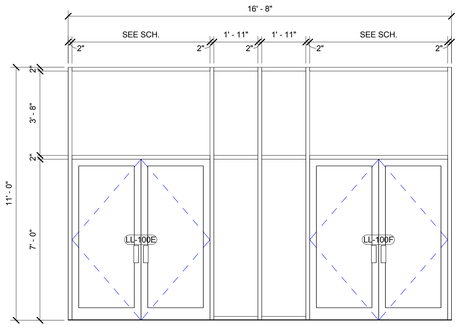


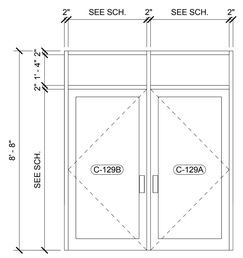
3 STOREFRONT ELEVATIONS

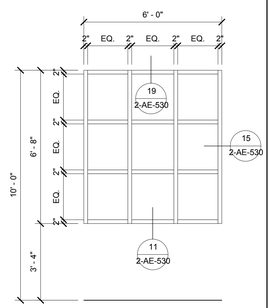
SCALE 3/8" = 1'-0"





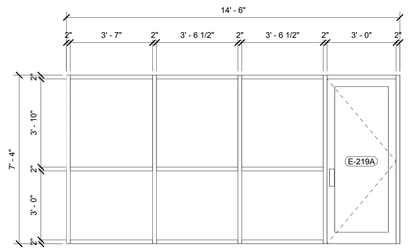




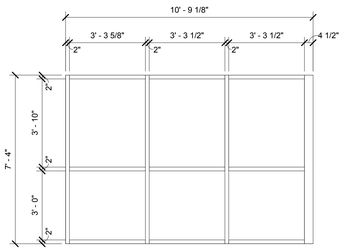


2 STOREFRONT ELEVATIONS

SCALE 3/8" = 1'-0"



ALTERNATE BID



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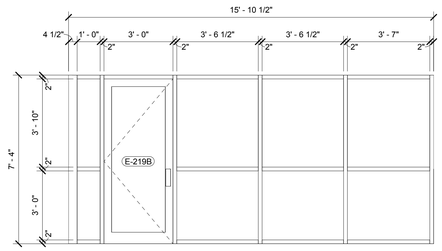

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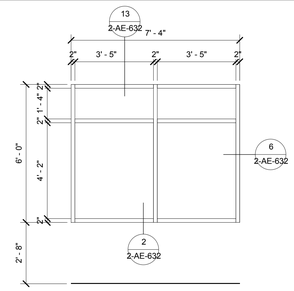

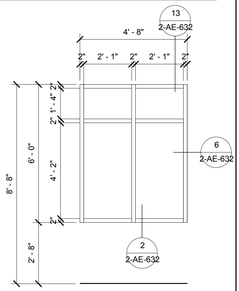

1 STOREFRONT ELEVATIONS

SCALE 3/8" = 1'-0"
AS REFERENCED BY:

GLAZING / SPANDREL PANEL LEGEND

IG-1 INSULATED GLAZING AT:
- EAST FACING WINDOWS,
- SOUTH-FACING WINDOWS,
- WEST-FACING WINDOWS.

IG-2 INSULATED GLAZING AT:
- NORTH FACING WINDOWS,
- SHADED WINDOWS.

IG-7 EXTERIOR SAFETY GLAZING - EXTERIOR DOORS AND SIDELITES.

G-2 INTERIOR GLAZING

G-5 INTERIOR SAFETY GLAZING - INTERIOR DOORS AND SIDELITES, SLIDING GLASS DOORS.

SP-1 SPANDREL PANEL - 1" INSULATED SANDWICH PANEL:
EXTERIOR: 1/4" OPAQUE GLASS, GLASS COLOR TO MATCH ADJACENT METAL WALL PANEL.
INTERIOR: PREFIN. METAL, COLOR TO MATCH ADJACENT WINDOW FRAME.

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CHECKED BY:	Checker

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SHEET TITLE:
STOREFRONT ELEVATIONS

SHEET NUMBER:
2-AE-630

GLAZING / SPANDREL PANEL LEGEND

IG-1 INSULATED GLAZING AT:
- EAST FACING WINDOWS,
- SOUTH-FACING WINDOWS,
- WEST-FACING WINDOWS.

IG-2 INSULATED GLAZING AT:
- NORTH FACING WINDOWS,
- SHADED WINDOWS.

IG-7 EXTERIOR SAFETY GLAZING - EXTERIOR DOORS AND SIDELITES.

G-2 INTERIOR GLAZING

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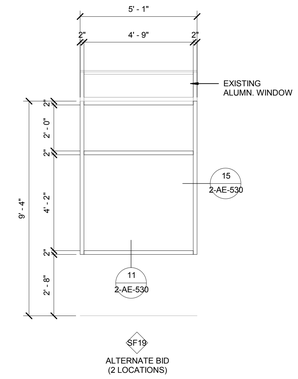
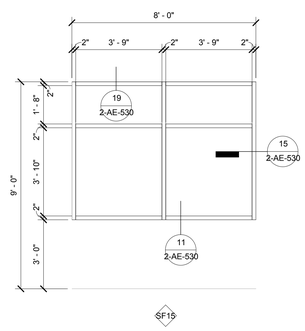
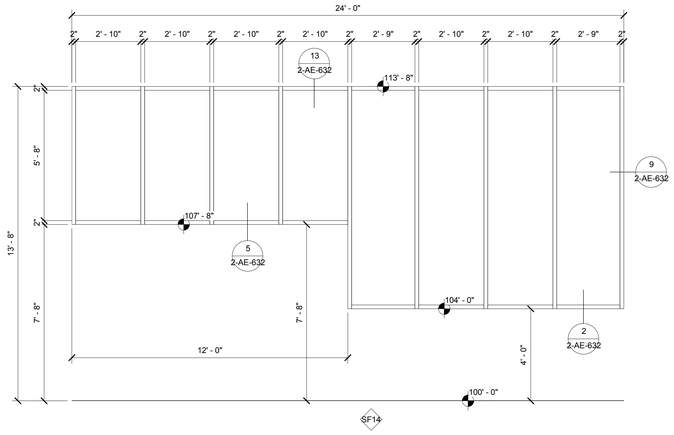
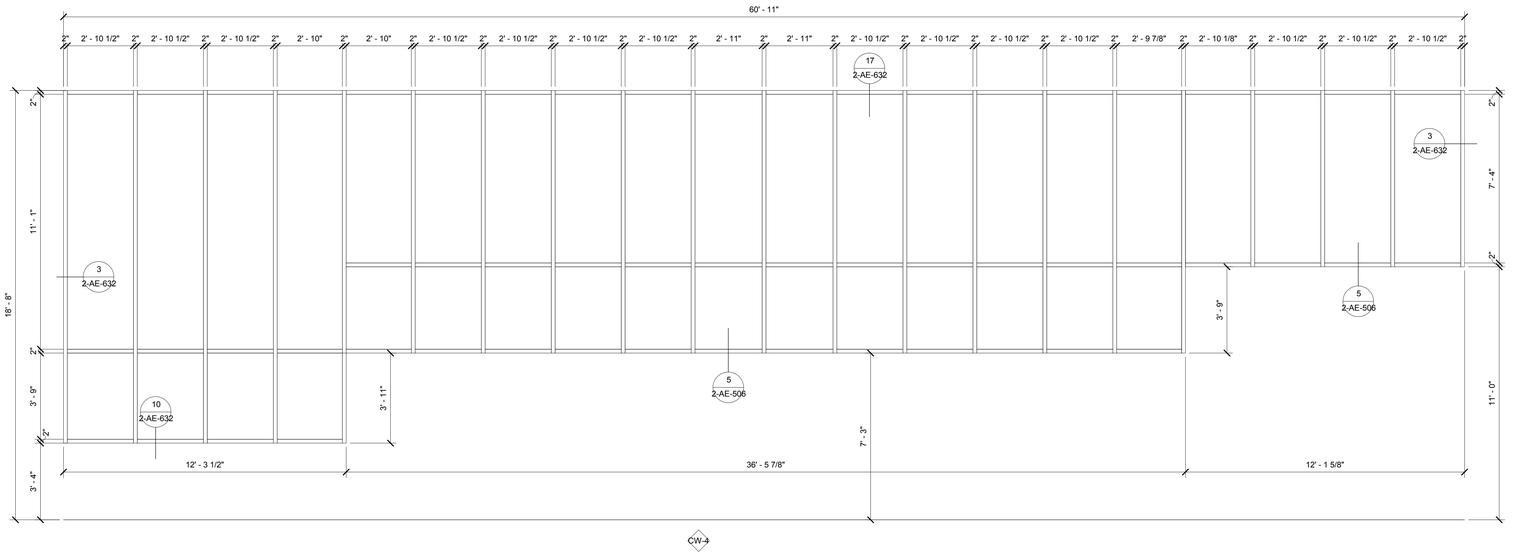


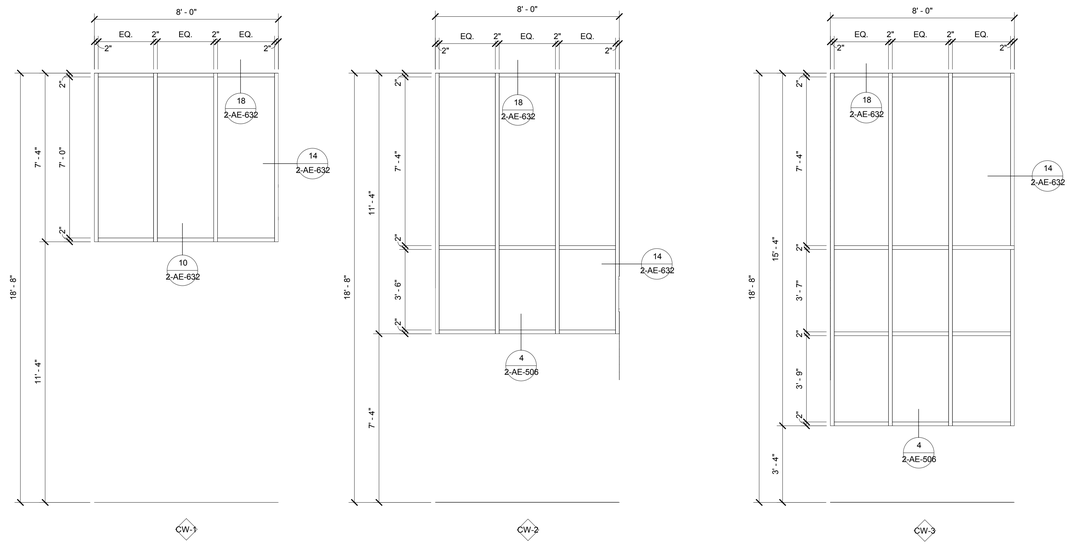




3 STOREFRONT ELEVATIONS
SCALE 3/8" = 1'-0"



2 CURTAINWALL ELEVATION
SCALE 3/8" = 1'-0"



1 CURTAINWALL ELEVATIONS
SCALE 3/8" = 1'-0"

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CONSULTANT:

MANAWA

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CHECKED BY:	Checker

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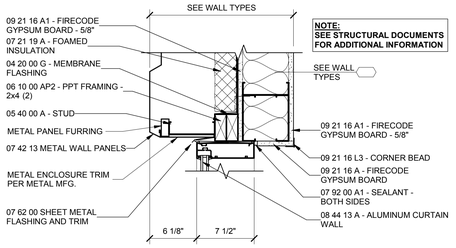
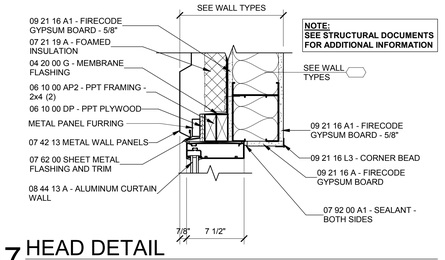
SHEET TITLE:
STOREFRONT AND CURTAINWALL ELEVATIONS

SHEET NUMBER:
2-AE-631



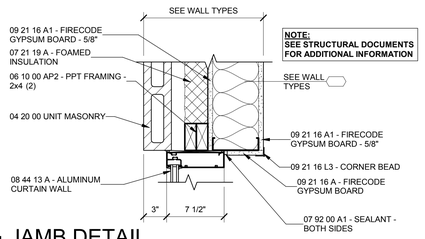
18 HEAD DETAIL

SCALE 1 1/2" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-631



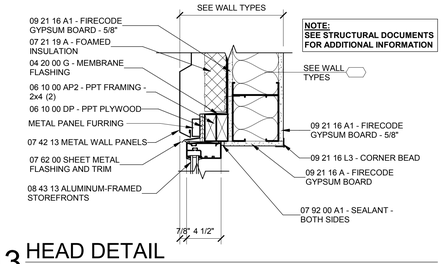
17 HEAD DETAIL

SCALE 1 1/2" = 1'-0"
AS REFERENCED BY: 2 / 2-AE-631



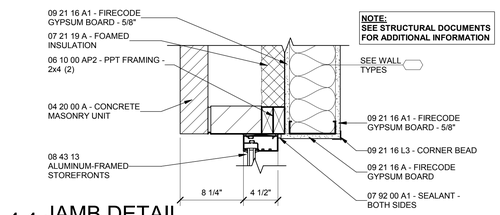
14 JAMB DETAIL

SCALE 1 1/2" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-631



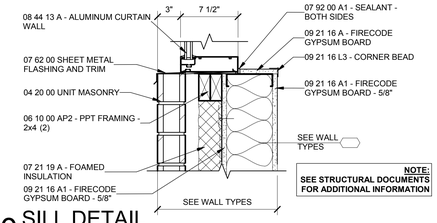
13 HEAD DETAIL

SCALE 1 1/2" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-314



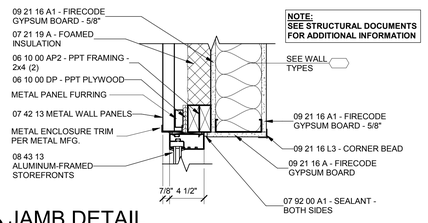
11 JAMB DETAIL

SCALE 1 1/2" = 1'-0"
AS REFERENCED BY: 2A / 2-AE-630



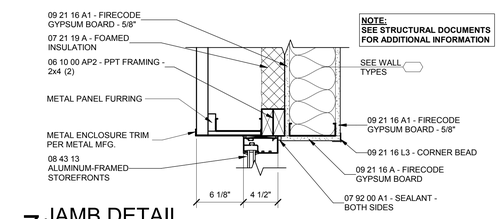
10 SILL DETAIL

SCALE 1 1/2" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-631



9 JAMB DETAIL

SCALE 1 1/2" = 1'-0"
AS REFERENCED BY: 3B / 2-AE-630



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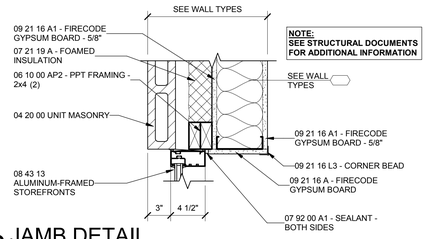
AS REFERENCED BY: 2 / 2-AE-630



6 JAMB DETAIL

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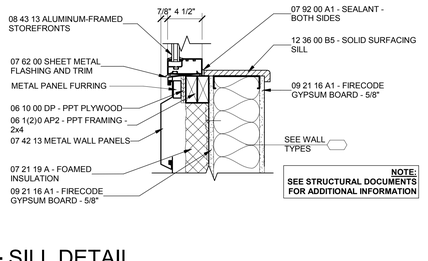
AS REFERENCED BY: 1 / 2-AE-314



5 SILL DETAIL

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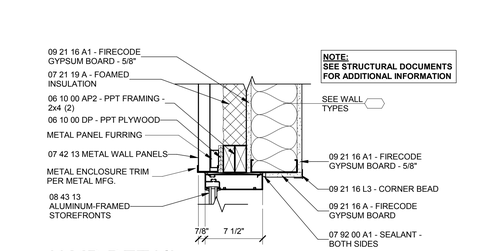
AS REFERENCED BY: 3B / 2-AE-631



3 JAMB DETAIL

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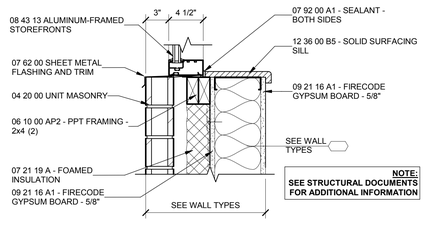
AS REFERENCED BY: 2 / 2-AE-631



2 SILL DETAIL

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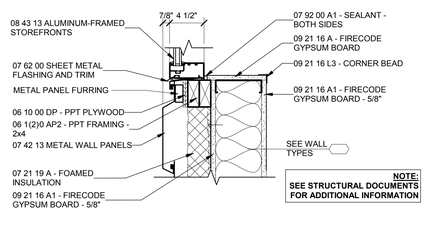
AS REFERENCED BY: 1 / 2-AE-314



1 SILL DETAIL

SCALE 1 1/2" = 1'-0"
AS REFERENCED BY: 5 / 2-AE-314

KEYNOTE LEGEND

KEY NO.	KEYNOTE TEXT
04 20 00	UNIT MASONRY
04 20 00 A -	CONCRETE MASONRY UNIT
04 20 00 G -	MEMBRANE FLASHING
05 40 00 A -	STUD
06 10 00 AP2 -	PPT FRAMING - 2x4
06 10 00 DP -	PPT PLYWOOD
07 21 19 A -	FOAMED INSULATION
07 42 13	METAL WALL PANELS
07 62 00	SHEET METAL FLASHING AND TRIM
07 92 00 A1 -	SEALANT - BOTH SIDES
08 43 13	ALUMINUM-FRAMED STOREFRONTS
08 44 13 A -	ALUMINUM CURTAIN WALL
09 21 16 A1 -	FIRECODE GYPSUM BOARD - 5/8"
09 21 16 A -	FIRECODE GYPSUM BOARD
09 21 16 L3 -	CORNER BEAD
12 36 00 B5 -	SOLID SURFACING SILL

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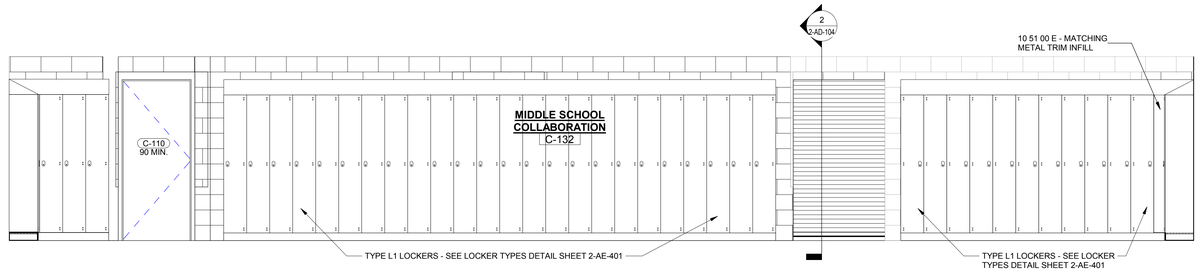
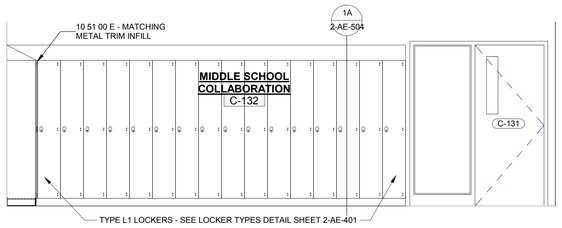
SHEET TITLE:
STOREFRONT AND CURTAINWALL DETAILS

SHEET NUMBER:
2-AE-632



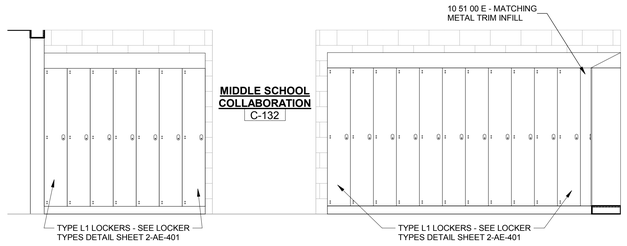
16 C-132 NORTH WALL

SCALE 3/8" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-104



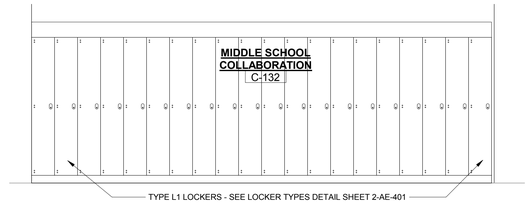
15 C-132 EAST WALL

SCALE 3/8" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-104



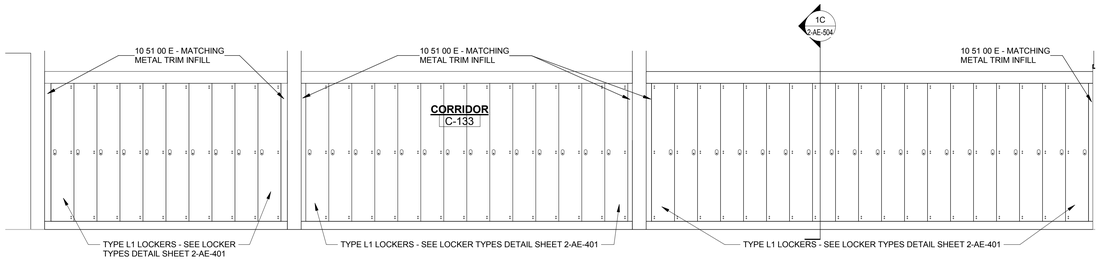
14 C-132 WEST WALL 2

SCALE 3/8" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-104



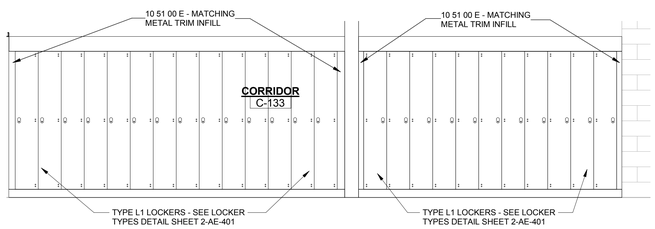
13 C-132 WEST WALL 1

SCALE 3/8" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-104



12 C-133 NORTH WALL 2

SCALE 3/8" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-104

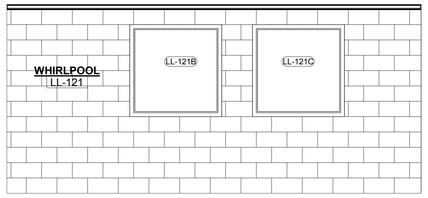


11 C-133 CORRIDOR NORTH WALL 1

SCALE 3/8" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-104

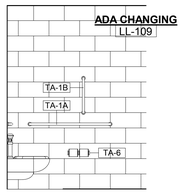
10 DRINKING FOUNTAINS & WALLS

SCALE 3/8" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-101



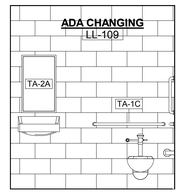
9 LL-121 EAST WALL

SCALE 3/8" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-402



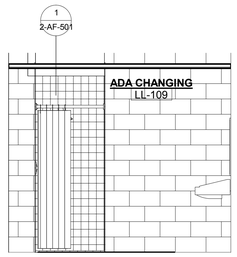
8 LL-109 ADA CHANGING 3

SCALE 3/8" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-402



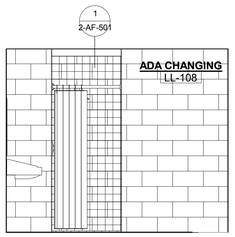
7 LL-109 ADA CHANGING 2

SCALE 3/8" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-402



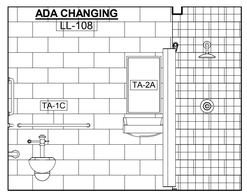
6 LL-109 ADA CHANGING 1

SCALE 3/8" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-402



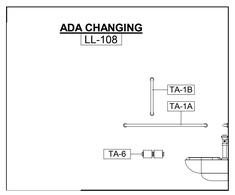
5 LL-108 ADA CHANGING 3

SCALE 3/8" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-402



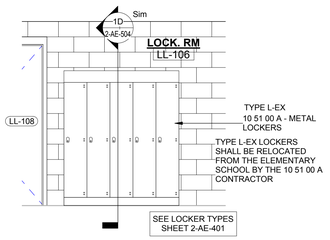
4 LL-108 ADA CHANGING 2

SCALE 3/8" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-402



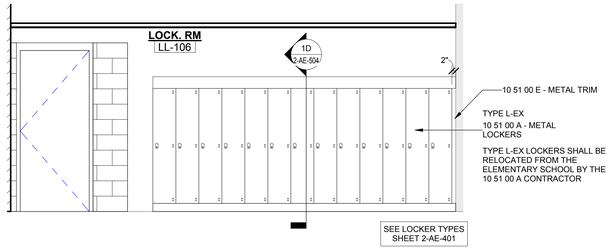
3 LL-108 ADA CHANGING 1

SCALE 3/8" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-402



2 LL-106 EAST WALL

SCALE 3/8" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-402



1 LL-106 WEST WALL

SCALE 3/8" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-402

KEYNOTE LEGEND	
KEY NO.	KEYNOTE TEXT
10 51 00 A -	METAL LOCKERS
10 51 00 E -	METAL TRIM
10 51 00 E - MATCHING METAL TRIM INFILL	

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CONSULTANT:

MANAWA

MANAWA ELEMENTARY SCHOOL - ALTERATIONS
MANAWA MIDDLE/HIGH SCHOOL - ADDITIONS & ALTERATIONS
PART 2 - MANAWA MIDDLE / HIGH SCHOOL
515 E. 4th STREET
MANAWA, WI 54949

MARK	DATE
ISSUED:	6 JUN 2019
PROJECT NO:	18268
CAD DWG FILE:	
DRAWN BY:	Author
CHECKED BY:	Checker

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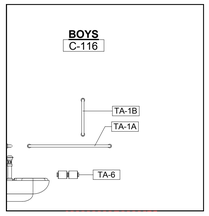
SHEET TITLE:
INTERIOR ELEVATIONS

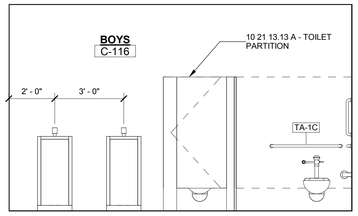
SHEET NUMBER:
2-AE-701

KEYNOTE LEGEND

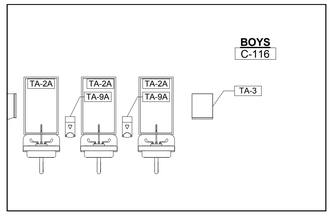
KEY NO.	KEYNOTE TEXT
06 41 00 A12 -	P-LAM MAIL BOXES
06 41 00 F -	MATCHING FILLER
10 21 13.13 A -	TOILET PARTITION
12 36 00 A -	P-LAM COUNTERTOP
22 30 00 A -	SINK



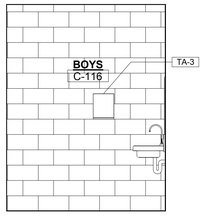
19 C-116 EAST WALL
SCALE 3/8" = 1'-0"
AS REFERENCED BY: 3 / 2-AE-403



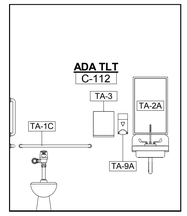
18 C-116 NORTH WALL
SCALE 3/8" = 1'-0"
AS REFERENCED BY: 3 / 2-AE-403



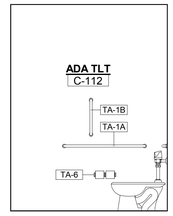
17 C-116 WEST WALL
SCALE 3/8" = 1'-0"
AS REFERENCED BY: 3 / 2-AE-403



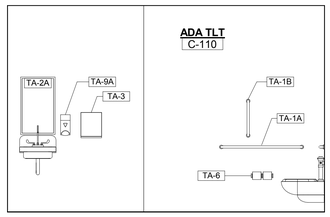
16 C-116 SOUTH WALL
SCALE 3/8" = 1'-0"
AS REFERENCED BY: 3 / 2-AE-403



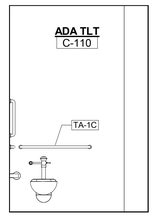
15 C-112 SOUTH WALL
SCALE 3/8" = 1'-0"
AS REFERENCED BY: 3 / 2-AE-403



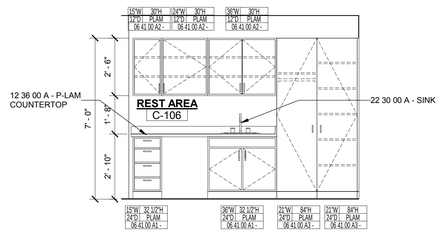
14 C-112 EAST WALL
SCALE 3/8" = 1'-0"
AS REFERENCED BY: 3 / 2-AE-403



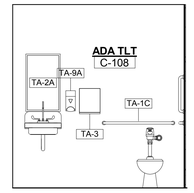
13 C-110 NORTH WALL
SCALE 3/8" = 1'-0"
AS REFERENCED BY: 3 / 2-AE-403



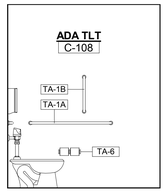
12 C-110 EAST WALL
SCALE 3/8" = 1'-0"
AS REFERENCED BY: 3 / 2-AE-403



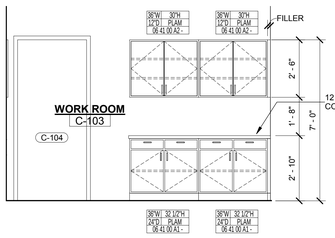
11 C-106 NORTH WALL
SCALE 3/8" = 1'-0"
AS REFERENCED BY: 3 / 2-AE-403



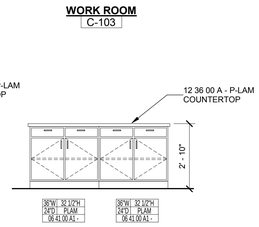
10 C-108 NORTH WALL
SCALE 3/8" = 1'-0"
AS REFERENCED BY: 3 / 2-AE-403



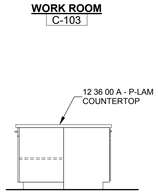
9 C-108 EAST WALL
SCALE 3/8" = 1'-0"
AS REFERENCED BY: 3 / 2-AE-403



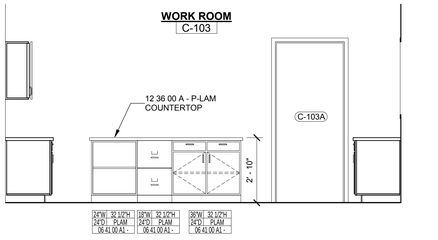
8 C-103 EAST WALL
SCALE 3/8" = 1'-0"
AS REFERENCED BY: 3 / 2-AE-403



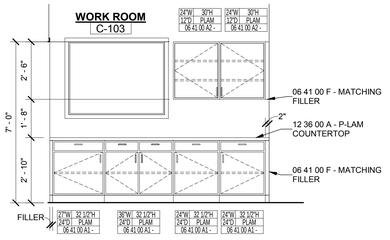
7 C-103 ISLAND 2
SCALE 3/8" = 1'-0"
AS REFERENCED BY: 3 / 2-AE-403



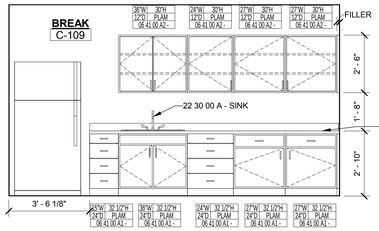
6 C-103 ISLAND 1
SCALE 3/8" = 1'-0"
AS REFERENCED BY: 3 / 2-AE-403



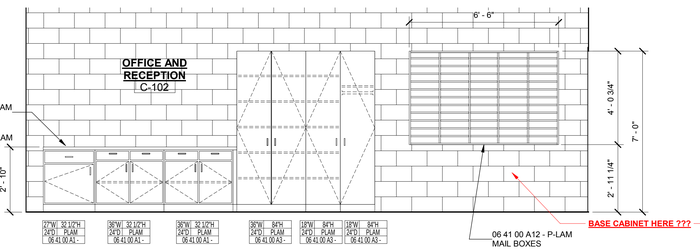
5 C-103 SOUTH WALL
SCALE 3/8" = 1'-0"
AS REFERENCED BY: 3 / 2-AE-403



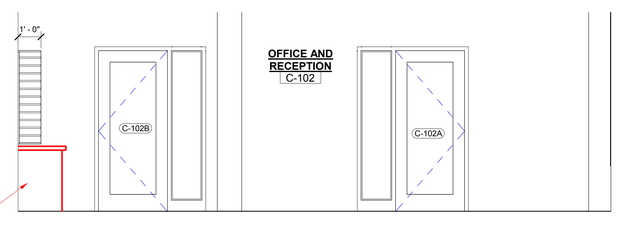
4 C-103 WEST WALL
SCALE 3/8" = 1'-0"
AS REFERENCED BY: 3 / 2-AE-403



3 C-109 WEST WALL
SCALE 3/8" = 1'-0"
AS REFERENCED BY: 3 / 2-AE-403



2 C-102 SOUTH WALL
SCALE 3/8" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-102



1 C-102 WEST WALL
SCALE 3/8" = 1'-0"
AS REFERENCED BY: 2 / 2-AE-403

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CONSULTANT:

MANAWA ELEMENTARY SCHOOL - ALTERATIONS
MANAWA MIDDLE/HIGH SCHOOL - ADDITIONS & ALTERATIONS
PART 2 - MANAWA MIDDLE / HIGH SCHOOL
515 E. 4th STREET
MANAWA, WI 54949

MARK	DATE
ISSUED:	6 JUN 2019
PROJECT NO:	18268
CAD DWG FILE:	
DRAWN BY:	Author
CHECKED BY:	Checker

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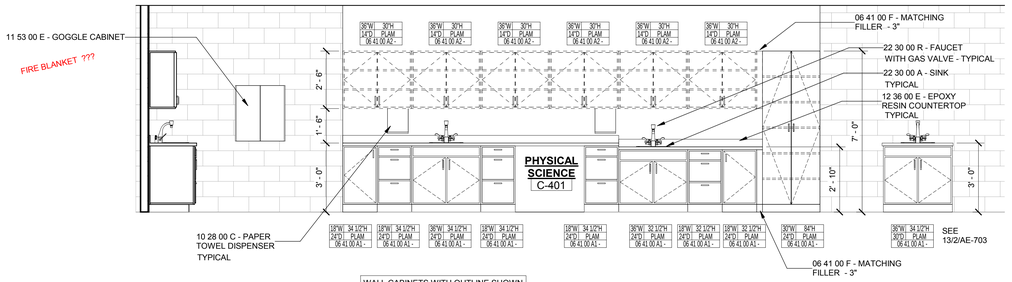
SHEET TITLE:
INTERIOR ELEVATIONS

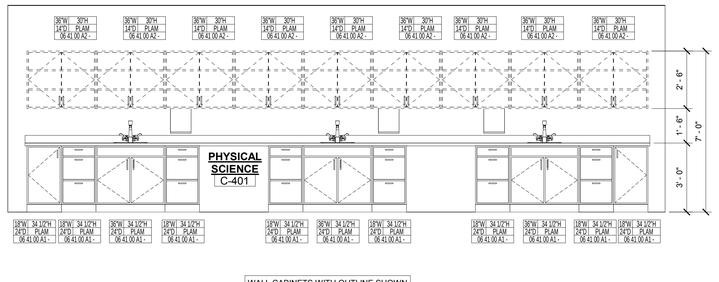
SHEET NUMBER:
2-AE-702



14 C-401 NORTH WALL

SCALE 3/8" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-104

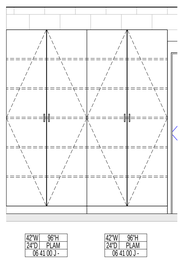
WALL CABINETS WITH OUTLINE SHOWN DASHED ARE BY ALTERNATE BID



13 C-401 WEST WALL

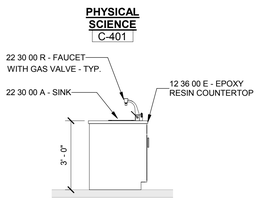
SCALE 3/8" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-104

WALL CABINETS WITH OUTLINE SHOWN DASHED ARE BY ALTERNATE BID



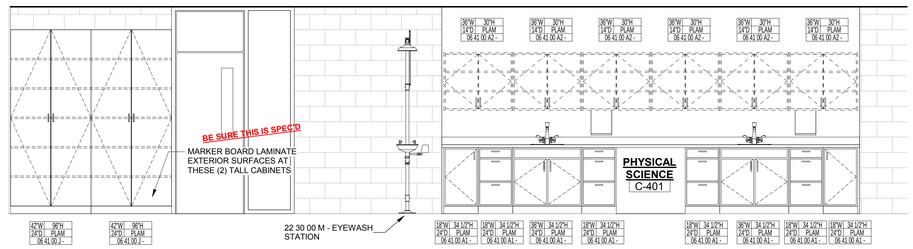
12 C-401 SOUTH WALL - 2

SCALE 3/8" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-104



11 C-401 ISLAND

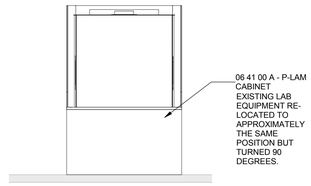
SCALE 3/8" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-104



10 C-401 SOUTH WALL

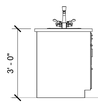
SCALE 3/8" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-104

WALL CABINETS WITH OUTLINE SHOWN DASHED ARE BY ALTERNATE BID



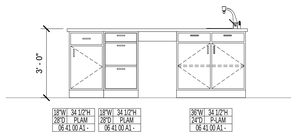
9 C-401 LAB EQUIP. ELEVATION

SCALE 3/8" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-104



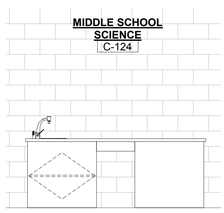
8C C-124 DEMO STATION 3

SCALE 3/8" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-104



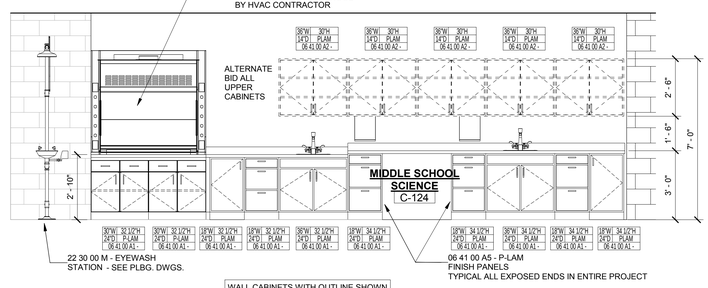
8B C-124 DEMO STATION 2

SCALE 3/8" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-104



8A C-124 DEMO STATION 1

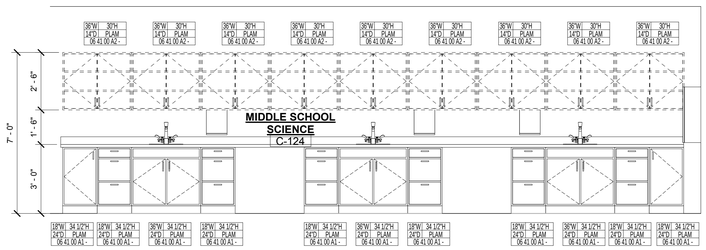
SCALE 3/8" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-104



7 C-124 SOUTH WALL

SCALE 3/8" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-104

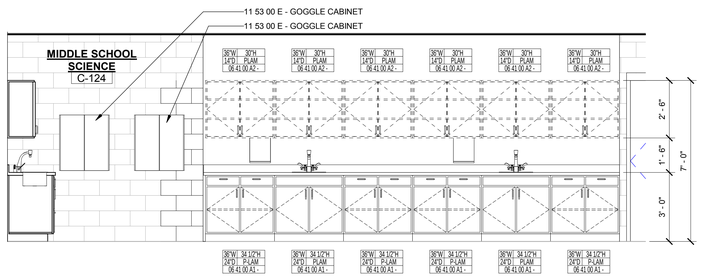
WALL CABINETS WITH OUTLINE SHOWN DASHED ARE BY ALTERNATE BID



6 C-124 WEST WALL

SCALE 3/8" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-104

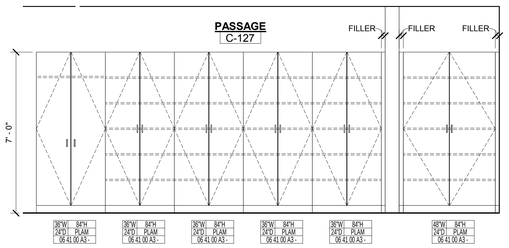
WALL CABINETS WITH OUTLINE SHOWN DASHED ARE BY ALTERNATE BID



5 C-124 NORTH WALL

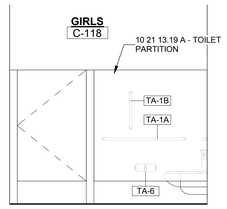
SCALE 3/8" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-104

WALL CABINETS WITH OUTLINE SHOWN DASHED ARE BY ALTERNATE BID



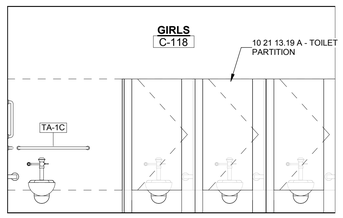
4 C-127 SOUTH WALL

SCALE 3/8" = 1'-0"
AS REFERENCED BY: 3 / 2-AE-403



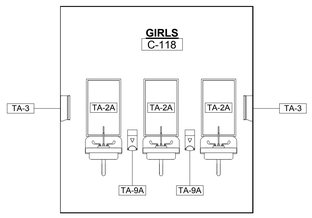
3 C-118 WEST WALL

SCALE 3/8" = 1'-0"
AS REFERENCED BY: 3 / 2-AE-403



2 C-118 NORTH WALL

SCALE 3/8" = 1'-0"
AS REFERENCED BY: 3 / 2-AE-403



1 C-118 EAST WALL

SCALE 3/8" = 1'-0"
AS REFERENCED BY: 3 / 2-AE-403

KEYNOTE LEGEND

KEY NO.	KEYNOTE TEXT
06 41 00 A5 -	P-LAM FINISH PANELS
06 41 00 A -	P-LAM CABINET
06 41 00 F -	MATCHING FILLER
10 21 13.19 A -	TOILET PARTITION
10 28 00 C -	PAPER TOWEL DISPENSER
11 53 00 E -	GOGGLE CABINET
12 36 00 E -	EPOXY RESIN COUNTERTOP
22 30 00 A -	SINK
22 30 00 M -	EYEWASH STATION
22 30 00 R -	FAUCET

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CONSULTANT:

MANAWA

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MANAWA MIDDLE/HIGH SCHOOL - ADDITIONS & ALTERATIONS
PART 2 - MANAWA MIDDLE / HIGH SCHOOL
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MANAWA, WI 54949

MARK	DATE
ISSUED:	6 JUN 2019
PROJECT NO:	18268
CAD DWG FILE:	
DRAWN BY:	Author
CHECKED BY:	Checker

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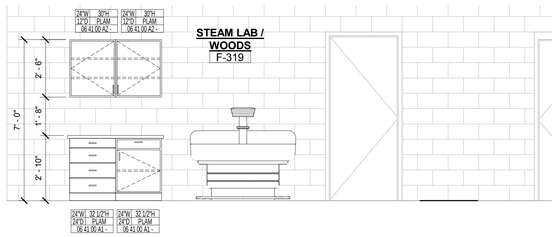
SHEET TITLE:
INTERIOR ELEVATIONS

SHEET NUMBER:
2-AE-703

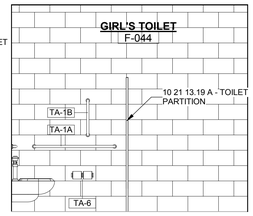


17 F-319 NORTH WALL

SCALE 3/8" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-107

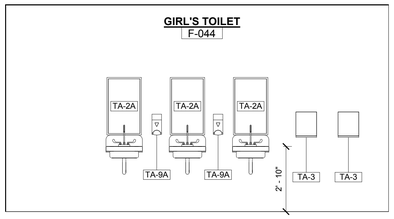
16 F-044 EAST WALL

SCALE 3/8" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-106



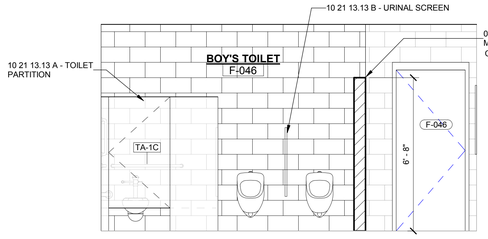
15 F-044 SOUTH WALL

SCALE 3/8" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-405



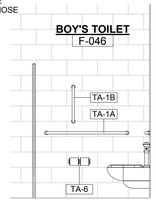
14 F-044 WEST WALL

SCALE 3/8" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-106



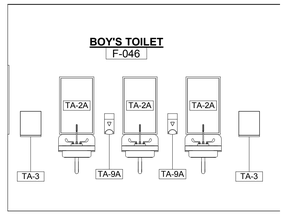
13 F-046 WEST WALL

SCALE 3/8" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-106



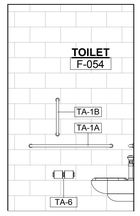
12 F-046 SOUTH WALL

SCALE 3/8" = 1'-0"
AS REFERENCED BY: 2 / 2-AE-405



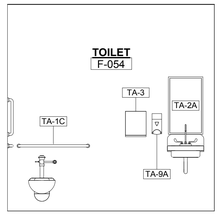
11 F-046 EAST WALL

SCALE 3/8" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-106



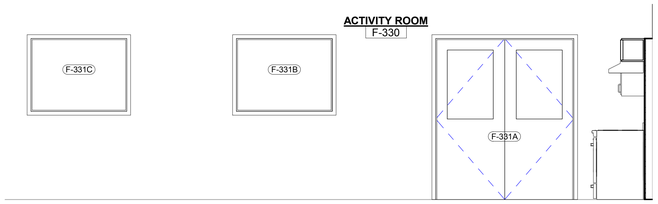
10 F-054 WEST WALL

SCALE 3/8" = 1'-0"
AS REFERENCED BY: 3 / 2-AE-405



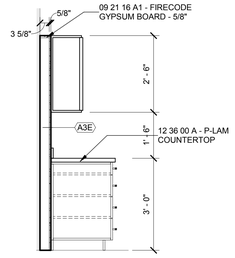
9 F-054 NORTH WALL

SCALE 3/8" = 1'-0"
AS REFERENCED BY: 3 / 2-AE-405



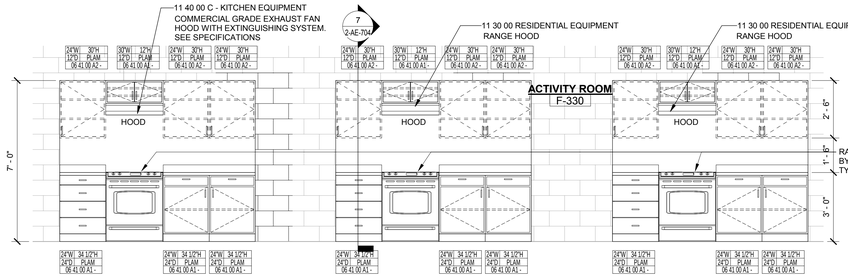
8 F-330 SOUTH WALL

SCALE 3/8" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-107



7 CSWK SECTION

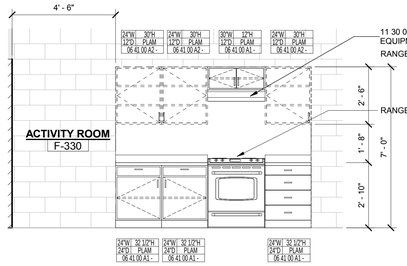
SCALE 1/2" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-107



6 F-330 WEST WALL

WALL CABINETS WITH OUTLINE SHOWN DASHED ARE BY ALTERNATE BID

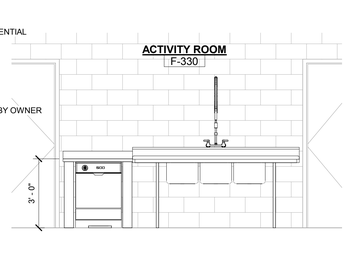
SCALE 3/8" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-107



5 F-330 NORTH WALL

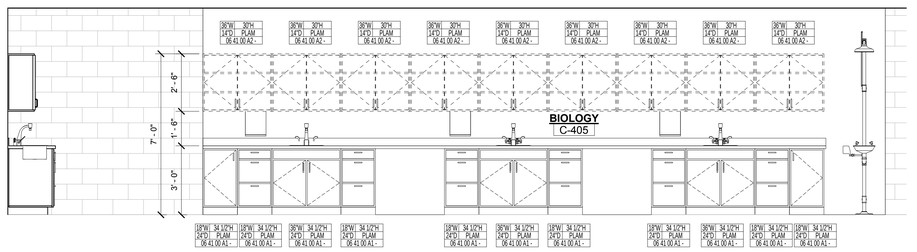
WALL CABINETS WITH OUTLINE SHOWN DASHED ARE BY ALTERNATE BID

SCALE 3/8" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-107



4 F-330 EAST WALL

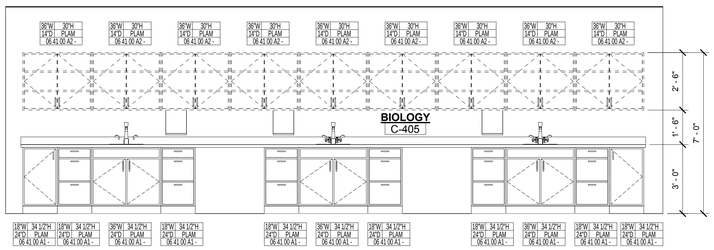
SCALE 3/8" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-107



3 C-405 SOUTH WALL

WALL CABINETS WITH OUTLINE SHOWN DASHED ARE BY ALTERNATE BID

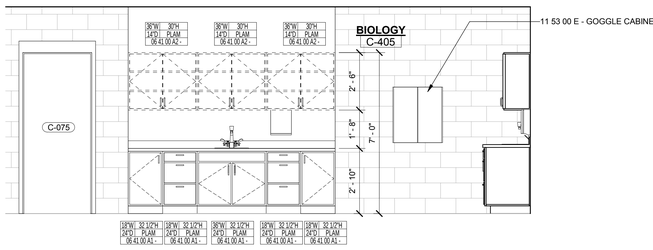
SCALE 3/8" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-104



2 C-405 EAST WALL

WALL CABINETS WITH OUTLINE SHOWN DASHED ARE BY ALTERNATE BID

SCALE 3/8" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-104



1 C-405 NORTH WALL

WALL CABINETS WITH OUTLINE SHOWN DASHED ARE BY ALTERNATE BID

SCALE 3/8" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-104

KEYNOTE LEGEND

KEY NO.	KEYNOTE TEXT
04 20 00 A2 -	CONCRETE MASONRY UNIT - BULLNOSE
09 21 16 A1 -	FIRECODE GYPSUM BOARD - 5/8"
10 21 13.13 A -	TOILET PARTITION
10 21 13.13 B -	URINAL SCREEN
10 21 13.19 A -	TOILET PARTITION
11 30 00	RESIDENTIAL EQUIPMENT
11 40 00 C -	KITCHEN EQUIPMENT
11 53 00 E -	GOGGLE CABINET
12 36 00 A -	P-LAM COUNTERTOP

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MANAWA MIDDLE/HIGH SCHOOL - ADDITIONS & ALTERATIONS
PART 2 - MANAWA MIDDLE / HIGH SCHOOL
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MANAWA, WI 54949

MARK	DATE
ISSUED:	6 JUN 2019
PROJECT NO:	18268
CAD DWG FILE:	
DRAWN BY:	Author
CHECKED BY:	Checker

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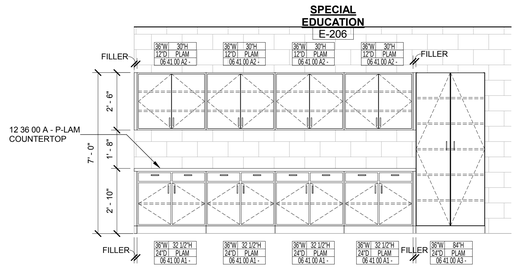
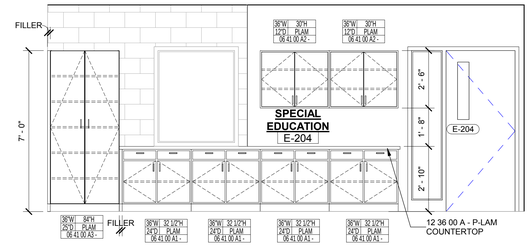
SHEET TITLE:
INTERIOR ELEVATIONS

SHEET NUMBER:
2-AE-704

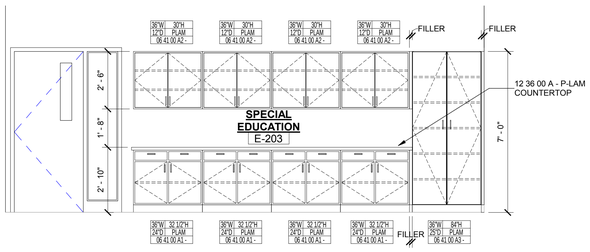
KEYNOTE LEGEND	
KEY NO.	KEYNOTE TEXT
11 30 00	RESIDENTIAL EQUIPMENT
12 36 00 A -	P-LAM COUNTERTOP
22 30 00 A -	SINK



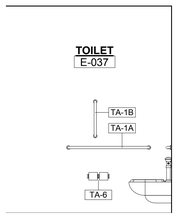
11 E-206 SOUTH WALL
SCALE 3/8" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-106



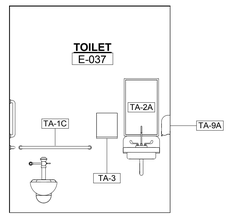
10 E-204 SOUTH WALL
SCALE 3/8" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-106



9 E-203 SOUTH WALL
SCALE 3/8" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-106



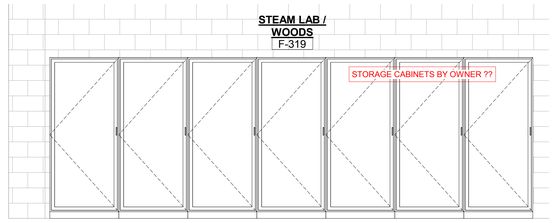
8 E-037 EAST WALL
SCALE 3/8" = 1'-0"
AS REFERENCED BY: 5 / 2-AE-405



7 E-037 SOUTH WALL
SCALE 3/8" = 1'-0"
AS REFERENCED BY: 5 / 2-AE-405

6 E-036 SOUTH WALL
SCALE 3/8" = 1'-0"
AS REFERENCED BY: 5 / 2-AE-405

2 E-205 WEST WALL
SCALE 3/8" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-106



1 F-319 WEST WALL
SCALE 3/8" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-107

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CONSULTANT:

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MANAWA, WI 54949

MARK	DATE
ISSUED:	6 JUN 2019
PROJECT NO:	18268
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CHECKED BY:	Checker

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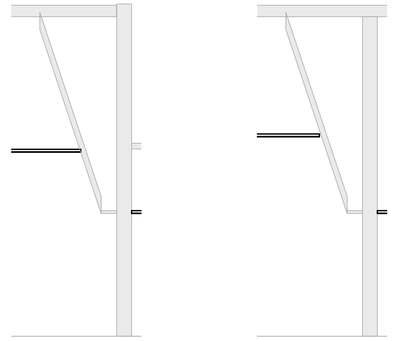
SHEET TITLE:
INTERIOR ELEVATIONS

SHEET NUMBER:
2-AE-705

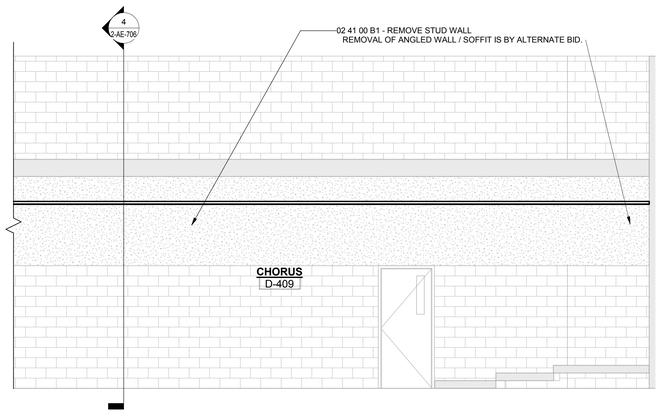
KEYNOTE LEGEND

KEY NO.	KEYNOTE TEXT
02 41 00 B1 -	REMOVE STUD WALL

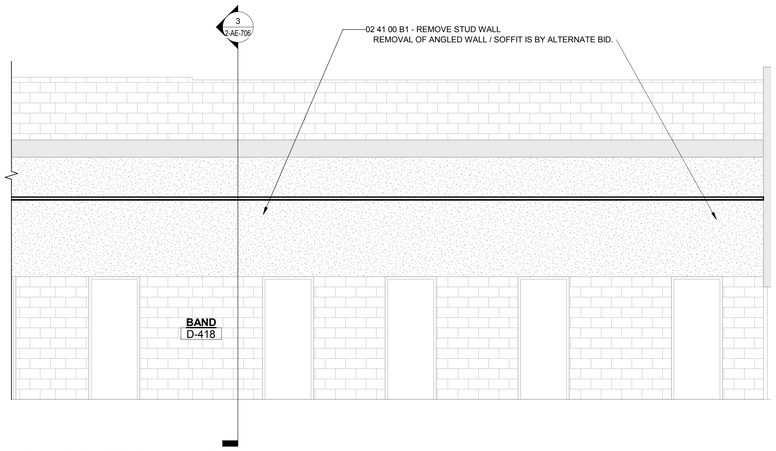


4 CHORUS SECTION
SCALE 1/4" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-105

3 BAND SECTION
SCALE 1/4" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-105



2 D-409 CHORUS EAST WALL
SCALE 1/4" = 1'-0"
AS REFERENCED BY: 1 / 2-AD-105



1 D-418 BAND EAST WALL
SCALE 1/4" = 1'-0"
AS REFERENCED BY: 1 / 2-AD-105

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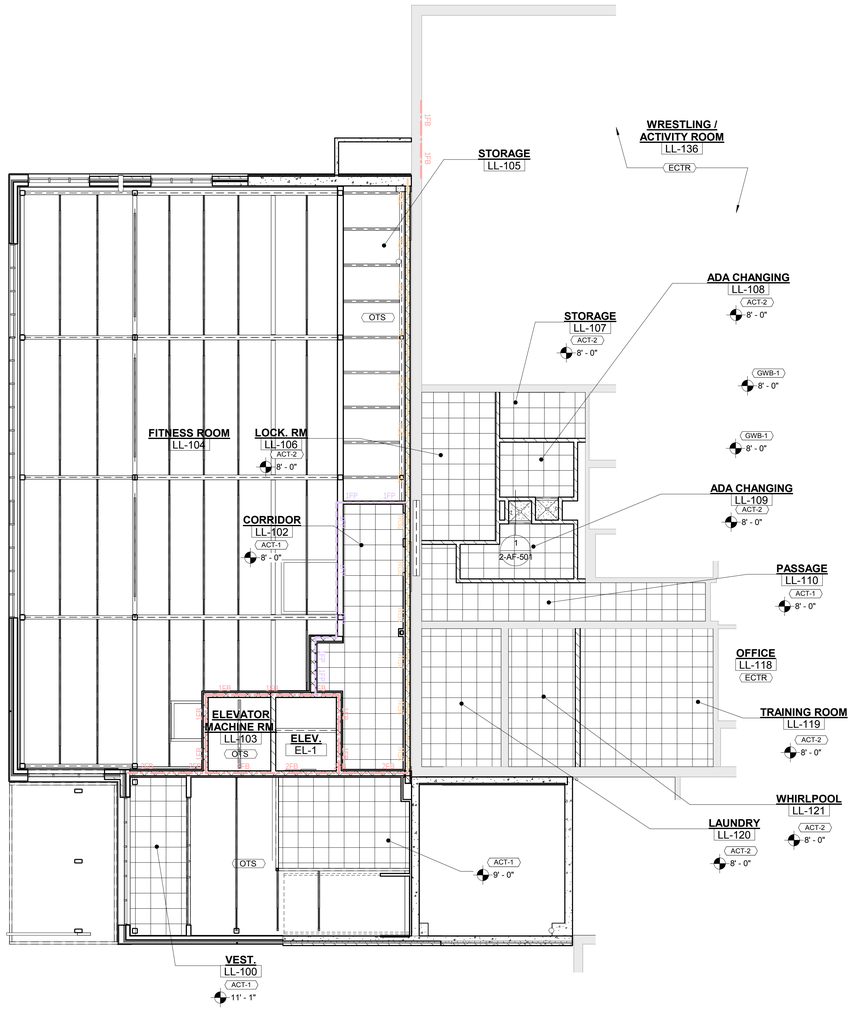
SHEET TITLE:
INTERIOR ELEVATIONS

SHEET NUMBER:
2-AE-706



2 LOWER LEVEL REFLECTED CEILING PLAN

SCALE 1/8" = 1'-0"
AS REFERENCED BY: 1C / 2-AE-201

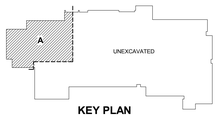
REFLECTED CEILING PLAN KEY:

- CEILING TYPE - SEE TYPES BELOW.
- ACT-# / 9'-0" — CEILING HEIGHT ABOVE FLOOR.
- ACT-1: 09 51 00 A - SUSPENDED ACOUSTICAL CEILING, 2x2 GRID AND TILE (SEE SPECIFICATIONS). UNLESS NOTED OTHERWISE, ALL SUSPENDED ACOUSTICAL CEILINGS SHALL BE TYPE ACT-1.
- ACT-2: 09 51 00 C - SUSPENDED VINYL FACED GYPSUM BOARD CEILING, 2x2 STANDARD GRID WITH VINYL-COVERED GWB TILES
- ACT-3: 09 51 00 A - SUSPENDED ACOUSTICAL CEILING, 2x2 GRID AND TILE (SEE SPECIFICATIONS)
- GWB-1: 09 21 16 A - 5/8" FIRECODE GYPSUM BOARD ON 1/2" RESILIENT CHANNEL
- GWB-2: 09 21 16 A - 5/8" FIRECODE GYPSUM GYPSUM BOARD SOFFIT, BULKHEAD OR CEILING
- CEILING GRID TERMINATION / ALIGNMENT CHANGE
- CEILING LIGHT FIXTURES - GRAPHIC REPRESENTATION ONLY FOR GRID LAYOUT - SEE ELECTRICAL DRAWINGS FOR SPECIFIC FIXTURE INFORMATION
- 23 00 00 E - GRID HVAC SUPPLY DIFFUSER
- 23 00 00 E - GRID HVAC RETURN DIFFUSER
- RECESSED CAN LIGHT
- PENDANT
- WALL SCONCE / VANITY LIGHT
- SURFACE-MOUNTED DOME LIGHT
- OTS — DENOTES AREA OPEN TO EXPOSED STRUCTURE ABOVE. REFER TO ROOM FINISH SCHEDULE FOR FINISHING OF EXPOSED STRUCTURE, DECKING, DUCTWORK, CONDUITS, PIPING, ETC.
- ECTR — DENOTES EXISTING CEILING TO REMAIN. REFER TO MEP DRAWINGS FOR INFORMATION REGARDING REPLACEMENT OF CEILING MOUNTED FIXTURES.

REFER TO ELECTRICAL LIGHTING PLANS FOR SWITCHING, CIRCUITING, AND SPECIFIC FIXTURE TYPES

GENERAL CEILING PLAN NOTES

1. ALL CEILING HEIGHTS TAKEN ABOVE FINISH FLOOR, UNLESS OTHERWISE NOTED.
2. ALL CEILINGS PRESUMED TO BE 8'-0" ABOVE FINISHED FLOOR UNLESS NOTED OTHERWISE.
3. COORDINATE FIXTURE AND DIFFUSER LOCATIONS WITH M.E.P. DRAWINGS.
4. MECHANICAL AND ELECTRICAL DRAWINGS TAKE PRECEDENCE OVER REFLECTED CEILING PLANS FOR TYPE, QUANTITY AND LOCATION OF FIXTURES, DIFFUSERS AND GRILLES.
5. IN 2' X 2' ACT CEILINGS, WHERE TILE IS SHOWN TO BE LESS THAN 2", CUT FROM 2' x 4' TILE TO BE LONGER THAN 2 FT TO ELIMINATE SLIVERS, AND ELIMINATE THE 2' GRID SECTIONS.
6. PROVIDE HURRICANE CLIPS AT CEILING TILES AT RETURN AIR PLENUMS AND VESTIBULES (TYP.)



KEY PLAN

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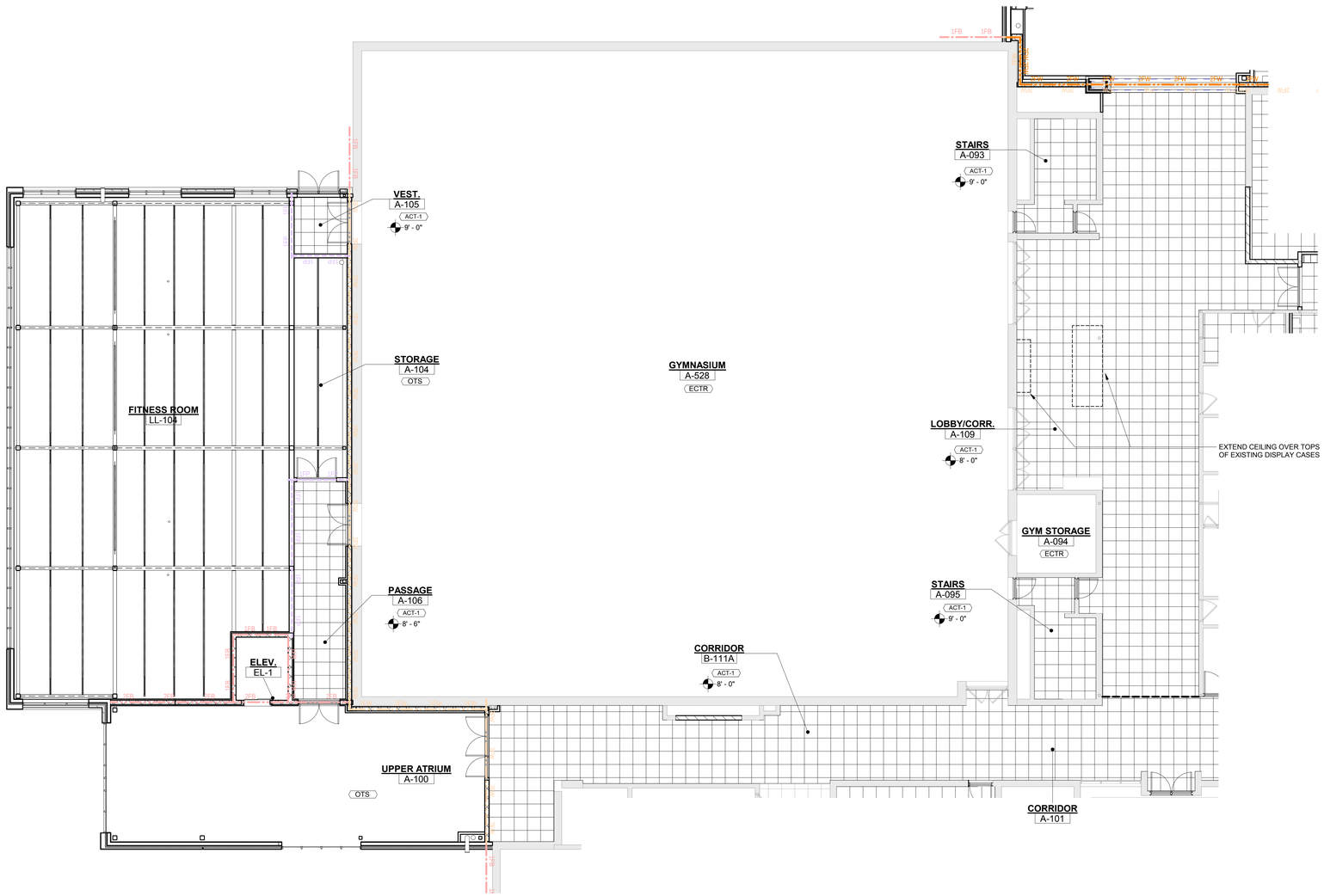
SHEET TITLE:
REFLECTED CEILING PLAN - LOWER LEVEL

SHEET NUMBER:
2-AF-101



1 FIRST FLOOR REFLECTED CEILING PLAN - AREA A

SCALE 1/8" = 1'-0"
AS REFERENCED BY: 2 / 2-AD-104

REFLECTED CEILING PLAN KEY:

CEILING TYPE - SEE TYPES BELOW.
ACT-#
9'-0"
CEILING HEIGHT ABOVE FLOOR.

ACT-1
09 51 00 A - SUSPENDED ACOUSTICAL CEILING, 2x2 GRID AND TILE (SEE SPECIFICATIONS).
UNLESS NOTED OTHERWISE, ALL SUSPENDED ACOUSTICAL CEILINGS SHALL BE TYPE ACT-1.

ACT-2
09 51 00 C - SUSPENDED VINYL FACED GYPSUM BOARD CEILING, 2x2 STANDARD GRID WITH VINYL-COVERED GWB TILES

ACT-3
09 51 00 A - SUSPENDED ACOUSTICAL CEILING, 2x2 GRID AND TILE (SEE SPECIFICATIONS)

GWB-1
09 21 16 A - 5/8" FIRECODE GYPSUM BOARD ON 1/2" RESILIENT CHANNEL

GWB-2
09 21 16 A - 5/8" FIRECODE GYPSUM GYPSUM BOARD SOFFIT, BULKHEAD OR CEILING

CEILING GRID TERMINATION / ALIGNMENT CHANGE

CEILING LIGHT FIXTURES - GRAPHIC REPRESENTATION ONLY FOR GRID LAYOUT - SEE ELECTRICAL DRAWINGS FOR SPECIFIC FIXTURE INFORMATION

23 00 00 E - GRID HVAC SUPPLY DIFFUSER

23 00 00 E - GRID HVAC RETURN DIFFUSER

RECESSED CAN LIGHT

PENDANT

WALL SCONCE / VANITY LIGHT

SURFACE-MOUNTED DOME LIGHT

OTS — DENOTES AREA OPEN TO EXPOSED STRUCTURE ABOVE. REFER TO ROOM FINISH SCHEDULE FOR FINISHING OF EXPOSED STRUCTURE, DECKING, DUCTWORK, CONDUITS, PIPING, ETC.

ECTR — DENOTES EXISTING CEILING TO REMAIN. REFER TO MEP DRAWINGS FOR INFORMATION REGARDING REPLACEMENT OF CEILING MOUNTED FIXTURES.

REFER TO ELECTRICAL LIGHTING PLANS FOR SWITCHING, CIRCUITING, AND SPECIFIC FIXTURE TYPES

GENERAL CEILING PLAN NOTES

1. ALL CEILING HEIGHTS TAKEN ABOVE FINISH FLOOR, UNLESS OTHERWISE NOTED.

2. ALL CEILINGS PRESUMED TO BE 8'-0" ABOVE FINISHED FLOOR UNLESS NOTED OTHERWISE.

3. COORDINATE FIXTURE AND DIFFUSER LOCATIONS WITH M.E.P. DRAWINGS.

4. MECHANICAL AND ELECTRICAL DRAWINGS TAKE PRECEDENCE OVER REFLECTED CEILING PLANS FOR TYPE, QUANTITY AND LOCATION OF FIXTURES, DIFFUSERS AND GRILLES.

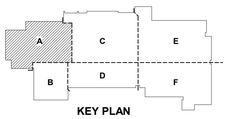
5. IN 2' X 2' ACT CEILINGS, WHERE TILE IS SHOWN TO BE LESS THAN 2", CUT FROM 2' x 4' TILE TO BE LONGER THAN 2 FT TO ELIMINATE SLIVERS, AND ELIMINATE THE 2' GRID SECTIONS.

6. PROVIDE HURRICANE CLIPS AT CEILING TILES AT RETURN AIR PLENUMS AND VESTIBULES (TYP.)

KEYNOTE LEGEND

KEY NO.	KEYNOTE TEXT

KEY PLAN



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CONSULTANT:

MANAWA ELEMENTARY SCHOOL - ALTERATIONS
MANAWA MIDDLE/HIGH SCHOOL - ADDITIONS & ALTERATIONS
PART 2 - MANAWA MIDDLE / HIGH SCHOOL
515 E. 4th STREET
MANAWA, WI 54949

MARK	DATE

ISSUED: 6 JUN 2019
PROJECT NO: 18268
CAD DWG FILE:
DRAWN BY: Author
CHECKED BY: Checker

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SHEET TITLE:
REFLECTED CEILING PLAN - AREA A

SHEET NUMBER:
2-AF-102

1 FIRST FLOOR REFLECTED CEILING PLAN - AREA B

SCALE 1/8" = 1'-0"
AS REFERENCED BY: 2 / 2-AD-104

REFLECTED CEILING PLAN KEY:

CEILING TYPE - SEE TYPES BELOW.

ACT-1
9' - 0"

CEILING HEIGHT ABOVE FLOOR.

ACT-1
09 51 00 A - SUSPENDED ACOUSTICAL CEILING, 2x2 GRID AND TILE (SEE SPECIFICATIONS).
UNLESS NOTED OTHERWISE, ALL SUSPENDED ACOUSTICAL CEILINGS SHALL BE TYPE ACT-1.

ACT-2
09 51 00 C - SUSPENDED VINYL FACED GYPSUM BOARD CEILING, 2x2 STANDARD GRID WITH VINYL-COVERED GWB TILES

ACT-3
09 51 00 A - SUSPENDED ACOUSTICAL CEILING, 2x2 GRID AND TILE (SEE SPECIFICATIONS)

GWB-1
09 21 16 A - 5/8" FIRECODE GYPSUM BOARD ON 1/2" RESILIENT CHANNEL

GWB-2
09 21 16 A - 5/8" FIRECODE GYPSUM GYPSUM BOARD SOFFIT, BULKHEAD OR CEILING

CEILING GRID TERMINATION / ALIGNMENT CHANGE

CEILING LIGHT FIXTURES - GRAPHIC REPRESENTATION ONLY FOR GRID LAYOUT - SEE ELECTRICAL DRAWINGS FOR SPECIFIC FIXTURE INFORMATION

23 00 00 E - GRID HVAC SUPPLY DIFFUSER

23 00 00 E - GRID HVAC RETURN DIFFUSER

RECESSED CAN LIGHT

PENDANT

WALL SCONCE / VANITY LIGHT

SURFACE-MOUNTED DOME LIGHT

OTS — DENOTES AREA OPEN TO EXPOSED STRUCTURE ABOVE. REFER TO ROOM FINISH SCHEDULE FOR FINISHING OF EXPOSED STRUCTURE, DECKING, DUCTWORK, CONDUITS, PIPING, ETC.

ECTR — DENOTES EXISTING CEILING TO REMAIN. REFER TO MEP DRAWINGS FOR INFORMATION REGARDING REPLACEMENT OF CEILING MOUNTED FIXTURES.

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4. MECHANICAL AND ELECTRICAL DRAWINGS TAKE PRECEDENCE OVER REFLECTED CEILING PLANS FOR TYPE, QUANTITY AND LOCATION OF FIXTURES, DIFFUSERS AND GRILLES.
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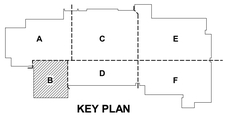

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MANAWA, WI 54949

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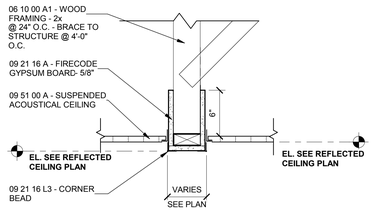
SHEET TITLE:

REFLECTED CEILING PLAN - AREA B

SHEET NUMBER:

2-AF-103



2 GYPSUM BD. BULKHEAD DETAIL

SCALE 1 1/2" = 1'-0"
AS REFERENCED BY:

1 FIRST FLOOR REFLECTED CEILING PLAN - AREA C

SCALE 1/8" = 1'-0"
AS REFERENCED BY: 2 / 2-AD-104

REFLECTED CEILING PLAN KEY:

- ACT-# / 9'-0" — CEILING TYPE - SEE TYPES BELOW. / CEILING HEIGHT ABOVE FLOOR.
- ACT-1 — 09 51 00 A - SUSPENDED ACOUSTICAL CEILING, 2x2 GRID AND TILE (SEE SPECIFICATIONS). UNLESS NOTED OTHERWISE, ALL SUSPENDED ACOUSTICAL CEILINGS SHALL BE TYPE ACT-1.
- ACT-2 — 09 51 00 C - SUSPENDED VINYL FACED GYPSUM BOARD CEILING, 2x2 STANDARD GRID WITH VINYL-COVERED GWB TILES
- ACT-3 — 09 51 00 A - SUSPENDED ACOUSTICAL CEILING, 2x2 GRID AND TILE (SEE SPECIFICATIONS)
- GWB-1 — 09 21 16 A - 5/8" FIRECODE GYPSUM BOARD ON 1/2" RESILIENT CHANNEL
- GWB-2 — 09 21 16 A - 5/8" FIRECODE GYPSUM GYPSUM BOARD SOFFIT, BULKHEAD OR CEILING
- CEILING GRID TERMINATION / ALIGNMENT CHANGE
- CEILING LIGHT FIXTURES - GRAPHIC REPRESENTATION ONLY FOR GRID LAYOUT - SEE ELECTRICAL DRAWINGS FOR SPECIFIC FIXTURE INFORMATION
- 23 00 00 E - GRID HVAC SUPPLY DIFFUSER
- 23 00 00 E - GRID HVAC RETURN DIFFUSER
- RECESSED CAN LIGHT
- PENDANT
- WALL SCONCE / VANITY LIGHT
- SURFACE-MOUNTED DOME LIGHT
- OTS — DENOTES AREA OPEN TO EXPOSED STRUCTURE ABOVE. REFER TO ROOM FINISH SCHEDULE FOR FINISHING OF EXPOSED STRUCTURE, DECKING, DUCTWORK, CONDUITS, PIPING, ETC.
- ECTR — DENOTES EXISTING CEILING TO REMAIN. REFER TO MEP DRAWINGS FOR INFORMATION REGARDING REPLACEMENT OF CEILING MOUNTED FIXTURES.

REFER TO ELECTRICAL LIGHTING PLANS FOR SWITCHING, CIRCUITING, AND SPECIFIC FIXTURE TYPES

GENERAL CEILING PLAN NOTES

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2. ALL CEILINGS PRESUMED TO BE 8'-0" ABOVE FINISHED FLOOR UNLESS NOTED OTHERWISE.
3. COORDINATE FIXTURE AND DIFFUSER LOCATIONS WITH M.E.P. DRAWINGS.
4. MECHANICAL AND ELECTRICAL DRAWINGS TAKE PRECEDENCE OVER REFLECTED CEILING PLANS FOR TYPE, QUANTITY AND LOCATION OF FIXTURES, DIFFUSERS AND GRILLES.
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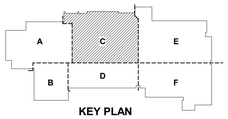
6. PROVIDE HURRICANE CLIPS AT CEILING TILES AT RETURN AIR PLENUMS AND VESTIBULES (TYP.)

KEYNOTE LEGEND

KEY NO.	KEYNOTE TEXT
06 10 00 A1 -	WOOD FRAMING - 2x
09 21 16 A -	FIRECODE GYPSUM BOARD
09 21 16 L3 -	CORNER BEAD
09 51 00 A -	SUSPENDED ACOUSTICAL CEILING



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PART 2 - MANAWA MIDDLE / HIGH SCHOOL
515 E. 4th STREET
MANAWA, WI 54949

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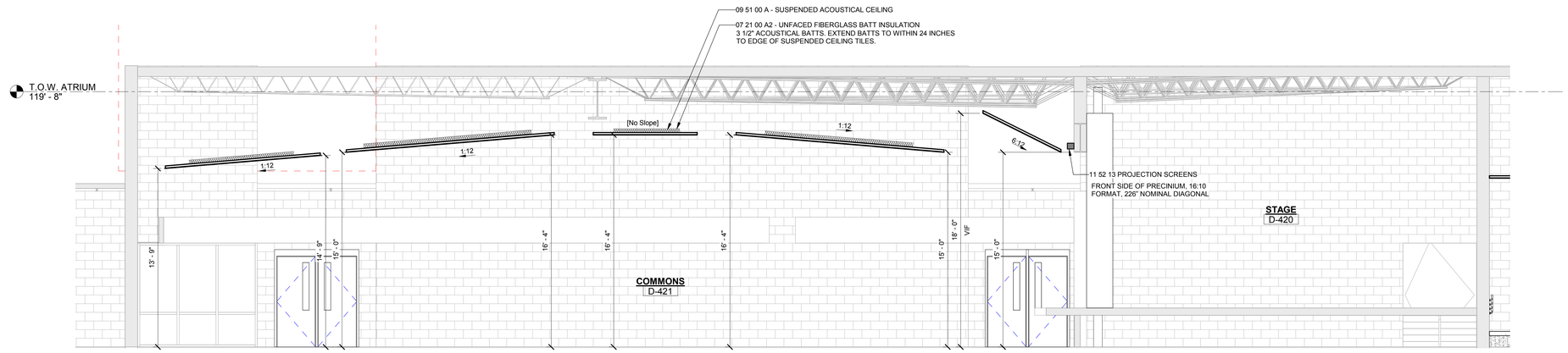
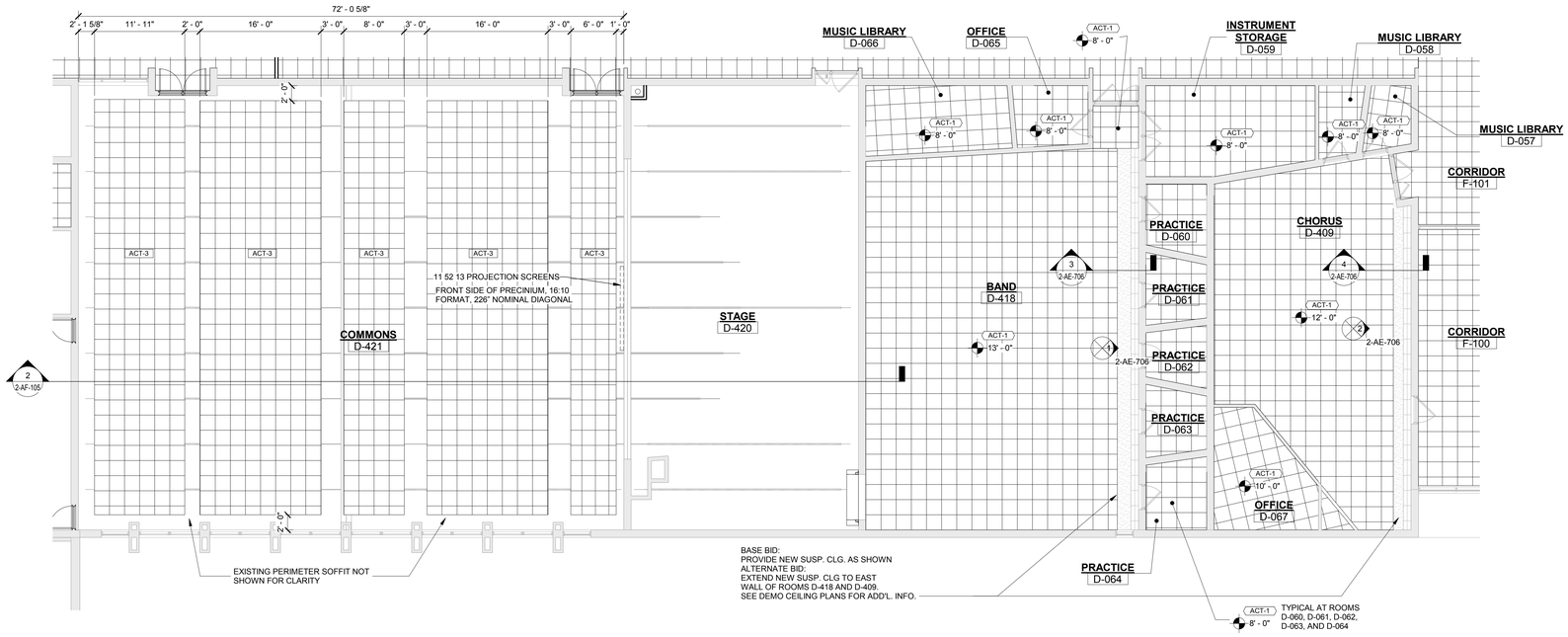
SHEET TITLE:
REFLECTED CEILING PLAN - AREA C

SHEET NUMBER:
2-AF-104



2 AREA D - COMMONS LONGITUDINAL SECTION

SCALE 1/4" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-105



1 FIRST FLOOR REFLECTED CEILING PLAN - AREA D

SCALE 1/8" = 1'-0"
AS REFERENCED BY: 2 / 2-AD-104

REFLECTED CEILING PLAN KEY:

CEILING TYPE - SEE TYPES BELOW.
ACT-# 9'-0"
CEILING HEIGHT ABOVE FLOOR.

ACT-1
09 51 00 A - SUSPENDED ACOUSTICAL CEILING, 2x2 GRID AND TILE (SEE SPECIFICATIONS).
UNLESS NOTED OTHERWISE, ALL SUSPENDED ACOUSTICAL CEILINGS SHALL BE TYPE ACT-1.

ACT-2
09 51 00 C - SUSPENDED VINYL FACED GYPSUM BOARD CEILING, 2x2 STANDARD GRID WITH VINYL-COVERED GWB TILES

ACT-3
09 51 00 A - SUSPENDED ACOUSTICAL CEILING, 2x2 GRID AND TILE (SEE SPECIFICATIONS)

GWB-1
09 21 16 A - 5/8" FIRECODE GYPSUM BOARD ON 1/2" RESILIENT CHANNEL

GWB-2
09 21 16 A - 5/8" FIRECODE GYPSUM GYPSUM BOARD SOFFIT, BULKHEAD OR CEILING

CEILING GRID TERMINATION / ALIGNMENT CHANGE

CEILING LIGHT FIXTURES - GRAPHIC REPRESENTATION ONLY FOR GRID LAYOUT - SEE ELECTRICAL DRAWINGS FOR SPECIFIC FIXTURE INFORMATION

23 00 00 E - GRID HVAC SUPPLY DIFFUSER

23 00 00 E - GRID HVAC RETURN DIFFUSER

RECESSED CAN LIGHT

PENDANT

WALL SCONCE / VANITY LIGHT

SURFACE-MOUNTED DOME LIGHT

OTS — DENOTES AREA OPEN TO EXPOSED STRUCTURE ABOVE. REFER TO ROOM FINISH SCHEDULE FOR FINISHING OF EXPOSED STRUCTURE, DECKING, DUCTWORK, CONDUITS, PIPING, ETC.

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GENERAL CEILING PLAN NOTES

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6. PROVIDE HURRICANE CLIPS AT CEILING TILES AT RETURN AIR PLENUMS AND VESTIBULES (TYP.)

KEYNOTE LEGEND

KEY NO.	KEYNOTE TEXT
07 21 00 A2 -	UNFACED FIBERGLASS BATT INSULATION
09 51 00 A -	SUSPENDED ACOUSTICAL CEILING
11 52 13	PROJECTION SCREENS

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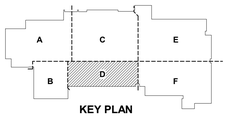

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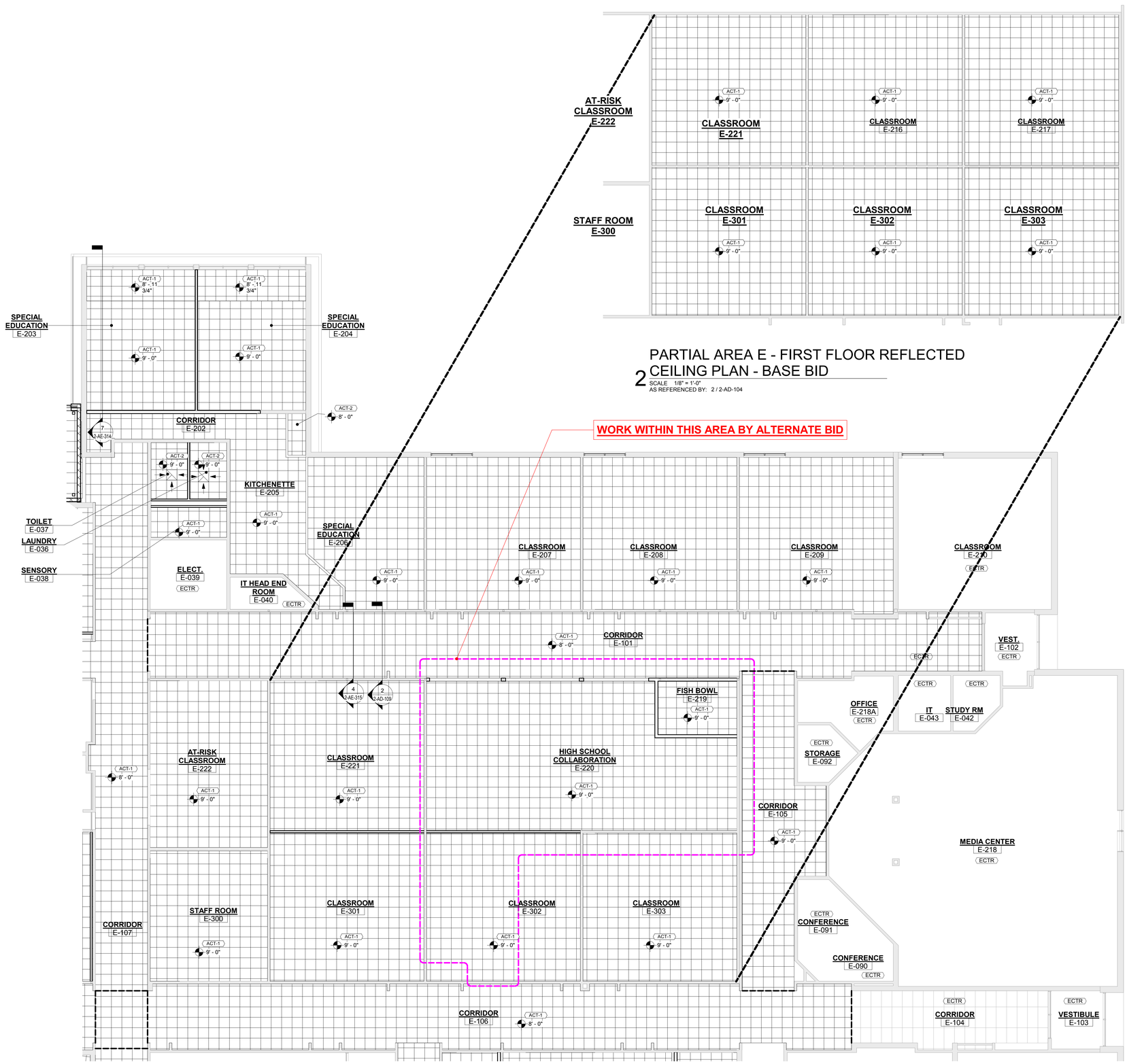
SHEET TITLE:
REFLECTED CEILING PLAN - AREA D

SHEET NUMBER:
2-AF-105



2 PARTIAL AREA E - FIRST FLOOR REFLECTED CEILING PLAN - BASE BID

SCALE 1/8" = 1'-0"
AS REFERENCED BY: 2 / 2-AD-104

1 FIRST FLOOR REFLECTED CEILING PLAN - AREA E

SCALE 1/8" = 1'-0"
AS REFERENCED BY: 2 / 2-AD-104

REFLECTED CEILING PLAN KEY:

- CEILING TYPE - SEE TYPES BELOW.
- CEILING HEIGHT ABOVE FLOOR.
- ACT-1 — 09 51 00 A - SUSPENDED ACOUSTICAL CEILING, 2x2 GRID AND TILE (SEE SPECIFICATIONS). UNLESS NOTED OTHERWISE, ALL SUSPENDED ACOUSTICAL CEILINGS SHALL BE TYPE ACT-1.
- ACT-2 — 09 51 00 C - SUSPENDED VINYL FACED GYPSUM BOARD CEILING, 2x2 STANDARD GRID WITH VINYL-COVERED GWB TILES
- ACT-3 — 09 51 00 A - SUSPENDED ACOUSTICAL CEILING, 2x2 GRID AND TILE (SEE SPECIFICATIONS)
- GWB-1 — 09 21 16 A - 5/8" FIRECODE GYPSUM BOARD ON 1/2" RESILIENT CHANNEL
- GWB-2 — 09 21 16 A - 5/8" FIRECODE GYPSUM GYPSUM BOARD SOFFIT, BULKHEAD OR CEILING
- CEILING GRID TERMINATION / ALIGNMENT CHANGE
- CEILING LIGHT FIXTURES - GRAPHIC REPRESENTATION ONLY FOR GRID LAYOUT - SEE ELECTRICAL DRAWINGS FOR SPECIFIC FIXTURE INFORMATION
- 23 00 00 E - GRID HVAC SUPPLY DIFFUSER
- 23 00 00 E - GRID HVAC RETURN DIFFUSER
- RECESSED CAN LIGHT
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6. PROVIDE HURRICANE CLIPS AT CEILING TILES AT RETURN AIR PLENUMS AND VESTIBULES (TYP.)

KEYNOTE LEGEND

KEY NO.	KEYNOTE TEXT

KEY PLAN

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515 E. 4th STREET
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SHEET TITLE:
REFLECTED CEILING PLAN - AREA E

SHEET NUMBER:
2-AF-106

1 FIRST FLOOR REFLECTED CEILING PLAN - AREA F

SCALE 1/8" = 1'-0"
AS REFERENCED BY: 2 / 2-AD-104

REFLECTED CEILING PLAN KEY:

CEILING TYPE - SEE TYPES BELOW.

ACT-1
9' -0"

CEILING HEIGHT ABOVE FLOOR.

ACT-1
09 51 00 A - SUSPENDED ACOUSTICAL CEILING, 2x2 GRID AND TILE (SEE SPECIFICATIONS).
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ACT-2
09 51 00 C - SUSPENDED VINYL FACED GYPSUM BOARD CEILING, 2x2 STANDARD GRID WITH VINYL-COVERED GWB TILES

ACT-3
09 51 00 A - SUSPENDED ACOUSTICAL CEILING, 2x2 GRID AND TILE (SEE SPECIFICATIONS)

GWB-1
09 21 16 A - 5/8" FIRECODE GYPSUM BOARD ON 1/2" RESILIENT CHANNEL

GWB-2
09 21 16 A - 5/8" FIRECODE GYPSUM GYPSUM BOARD SOFFIT, BULKHEAD OR CEILING

CEILING GRID TERMINATION / ALIGNMENT CHANGE

CEILING LIGHT FIXTURES - GRAPHIC REPRESENTATION ONLY FOR GRID LAYOUT - SEE ELECTRICAL DRAWINGS FOR SPECIFIC FIXTURE INFORMATION

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23 00 00 E - GRID HVAC RETURN DIFFUSER

RECESSED CAN LIGHT

PENDANT

WALL SCONCE / VANITY LIGHT

SURFACE-MOUNTED DOME LIGHT

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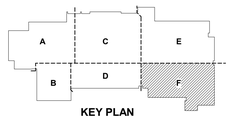
KEYNOTE LEGEND

KEY NO.	KEYNOTE TEXT



KEY PLAN

TRUE NORTH
PLAN NORTH

FOR BIDS
NOT FOR CONSTRUCTION

Hoffman
Planning, Design & Construction, Inc.
800.236.2370 | hoffman.net

CONSULTANT:

MANAWA

MANAWA ELEMENTARY SCHOOL - ALTERATIONS
MANAWA MIDDLE/HIGH SCHOOL - ADDITIONS & ALTERATIONS
PART 2 - MANAWA MIDDLE / HIGH SCHOOL
515 E. 4th STREET
MANAWA, WI 54949

MARK	DATE

ISSUED: 6 JUN 2019
PROJECT NO: 18268
CAD DWG FILE:
DRAWN BY: Author
CHECKED BY: Checker

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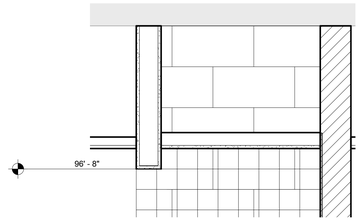
SHEET TITLE:
REFLECTED CEILING PLAN - AREA F

SHEET NUMBER:
2-AF-107

KEYNOTE LEGEND	
KEY NO.	KEYNOTE TEXT



1 TYP. SHOWER BULKHEAD/CEILING
SCALE 1" = 1'-0"
AS REFERENCED BY: 1 / 2-AE-402

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SHEET TITLE:
CEILING DETAILS

SHEET NUMBER:
2-AF-501

MMHS FINISH MATERIAL LEGEND

TAG	DESC.	MFGR.	STYLE NAME	STYLE NO.	COLOR NAME	COLOR NO.	SIZE	INSTALL	REMARKS
CB-1	PORCELAIN TILE WALL BASE - MMHS	CERAMIC TILEWORKS	MOTION	--	MIST	--	6" HIGH		CUT FLOOR TILE TO 6"; INSTALL WITH SCHLUTER DILEX-AHK
CB-2	PORCELAIN TILE WALL BASE - MES	CERAMIC TILEWORKS / IRIS	ATELIER COLLECTION		OLIVE GREY - HONED	IRG12224164	6" HIGH		CUT FLOOR TILE TO 6"; INSTALL WITH SCHLUTER DILEX-AHK
CPT-1	CARPET TILE	MOHAWK GROUP	LEARN & LIVE COLLECTION - SIDE STRIPE	GT419	HERITAGE	963	24" X 24"	1/4 TURN	SEE FLOORING PATTERN PLAN FOR INSTALL
CPT-2	CARPET TILE	MOHAWK GROUP	COLOR BALANCE	12BY36 - GT4025	ATOMIC	373	12" X 36"	MONOLITHIC	SEE FLOORING PATTERN PLAN FOR INSTALL
CPT-3	CARPET TILE	INTERFACE	THE STANDARD	1467302500	MANGROVE	9361	50CM X 50CM	1/4 TURN - VERIFY	MATCHES EXISTING OFFICE CARPET TILE
CPT-4	CARPET TILE	MOHAWK GROUP	LEARN & LIVE COLLECTION - SWIPE RIGHT TILE	GT418	BROOKWOOD	969	24" X 24"	1/4 TURN	
CT-1	PORCELAIN FLOOR TILE - MMHS	CERAMIC TILEWORKS	MOTION		MIST		12" X 24"	MONOLITHIC	
CT-2	CERAMIC WALL TILE - MMHS	DALTILE	FABRIQUE		BLANC LINEN - LIGHT POLISHED	P685	12" X 24"	HORIZONTAL	SEE INTERIOR ELEVATION FOR INSTALL; SCHLUTER RONDEC-AE ABOVE WALL TILE
CT-3	CERAMIC WALL TILE ACCENT	DALTILE	RITTENHOUSE SQUARE		VERMILLION	0DM1	3" X 6"		SEE INTERIOR ELEVATION FOR INSTALL
CT-4	CERAMIC WALL TILE - MES	CERAMIC TILEWORKS	MET WALL TILE	--	BIANCO	--	10" X 24"	VERTICAL	SEE INTERIOR ELEVATION FOR INSTALL; SCHLUTER RONDEC-AE ABOVE WALL TILE
CT-5	PORCELAIN FLOOR TILE - MES	CERAMIC TILEWORKS / IRIS	ATELIER COLLECTION		OLIVE GRAY - HONED	IRG1224164	12" X 24"	MONOLITHIC	
EPX-1	EPOXY FLOORING	SHERWIN-WILLIAMS	CERAMIC CARPET	400	CHARCOAL	--	--	FLUID-APPLIED	
EPX-2	EPOXY COUNTERTOPS				BLACK				INTEGRAL SINK BOWLS
EX	EXISTING	--	--	--	--	--	--	--	
LVT-1	VINYL TILE - MAIN	SHAW CONTRACT	UNITE COLLECTION - COVE		CASTER	27518	9" X 48"	ASHLAR	
LVT-2	VINYL TILE - ACCENT 10%	SHAW CONTRACT	UNITE COLLECTION - COVE		CORNERSTONE	27585	9" X 48"	ASHLAR	
LVT-3	VINYL TILE - ADMIN AREA	SHAW CONTRACT	UNITE COLLECTION - COVE		SILT	27504	9" X 48"	ASHLAR	
P-1	PAINT - MAIN - MES	SHERWIN-WILLIAMS	EG-SHEL	--	MISTY	222-C1	--	--	
P-2	PAINT - DOOR FRAMES, STRUCTURAL COMPONENTS	SHERWIN-WILLIAMS	SEMI-GLOSS	--	TRICORN BLACK	251-C1	--	--	
P-3	PAINT - CEILINGS	SHERWIN-WILLIAMS	FLAT/MATTE	--	HIGH REFLECTIVE WHITE	256-C1	--	--	
P-4	PAINT - ACCENT COLOR	SHERWIN-WILLIAMS	EG-SHEL	--	PASSIVE	236-C1	--	--	
P-5	PAINT - MATCH EXISTING	MATCH EXISTING	MATCH EXISTING	--	MATCH EXISTING	--	--	--	
P-6	PAINT - MAIN COLOR - MMHS	SHERWIN-WILLIAMS	EG-SHEL	--	HIGH REFLECTIVE WHITE	256-C1	--	--	
P-7	PAINT - ACCENT RED, STRUCTURAL COMPONENTS	SHERWIN-WILLIAMS	EG-SHEL	--	POSITIVE RED	101-C7	--	--	VERIFY RED WITH OWNERS - TO MATCH SCHOOL COLOR
PC	POLISHED CONCRETE	EUCLID CHEMICAL	--	--	RED ROCK AND RICH EARTH		--		STAINED - FINAL COLOR AND PATTERN TBD - VERIFY
PLAM-1	PLASTIC LAMINATE - CABINETS - MMHS	NEVAMAR			TRANQUILITY	WA3000 VE	--		VELVET FINISH
PLAM-2	PLASTIC LAMINATE - COUNTERTOPS - MMHS	WILSONART	--	--	PEWTER BRUSH	4779-60	--		MATTE FINISH
PLAM-3	PLASTIC LAMINATE - CABINETS - MES	NEVAMAR			BLACK LODESTONE	LD6001 ARP			
PLAM-4	PLASTIC LAMINATE - COUNTERTOPS - MES	FORMICA			FLINT CRYSTALL	3518 58			
RAT-1	RUBBER TILE	ECORE ATHLETIC	BEAST		RIPPIN RED	20	48" ROLLS		ALT. TARKETT / JOHNSONITE INERTIA AND TRIUMPH
RB-1	RUBBER WALL BASE	TARKETT / JOHNSONITE	TRADITIONAL		BLACK B	40	4" HIGH		
RB-2	RUBBER WALL BASE	TARKETT / JOHNSONITE	TRADITIONAL		CHARCOAL WG	20	4" HIGH		
RB-3	RUBBER WALL BASE	MATCH EXISTING	MATCH EXISTING		MATCH EXISTING		4" HIGH		MATCH EXISTING RUBBER BASE IN ADMIN AREA
RST-1	RUBBER STAIR TREAD AND RISER	TARKETT / JOHNSONITE	INTEGRATED TREAD AND RISER WITH GRIT TAPE	VIHTR	CHARCOAL WG	20	--		HAMMERED FINISH; GRIT TAPE GREY
SC	SEALED CONCRETE	--	--	--	--	--	--	--	
SS-1	SOLID SURFACE - WINDOWSILLS	CORIAN			EVEREST	--			
WOC-1	WALK-OFF CARPET TILE - MMHS	MANNINGTON COMMERCIAL	CHARGE	--	KINETIC	11360	18" X 36"	MONOLITHIC	
WOC-2	WALK-OFF CARPET TILE - MES	MOHAWK GROUP	FIRST STEP II	QL315	WALNUT	859	24" X 24"	1/4 TURN - VERIFY	MATCHES EXISTING WALK-OFF CARPET TILE

MMHS ROOM FINISH SCHEDULE

No.	ROOM NAME	FLOOR	BASE	WALL FINISH NORTH	WALL FINISH EAST	WALL FINISH SOUTH	WALL FINISH WEST	Ceiling Finish	CASEWORK CABINETS	CASEWORK COUNTERTOPS	REMARKS
A-093	STAIRS	RST-1	-	-	-	-	-	ACT-1	-	-	
A-095	STAIRS	RST-1	-	-	-	-	-	ACT-1	-	-	
A-100	UPPER ATRIUM	PC	RB-1	P-6	P-6	P-6	-		-	-	ADD ALT - LVT-1 FLOOR - STAIR RST-1
A-101	CORRIDOR	PC	-	-	-	-	-	ACT-1	-	-	
A-102	CORRIDOR	PC	RB-1	P-6	P-6	P-6	P-6	ACT-1	-	-	
A-103	MECH. EQUIP.	SC	-	P-6	P-6	P-6	P-6	-	-	-	
A-104	STORAGE	PC	RB-1	P-6	P-6	P-6	P-6	-	-	-	
A-105	VEST.										
A-106	PASSAGE	PC	RB-1	P-6	P-6	P-6	P-6	ACT-1			ADD ALT - LVT-1 FLOOR
A-109	LOBBY/CORR.	PC	-	-	-	-	-	ACT-1	-	-	
B-006	STORAGE	SC	-	-	-	-	-	ACT-1	-	-	
B-007	STORAGE	-	-	-	-	-	-	ACT-1	-	-	
B-179	STORAGE	-	-	-	-	-	-	ACT-1	-	-	
C-066	SCIENCE STORAGE	PC	-	-	-	-	-	ACT-1	-	-	ADD ALT - EPX-1 FLOOR / BASE
C-067	SCIENCE OFFICE	PC	-	-	-	-	-	ACT-1	-	-	ADD ALT - EPX-1 FLOOR / BASE
C-068	CONCESSIONS	PC	-	-	-	-	-	ACT-1	-	-	
C-075	SCIENCE STORAGE	PC	-	-	-	-	-	ACT-1	--	--	
C-076	CORRIDOR	-	-	-	-	-	-	ACT-1	-	-	P-6, RB-1 WALLS ADJ TO NEW DOORS
C-100	SECURE VESTIBULE	WOC-1	RB-1	P-6	P-6	P-6	P-6	ACT-1	-	-	
C-101	2ND VESTIBULE	WOC-1	RB-1	-	P-6	P-6	P-6	ACT-1	-	-	
C-102	OFFICE AND RECEPTION	CPT-1	RB-1	P-6	P-6	P-6	P-6	ACT-1	PLAM-1	PLAM-2	
C-103	WORK ROOM	LVT-1	RB-1	P-6	P-6	P-6	P-6	ACT-1	PLAM-1	PLAM-2	
C-104	STORAGE	LVT-1	RB-1	P-6	P-6	P-6	P-6	ACT-1	-	SHELVING	
C-105	ISS	LVT-1	RB-1	P-6	P-6	P-6	P-6	ACT-1	-	-	
C-106	REST AREA	LVT-1	RB-1	P-6	P-6	P-6	P-6	ACT-1	PLAM-1	PLAM-2	ADD ALT - LVT-1 FLOOR
C-107	NURSE	LVT-1	RB-1	P-6	P-6	P-6	P-6	ACT-1	-	-	
C-108	ADA TLT	EPX-1	EPX-1	P-6	P-6	P-6	P-6	ACT-2	-	-	ADD ALT - CT-1 / CB-1
C-109	BREAK	LVT-1	RB-1	P-6	P-6	P-6	P-6	ACT-1	PLAM-1	PLAM-2	ADD ALT - LVT-1 FLOOR
C-110	ADA TLT	EPX-1	EPX-1	P-6	P-6	P-6	P-6	ACT-2	-	-	ADD ALT - CT-1 / CB-1
C-111	ISS	LVT-1	RB-1	P-6	P-6	P-6	P-6	ACT-1	-	-	
C-112	ADA TLT	EPX-1	EPX-1	P-6	P-6	P-6	P-6	ACT-2	-	-	ADD ALT - CT-1 / CB-1
C-113	PRINCIPAL	CPT-1	RB-1	P-6	P-6	P-6	P-6	ACT-1	-	-	
C-114	OFFICE	CPT-1	RB-1	P-6	P-6	P-6	P-6	ACT-1	-	-	
C-115	PASSAGE	CPT-1	RB-1	P-6	P-6	P-6	P-6	ACT-1	-	-	
C-116	BOYS	EPX-1	EPX-1	P-6	P-6	P-6	P-6	ACT-2	-	-	ADD ALT - CT-1 / CB-1
C-117	VESTIBULE	EPX-1	RB-1	P-6	P-6	P-6	P-6	ACT-1	-	-	ADD ALT - LVT-1 FLOOR
C-118	GIRLS	EPX-1	EPX-1	P-6	P-6	P-6	P-6	ACT-2	-	-	ADD ALT - CT-1 / CB-1
C-119	CLOSET	CPT-1	RB-1	P-6	P-6	P-6	P-6	ACT-1			
C-120	OFFICE	CPT-1	RB-1	P-6	P-6	P-6	P-6	ACT-1	-	-	
C-121	MIDDLE SCHOOL CLASSROOM	CPT-1	-	-	-	-	-	ACT-1	-	-	ADD ALT - LVT-1 FLOOR
C-122	MIDDLE SCHOOL CLASSROOM	CPT-1	-	-	-	-	-	ACT-1	-	-	ADD ALT - LVT-1 FLOOR
C-123	MIDDLE SCHOOL CLASSROOM	CPT-1	-	-	-	-	-	ACT-1	-	-	ADD ALT - LVT-1 FLOOR
C-124	MIDDLE SCHOOL SCIENCE	PC	-	-	-	-	-	ACT-1	PLAM-1	EPX-2	ADD ALT - EPX-1 FLOOR / BASE
C-125	CONFERENCE	CPT-1	RB-1	P-6	P-6	P-6	P-6	ACT-1	-	-	
C-126	COUNSELOR	CPT-1	RB-1	P-6	P-6	P-6	P-6	ACT-1	-	-	
C-127	PASSAGE	CPT-1	RB-1	P-6	P-6	P-6	P-6	ACT-1			
C-128	GUIDANCE	CPT-1	RB-1	P-6	P-6	P-6	P-6	ACT-1	PLAM-1	PLAM-2	
C-129	VESTIBULE	WOC-1	RB-1	P-6	P-6	P-6	P-6	ACT-1	-	-	
C-130	IT OFFICE / WORKROOM	CPT-1	RB-1	-	-	P-6	P-6	ACT-1	-	-	
C-131	MIDDLE SCHOOL CLASSROOM	CPT-1	RB-1	-	P-6	P-1	P-6	ACT-1	-	-	ADD ALT - LVT-1 FLOOR
C-132	MIDDLE SCHOOL COLLABORATION	CPT-1	RB-1	-	P-6	P-6	P-6	ACT-1	-	-	ADD ALT - LVT-1 FLOOR
C-133	CORRIDOR	-	-	-	-	-	-	ACT-1	-	-	P-6, RB-1 WALLS ADJ TO NEW DOORS
C-134	IT CLOSET	-	-	-	-	-	-	-	-	-	
C-135	IT CLOSET	SC	-	-	-	-	-	-	-	-	
C-136	PASSAGE	CPT-1	-	-	-	-	P-6	ACT-1	-	-	
C-137	CONFERENCE	CPT-1	-	-	-	-	-	ACT-1	-	-	
C-138	MIDDLE SCHOOL CLASSROOM	PC	-	-	-	-	-	ACT-1	-	-	ADD ALT - LVT-1 FLOOR
C-400	FCS LAB	PC	-	-	-	-	-	ACT-1			ADD ALT - EPX FLOOR/ BASE
C-400A	STORAGE	PC	-	P-6	P-6	P-6	-	ACT-1	--	--	
C-401	PHYSICAL SCIENCE	PC	-	-	-	-	-	ACT-1	PLAM-1	EPX-2	ADD ALT - EPX-1 FLOOR / BASE
C-405	BIOLOGY	PC	-	-	-	-	-	ACT-1	PLAM-1	EPX-2	ADD ALT - EPX-1 FLOOR / BASE
D-057	MUSIC LIBRARY	LVT-1	RB-1	-	-	-	-	ACT-1	-	-	
D-058	MUSIC LIBRARY	LVT-1	RB-1	-	-	-	-	ACT-1	-	-	
D-059	INSTRUMENT STORAGE	SC	RB-1	-	-	-	-	-	-	-	
D-060	PRACTICE	LVT-1	RB-1	-	-	-	-	ACT-1	-	-	
D-061	PRACTICE	LVT-1	RB-1	-	-	-	-	ACT-1	-	-	
D-062	PRACTICE	LVT-1	RB-1	-	-	-	-	ACT-1	-	-	
D-063	PRACTICE	LVT-1	RB-1	-	-	-	-	ACT-1	-	-	
D-064	PRACTICE	LVT-1	RB-1	-	-	-	-	ACT-1	-	-	
D-065	OFFICE	LVT-1	RB-1	-	-	-	-	ACT-1	-	-	
D-066	MUSIC LIBRARY	LVT-1	-	-	-	-	-	ACT-1	-	-	
D-067	OFFICE	CPT-1	RB-1	-	-	-	-	ACT-1	-	-	
D-409	CHORUS	LVT-1	RB-1	-	-	-	-	ACT-1	-	-	ADD ALT - LVT-1 FLOOR
D-418	BAND	LVT-1	RB-1	-	-	-	-	ACT-1	-	-	
D-420	STAGE	-	-	-	-	-	-	-	-	-	
D-421	COMMONS	PC	RB-1	P-6	P-6	P-6	P-6	CLOUD - ACT-3	-	-	ADD ALT - LVT-1 FLOOR
E-036	LAUNDRY	EPX-1	EPX-1	P-6	P-6	P-6	P-6	ACT-2	-	-	ADD ALT - CT-1 / CB-1
E-037	TOILET	EPX-1	EPX-1	P-6	P-6	P-6	P-6	ACT-2	-	-	ADD ALT - CT-1 / CB-1
E-038	SENSORY	CPT-1	-	P-6	-	-	-	ACT-1	-	-	
E-039	ELECT.	-	-	-	-	-	-	-	-	-	
E-040	IT HEAD END ROOM	-	-	-	-	-	-	-	-	-	
E-100	CORRIDOR										
E-101	CORRIDOR	-	-	-	-	-	-	ACT-1	-	-	
E-105	CORRIDOR	-	-	-	-	-	-	ACT-1	-	-	
E-106	CORRIDOR	-	-	-	-	-	-	ACT-1	-	-	
E-106A	CORRIDOR	-	-	-	-	-	-	ACT-1	-	-	
E-107	CORRIDOR	-	-	-	-	-	-	ACT-1	-	-	
E-202	CORRIDOR	PC	RB-1	P-6	-	-	-	ACT-1	-	-	ADD ALT - LVT-1 FLOOR
E-203	SPECIAL EDUCATION	PC	RB-1	-	P-6	P-6	-	ACT-1	PLAM-1	PLAM-2	ADD ALT - LVT-1 FLOOR
E-204	SPECIAL EDUCATION	PC	RB-1	-	-	P-6	P-6	ACT-1	PLAM-1	PLAM-2	ADD ALT - LVT-1 FLOOR
E-205	KITCHENETTE	PC	RB-1	P-6	P-6	-	-	ACT-1	PLAM-1	PLAM-2	ADD ALT - LVT-1 FLOOR
E-206	SPECIAL EDUCATION	PC	RB-1	-	-	-	-	ACT-1	PLAM-1	PLAM-2	ADD ALT - LVT-1 FLOOR
E-207	CLASSROOM	PC	RB-1	-	-	-	-	ACT-1	PLAM-1	PLAM SHELVING	ADD ALT - LVT-1 FLOOR
E-208	CLASSROOM	PC	RB-1	-	-	-	-	ACT-1	PLAM-1	PLAM-2	ADD ALT - LVT-1 FLOOR
E-209	CLASSROOM	PC	RB-1	-	-	-	-	ACT-1	PLAM-1	PLAM-2	ADD ALT - LVT-1 FLOOR
E-216	CLASSROOM										
E-217	CLASSROOM										
E-219	FISH BOWL	CPT-1	RB-1	-	P-6	-	-	ACT-1	--	--	
E-220	HIGH SCHOOL COLLABORATION	CPT-1	RB-1	-	P-6	P-6	P-6	ACT-1	--	--	ADD ALT - LVT-1 FLOOR
E-221	CLASSROOM	PC	RB-1	P-6	P-6	P-6	P-6	ACT-1	PLAM-1	PLAM-2	ADD ALT - LVT-1 FLOOR
E-222	AT-RISK CLASSROOM	-	-	-	-	-	-	ACT-1	--	--	
E-300	STAFF ROOM	-	-	-	-	-	-	ACT-1	--	--	
E-301	CLASSROOM	PC	RB-1	P-6	P-6	P-6	P-6	ACT-1	PLAM-1	PLAM-2	ADD ALT - LVT-1 FLOOR
E-302	CLASSROOM	PC	RB-1	P-6	P-6	P-6	P-6	ACT-1	PLAM-1	PLAM-2	ADD ALT - LVT-1 FLOOR
E-303	CLASSROOM	PC	RB-1	P-6	P-6	P-6	P-6	ACT-1	PLAM-1	PLAM-2	ADD ALT - LVT-1 FLOOR
EL-1	ELEV.	NA	NA	-	-	-	-	-	-	-	FINISH SELECTION BY ARCH FROM MANUFACTURE'S FULL RANGE
F-044	GIRL'S TOILET	EPX-1	EPX-1	P-6	P-6	P-6	P-6	ACT-3	-	-	ADD ALT - CT-1 / CB-1
F-046	BOY'S TOILET	EPX-1	EPX-1	P-6	P-6	P-6	P-6	ACT-2	-	-	ADD ALT - CT-1 / CB-1
F-047	PANTRY	-	RB-1	P-6	-	-	-	-	-	PLAM-2	PLAM SHELVING
F-048	ELECTRICAL	-	-	-	-	-	-	-	-	-	
F-049	CORRIDOR	-	-	-	-	-	-	ACT-1	-	-	
F-054	TOILET	EPX-1	EPX-1	-	-	-	-	ACT-3	-	-	ADD ALT - CT-1 / CB-1
F-056	OFFICE	CPT-1	-	-	-	-	-	-	-	-	
F-100	CORRIDOR	-	-	-	-	-	-	ACT-1	-	-	
F-101	CORRIDOR	-	-	-	-	-	-	ACT-1	-	-	
F-319	STEAM LAB / WOODS	-	-	-	-	-	-	-	PLAM-1	PLAM-2	
F-319A	STORAGE	-	-	-	-	-	-	ACT-1	-	-	
F-320	FINISHING	-	-	P-6	-	-	-	ACT-3	--	--	
F-321	CLASSROOM	PC	RB-1	-	-	-	-	ACT-1	--	--	
F-326	METALS SHOP	PC	-	P-6	P-6	P-6	P-6	-	--	--	
F-326A	STORAGE	-	-	-	-	-	-	ACT-1			
F-330	ACTIVITY ROOM	-	-	-	-	-	-		PLAM-1	PLAM-2	
F-331	AG LAB	EPX-1	EPX-1	-	-	-	-	-	--	--	
F-336	CLASSROOM	-	-	-	-	-	-	-			
LL-100	VEST.	WOC-1	RB-1	P-6	-	P-7	P-6	ACT-1	-	-	
LL-101	LL-ATRIUM	PC	RB-1	P-6	P-6	P-7	P-6	-	-	-	ADD ALT - WOC-1
LL-102	CORRIDOR	PC	RB-1	P-6	P-6	P-6	P-6	ACT-1	-	-	ADD ALT - LVT-1 FLOOR
LL-103	ELEVATOR MACHINE RM.	SC	NA	-	-	-	-	-	-	-	
LL-104	FITNESS ROOM	RAT-1	RB-1	P-7	P-6	P-6	P-7	CLOUD	PLAM-1	PLAM-2	
LL-105	STORAGE	SC	NA	P-6	P-6	P-6	P-6	-			
LL-106	LOCK RM	PC	RB-1	P-6	P-6	P-6	P-6	ACT-2	-	-	ADD ALT - EPX-1 FLOOR / BASE
LL-107	STORAGE	EPX-1	EPX-1	P-6	P-6	P-6	P-6	ACT-2	-	-	
LL-108	ADA CHANGING	EPX-1	EPX-1	P-6	P-6	P-6	P-6	ACT-2	-	-	
LL-109	ADA CHANGING	EPX-1	EPX-1	P-6	P-6	P-6	P-6	ACT-2	-	-	
LL-110	PASSAGE	-	RB-1	P-6	-	P-6	-	-	-	-	
LL-119	TRAINING ROOM	PC	RB-1	P-6	P-6	P-6	P-6	ACT-2	PLAM-1	PLAM-2	
LL-120	LAUNDRY	-	-	-	-	-	-	ACT-2	-	-	ADD ALT - EPX-1 FLOOR / BASE
LL-121	WHIRLPOOL	-	RB-1	P-6	P-6	P-6	P-6	ACT-2	-	-	
LL-124	STAIRS	RST-1									
LL-141	STAIRS	RST-1									

GENERAL FINISH NOTES LEGEND

A. ROOMS NOT SHOWN ON SCHEDULE DO NOT RECEIVE ANY FINISH WORK.

B. IN ROOMS AND AREAS WHERE WORK OCCURS BUT WITH OTHERWISE NO FINISHES INDICATED, PATCH OR FINISH AREA OF WORK TO MATCH ADJACENT SURFACES.

C. SEE REFLECTED CEILING PLANS FOR CEILING TREATMENTS, SOFFIT COLORS, ETC.

D. SEE INTERIOR ELEVATIONS FOR WALL ACCENTS, ACOUSTIC PANELS, ETC.

E. SEE FLOOR PATTERN PLANS FOR FLOOR ACCENTS.

REMARKS KEY

1. ABCDEF
2. ABCDEF

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MANAWA MIDDLE/HIGH SCHOOL - ADDITIONS & ALTERATIONS
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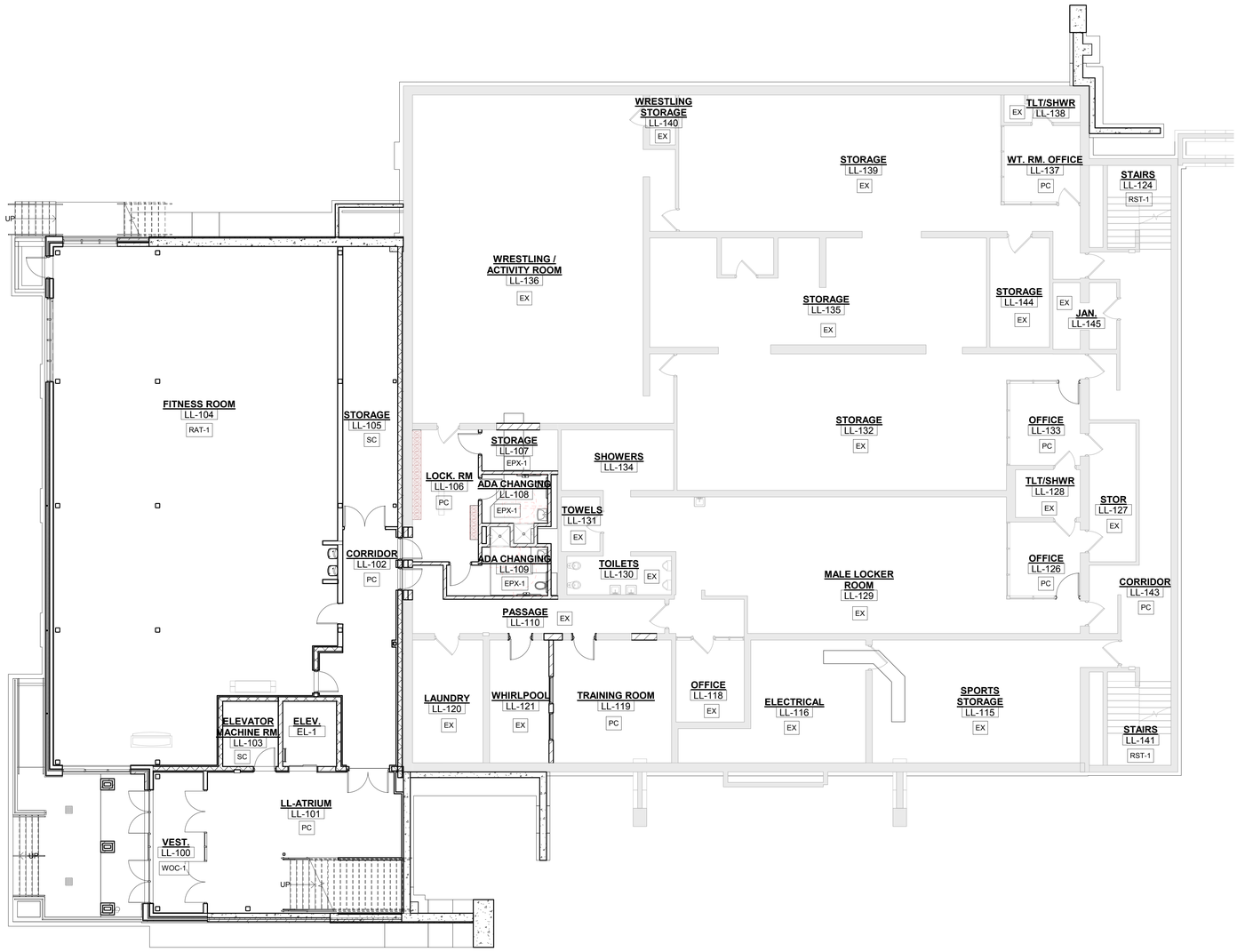
SHEET TITLE:
ROOM FINISH SCHEDULE

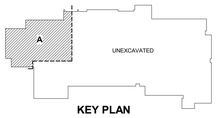
SHEET NUMBER:
2-AF-601



1 LOWER FLOOR PATTERN PLAN - AREA A

SCALE 1/8" = 1'-0"
AS REFERENCED BY: 1C / 2-AE-201

FLOORING KEY	
TAG	DESCRIPTION
CPT-1	CARPET TILE
EPX-1	EPOXY - FLUID-APPLIED
EX	EXISTING
LVT-1	VINYL TILE
PC	POLISHED CONCRETE
RAT-1	RUBBER ATHLETIC TILE
RST-1	RUBBER STAIR TREAD AND RISER
SC	SEALED CONCRETE
WOC-1	WALK-OFF CARPET TILE



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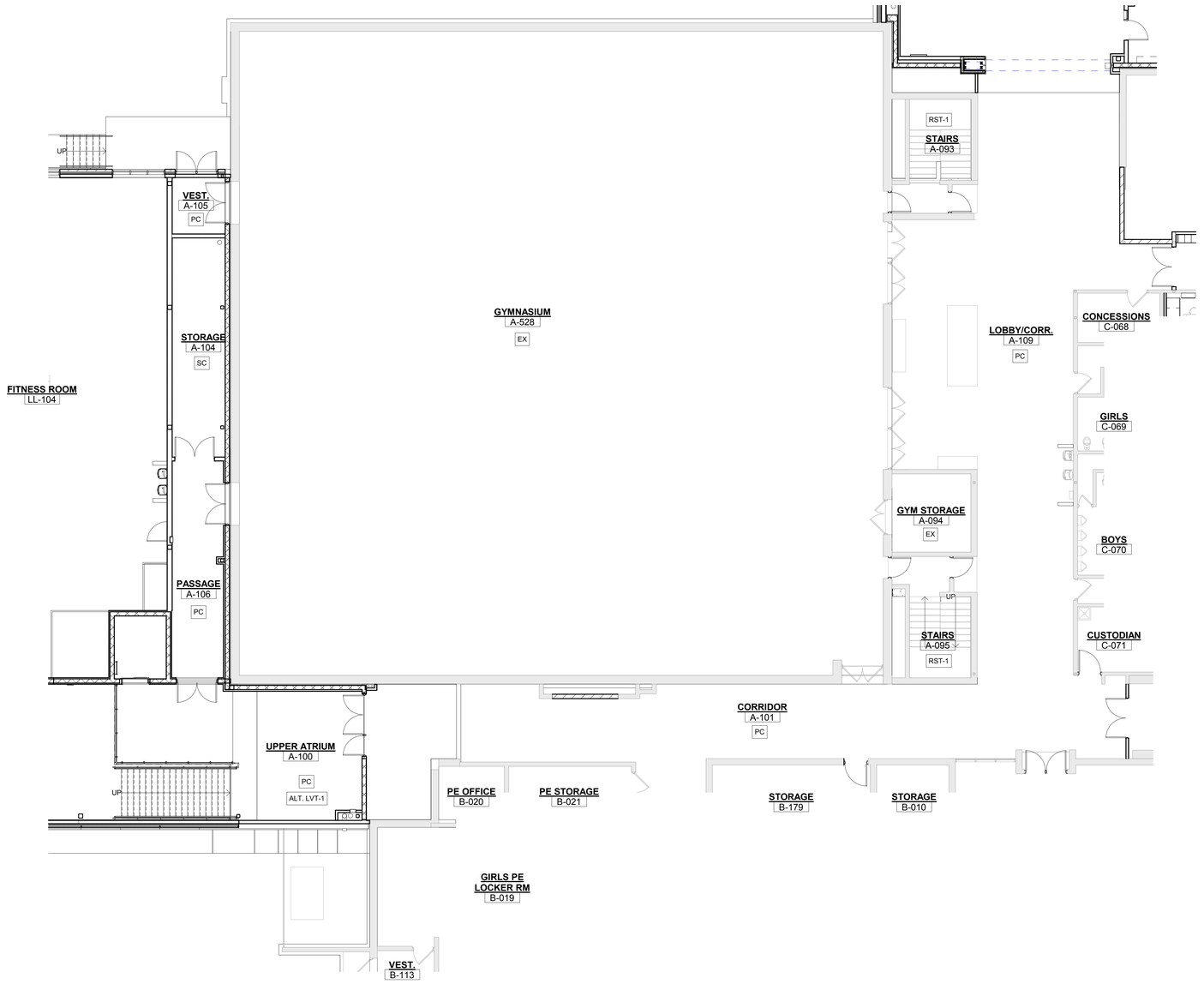
SHEET TITLE:
FLOOR PATTERN PLAN - LOWER LEVEL

SHEET NUMBER:
2-AF-801

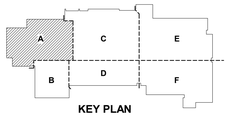


1 FIRST FLOOR PATTERN PLAN - AREA A

SCALE 1/8" = 1'-0"
AS REFERENCED BY: 2 / 2-AD-104

FLOORING KEY

TAG	DESCRIPTION
CPT-1	CARPET TILE
EPX-1	EPOXY - FLUID-APPLIED
EX	EXISTING
LVT-1	VINYL TILE
PC	POLISHED CONCRETE
RAT-1	RUBBER ATHLETIC TILE
RST-1	RUBBER STAIR TREAD AND RISER
SC	SEALED CONCRETE
WOC-1	WALK-OFF CARPET TILE



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SHEET TITLE:
FLOOR PATTERN PLAN - AREA A

SHEET NUMBER:
2-AF-802

1 FIRST FLOOR PATTERN PLAN - AREA B

SCALE 1/8" = 1'-0"
AS REFERENCED BY: 2 / 2-AD-104

FLOORING KEY	
TAG	DESCRIPTION
CPT-1	CARPET TILE
EPX-1	EPOXY - FLUID-APPLIED
EX	EXISTING
LVT-1	VINYL TILE
PC	POLISHED CONCRETE
RAT-1	RUBBER ATHLETIC TILE
RST-1	RUBBER STAIR TREAD AND RISER
SC	SEALED CONCRETE
WOC-1	WALK-OFF CARPET TILE

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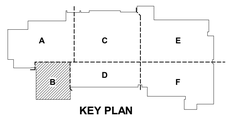
MANAWA, WI 54949



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SHEET TITLE:
FLOOR PATTERN PLAN - AREA B

SHEET NUMBER:
2-AF-803

1 FIRST FLOOR PATTERN PLAN - AREA C

SCALE 1/8" = 1'-0"
AS REFERENCED BY: 2 / 2-AD-104

FLOORING KEY	
TAG	DESCRIPTION
CPT-1	CARPET TILE
EPX-1	EPOXY - FLUID-APPLIED
EX	EXISTING
LVT-1	VINYL TILE
PC	POLISHED CONCRETE
RAT-1	RUBBER ATHLETIC TILE
RST-1	RUBBER STAIR TREAD AND RISER
SC	SEALED CONCRETE
WOC-1	WALK-OFF CARPET TILE

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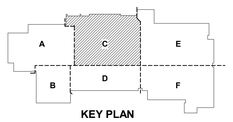
SHEET TITLE:
FLOOR PATTERN PLAN - AREA C

SHEET NUMBER:
2-AF-804



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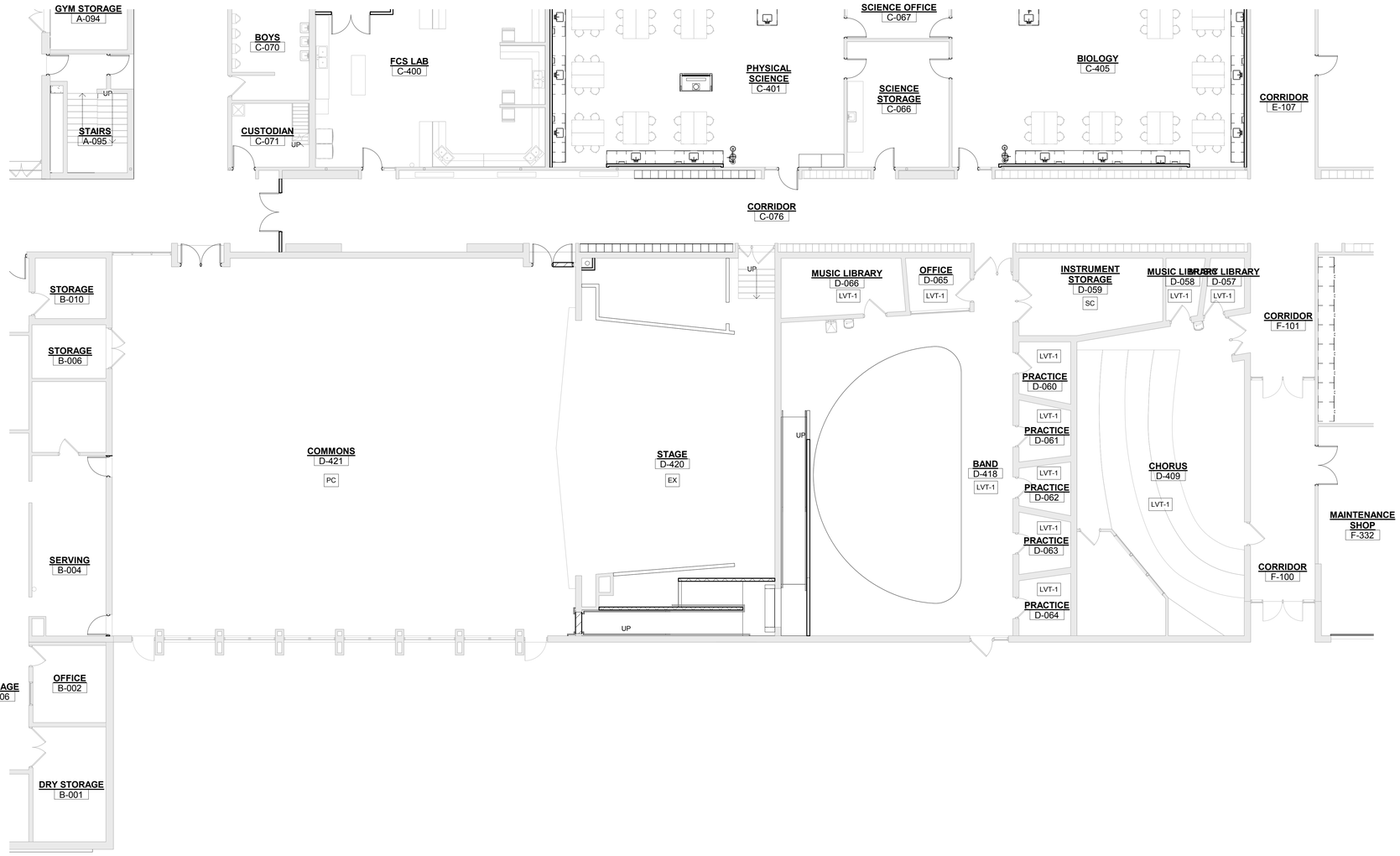

1 FIRST FLOOR PATTERN PLAN - AREA D

SCALE 1/8" = 1'-0"
AS REFERENCED BY: 2 / 2-AD-104

FLOORING KEY	
TAG	DESCRIPTION
CPT-1	CARPET TILE
EPX-1	EPOXY - FLUID-APPLIED
EX	EXISTING
LVT-1	VINYL TILE
PC	POLISHED CONCRETE
RAT-1	RUBBER ATHLETIC TILE
RST-1	RUBBER STAIR TREAD AND RISER
SC	SEALED CONCRETE
WOC-1	WALK-OFF CARPET TILE

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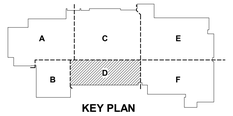
SHEET TITLE:
FLOOR PATTERN PLAN - AREA D

SHEET NUMBER:
2-AF-805



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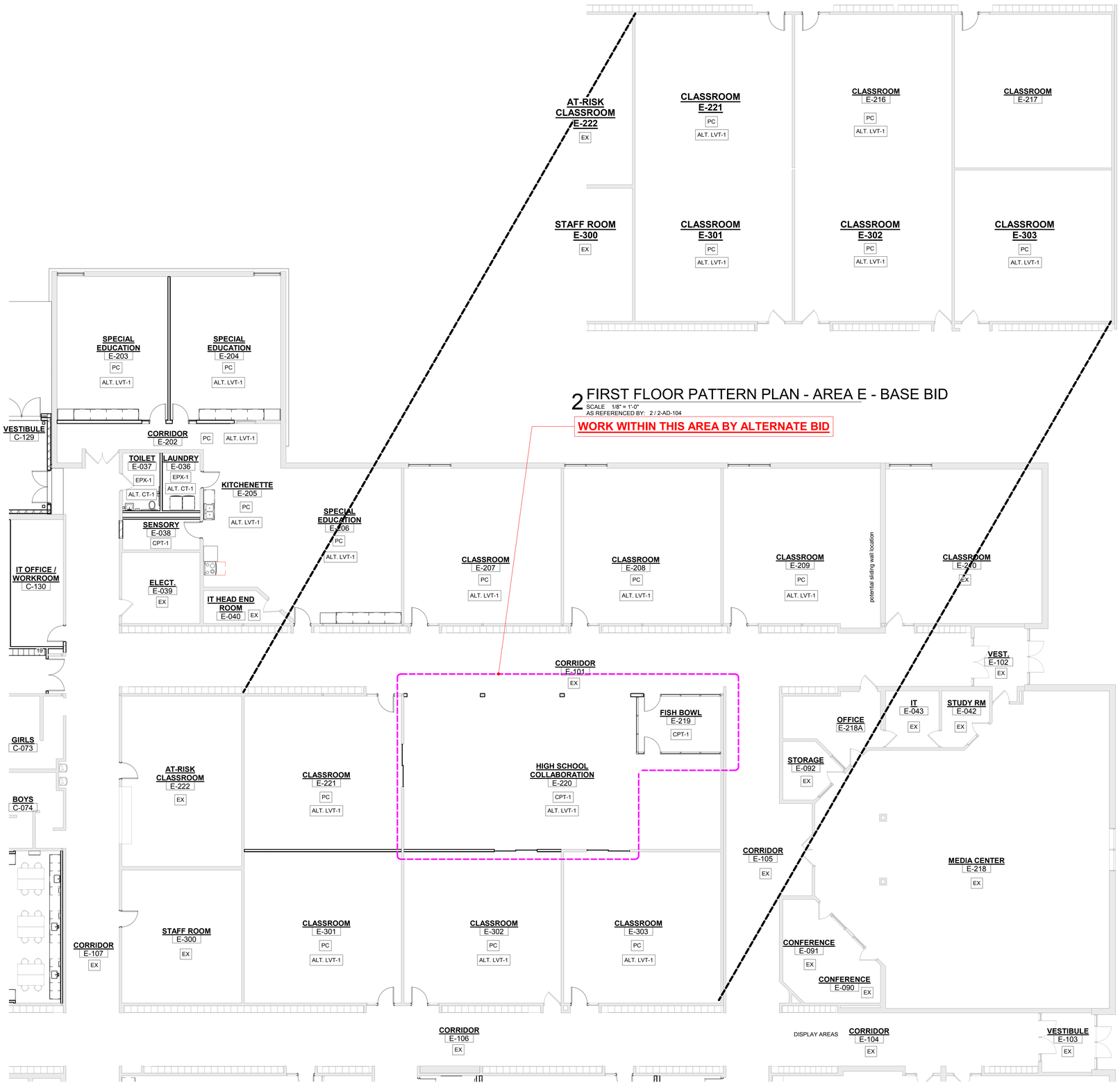

2 FIRST FLOOR PATTERN PLAN - AREA E - BASE BID

SCALE 1/8" = 1'-0"
AS REFERENCED BY: 2 / 2-AD-104

WORK WITHIN THIS AREA BY ALTERNATE BID

1 FIRST FLOOR PATTERN PLAN - AREA E

SCALE 1/8" = 1'-0"
AS REFERENCED BY: 2 / 2-AD-104

FLOORING KEY

TAG	DESCRIPTION
CPT-1	CARPET TILE
EPX-1	EPOXY - FLUID-APPLIED
EX	EXISTING
LVT-1	VINYL TILE
PC	POLISHED CONCRETE
RAT-1	RUBBER ATHLETIC TILE
RST-1	RUBBER STAIR TREAD AND RISER
SC	SEALED CONCRETE
WOC-1	WALK-OFF CARPET TILE

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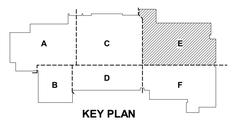
SHEET TITLE:
FLOOR PATTERN PLAN - AREA E

SHEET NUMBER:
2-AF-806



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1 FIRST FLOOR PATTERN PLAN - AREA F

SCALE 1/8" = 1'-0"
AS REFERENCED BY: 2 / 2-AD-104

FLOORING KEY	
TAG	DESCRIPTION
CPT-1	CARPET TILE
EPX-1	EPOXY - FLUID-APPLIED
EX	EXISTING
LVT-1	VINYL TILE
PC	POLISHED CONCRETE
RAT-1	RUBBER ATHLETIC TILE
RST-1	RUBBER STAIR TREAD AND RISER
SC	SEALED CONCRETE
WOC-1	WALK-OFF CARPET TILE

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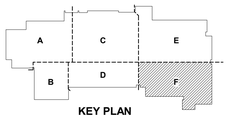

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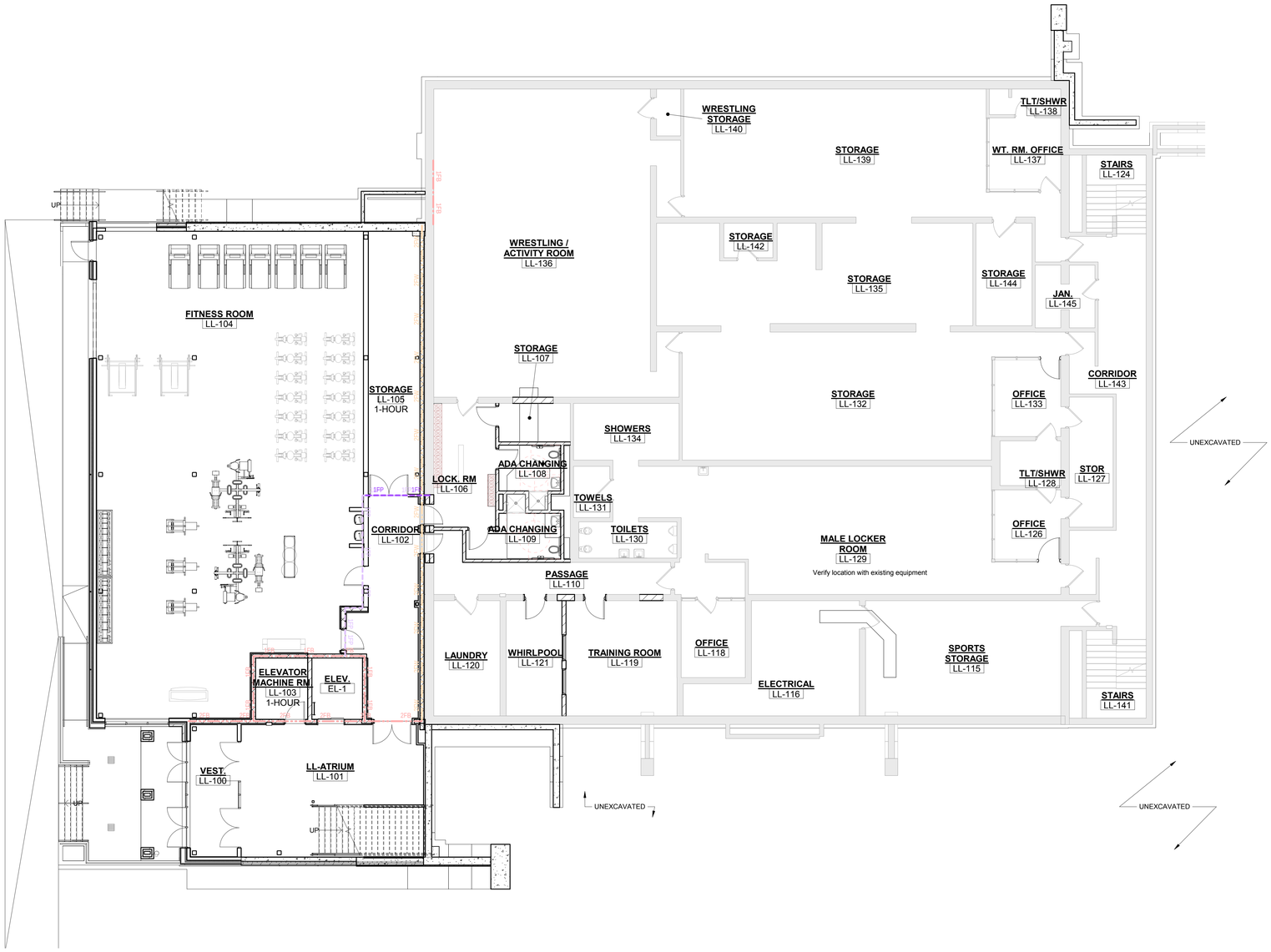
SHEET TITLE:
FLOOR PATTERN PLAN - AREA F

SHEET NUMBER:
2-AF-807



1 LOWER FLOOR PLAN - AREA A

SCALE 1/8" = 1'-0"
AS REFERENCED BY: 1C / 2-AE-201

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SHEET TITLE:
EQUIPMENT PLAN - AREA A LOWER LEVEL

SHEET NUMBER:
2-AF-901

GENERAL NOTES - DEMOLITION

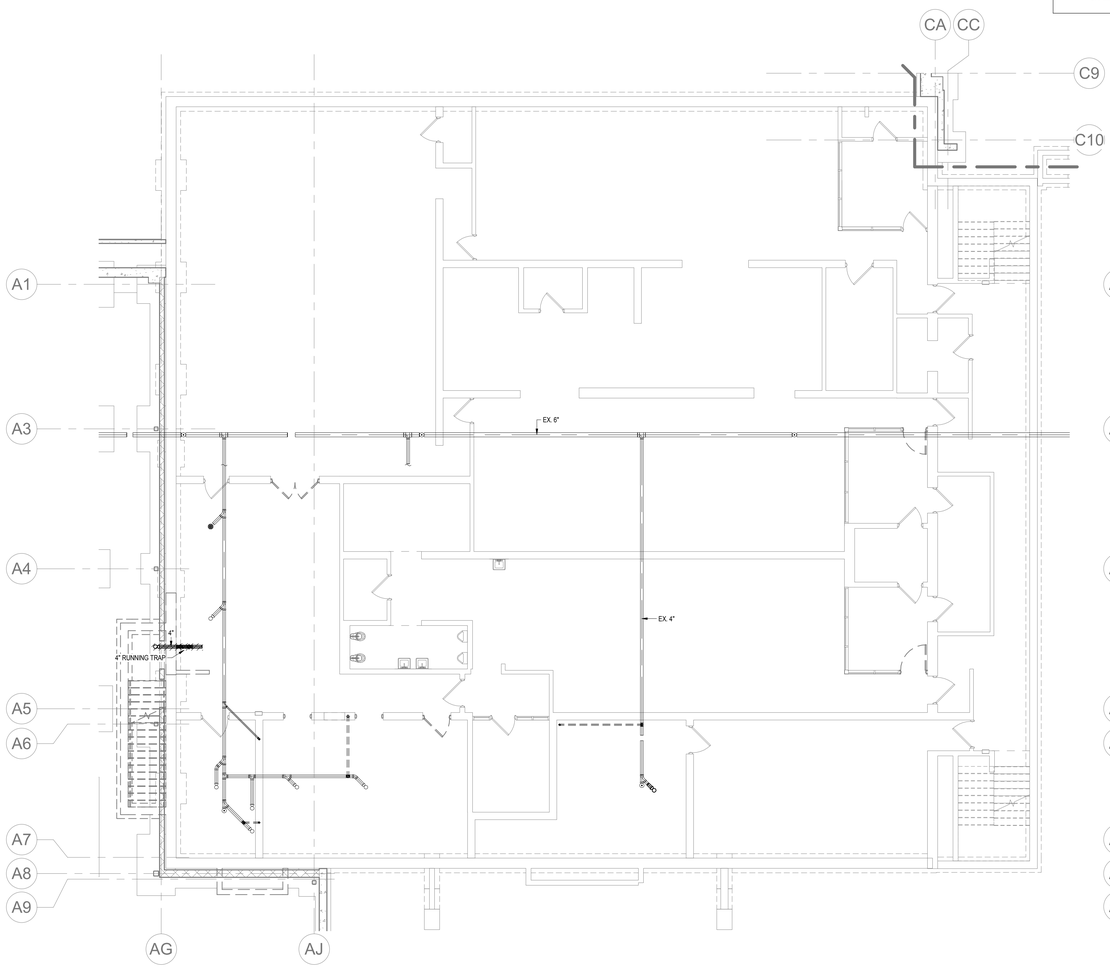
1. THE EXTENT OF THE EXISTING PIPING, VALVES, EQUIPMENT, ETC MAY NOT BE SHOWN IN ITS ENTIRETY. EXISTING PIPING SHOWN ON PLANS WAS TAKEN FROM EXISTING PLANS AND IS APPROXIMATE. FIELD VERIFY EXACT SIZE, LOCATION, AND CONFIGURATION OF EXISTING PIPING.
2. IT IS THE INTENT OF THESE DOCUMENTS THAT FIXTURES DESIGNATED TO BE REMOVED SHALL INCLUDE THE REMOVAL OF ALL INCIDENTAL BRANCH PIPING SERVING THAT FIXTURE OR FIXTURES.
3. FIELD VERIFY ALL PLUMBING EQUIPMENT, FIXTURES AND ASSOCIATED PIPING, ETC. TO BE REMOVED.
4. NO PIPING SHALL BE ABANDONED IN PLACE. ALL UNUSED EXISTING PIPING SHALL BE REMOVED.

PLUMBING DEMO LEGEND

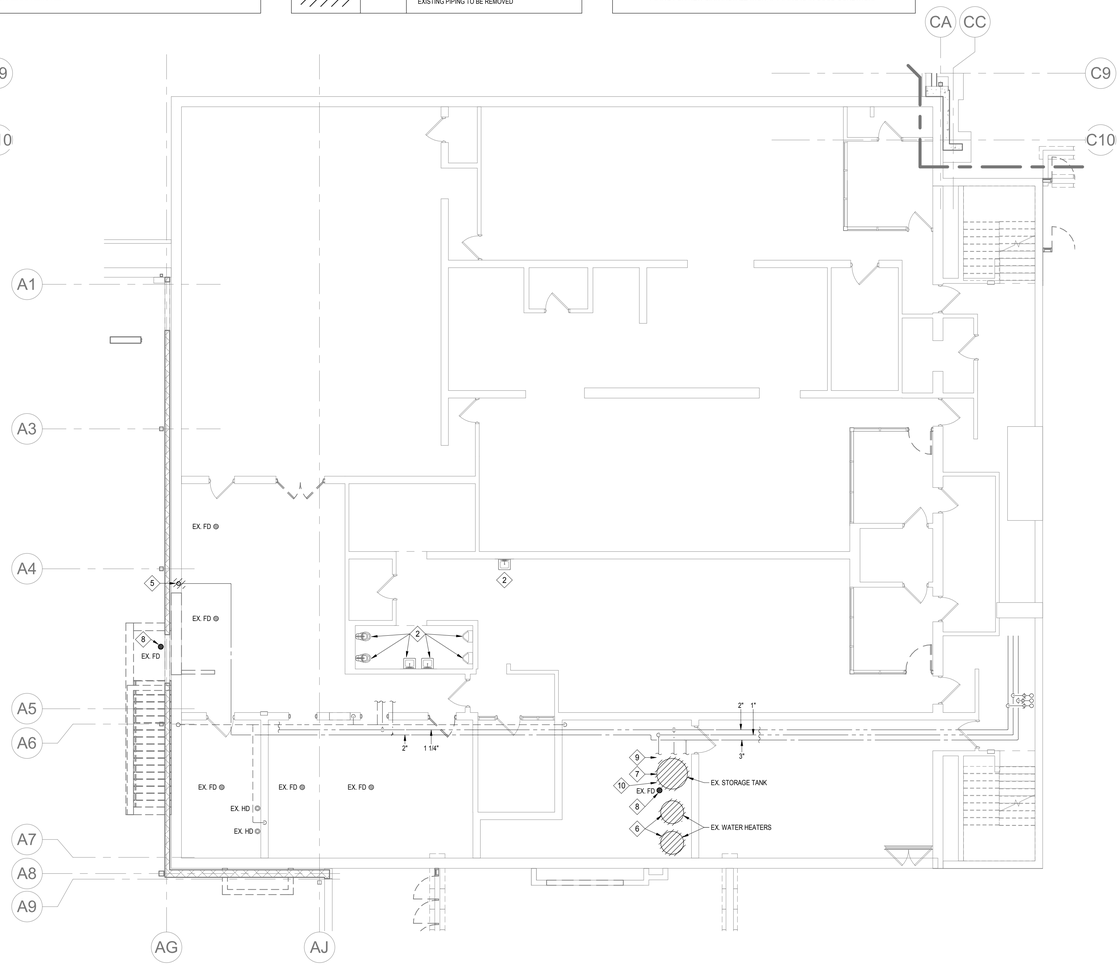
SYMBOL	ABBR.	DESCRIPTION
	CW	EXISTING COLD WATER PIPING
	HW	EXISTING HOT WATER PIPING
	HWR	EXISTING HOT WATER RETURN PIPING
	W	EXISTING SANITARY PIPING ABOVE GROUND
	W	EXISTING SANITARY PIPING BELOW GROUND
	V	EXISTING SANITARY VENT PIPING ABOVE GROUND
	V	EXISTING SANITARY VENT PIPING BELOW GROUND
	ST	EXISTING STORM PIPING ABOVE GROUND
	ST	EXISTING STORM PIPING BELOW GROUND
		EXISTING PIPING TO BE REMOVED

KEYED DEMOLITION NOTES:

1. EXISTING PLUMBING FIXTURE AND ASSOCIATED PIPING TO BE REMOVED TO BELOW FLOOR, ABOVE CEILING TO STRUCTURE, AND CAPPED OR PLUGGED.
2. EXISTING PLUMBING FIXTURE TO REMAIN.
3. EXISTING PIPING TO BE REMOVED.
4. EXISTING PIPING TO REMAIN.
5. EXISTING WALL HYDRANT TO BE REMOVED.
6. EXISTING WATER HEATER AND ALL ASSOCIATED PIPING TO BE REMOVED.
7. EXISTING STORAGE TANK AND ALL ASSOCIATED PIPING TO BE REMOVED.
8. EXISTING FLOOR DRAIN TO BE REMOVED. CAP PIPING BELOW SLAB.
9. EXISTING TANK CIRC PUMP AND ALL ASSOCIATED PIPING TO BE REMOVED.
10. EXISTING HWR CIRC PUMP AND ALL ASSOCIATED PIPING TO BE REMOVED.
11. EXISTING EEWSH TO BE REMOVED AND RELOCATED.
12. EXISTING SINK, SUPPLIES, STOPS, AND TRAP TO BE REMOVED. SAVE BRANCH PIPING FOR NEW SINK INSTALLATION, IF PIPING IS IN GOOD CONDITION.



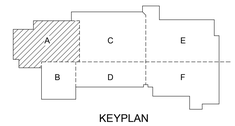
1 LOWER LEVEL FOUNDATION PLUMBING DEMOLITION PLAN - AREA A
1/8" = 1'-0"



2 LOWER LEVEL PLUMBING DEMOLITION PLAN - AREA A
1/8" = 1'-0"

PLUMBING SHEET INDEX

2-PD-101	LOWER LEVEL PLUMBING DEMOLITION PLANS - AREA A
2-PD-103	FIRST FLOOR PLUMBING DEMOLITION PLAN - AREA C
2-PD-104	FIRST FLOOR PLUMBING DEMOLITION PLAN - AREA D
2-PD-106	FIRST FLOOR PLUMBING DEMOLITION PLAN - AREA F
2-PL-001	FOUNDATION PLUMBING PLAN - AREA A
2-PL-003	FOUNDATION PLUMBING PLAN - AREA C
2-PL-005	FOUNDATION PLUMBING PLAN - AREA E
2-PL-006	FOUNDATION PLUMBING PLAN - AREA F
2-PL-100	LOWER LEVEL PLUMBING PLAN - AREA A
2-PL-103	FIRST FLOOR PLUMBING PLAN - AREA C
2-PL-104	FOUNDATION & FIRST FLOOR PLUMBING PLANS - AREA D
2-PL-105	FIRST FLOOR PLUMBING PLAN - AREA E
2-PL-106	FIRST FLOOR PLUMBING PLAN - AREA F
2-PL-200	WASTE AND VENT PIPING ISOMETRICS
2-PL-201	WASTE AND VENT PIPING ISOMETRICS
2-PL-300	WATER PIPING ISOMETRICS
2-PL-301	WATER PIPING ISOMETRICS



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CONSULTANT:
HARWOOD ENGINEERING CONSULTANTS, LTD
255 North 21st Street Milwaukee Wisconsin 53233
414.902.5045 | 414.902.5050 | www.harwoodeng.com
HEC Project Number 19-1004.00

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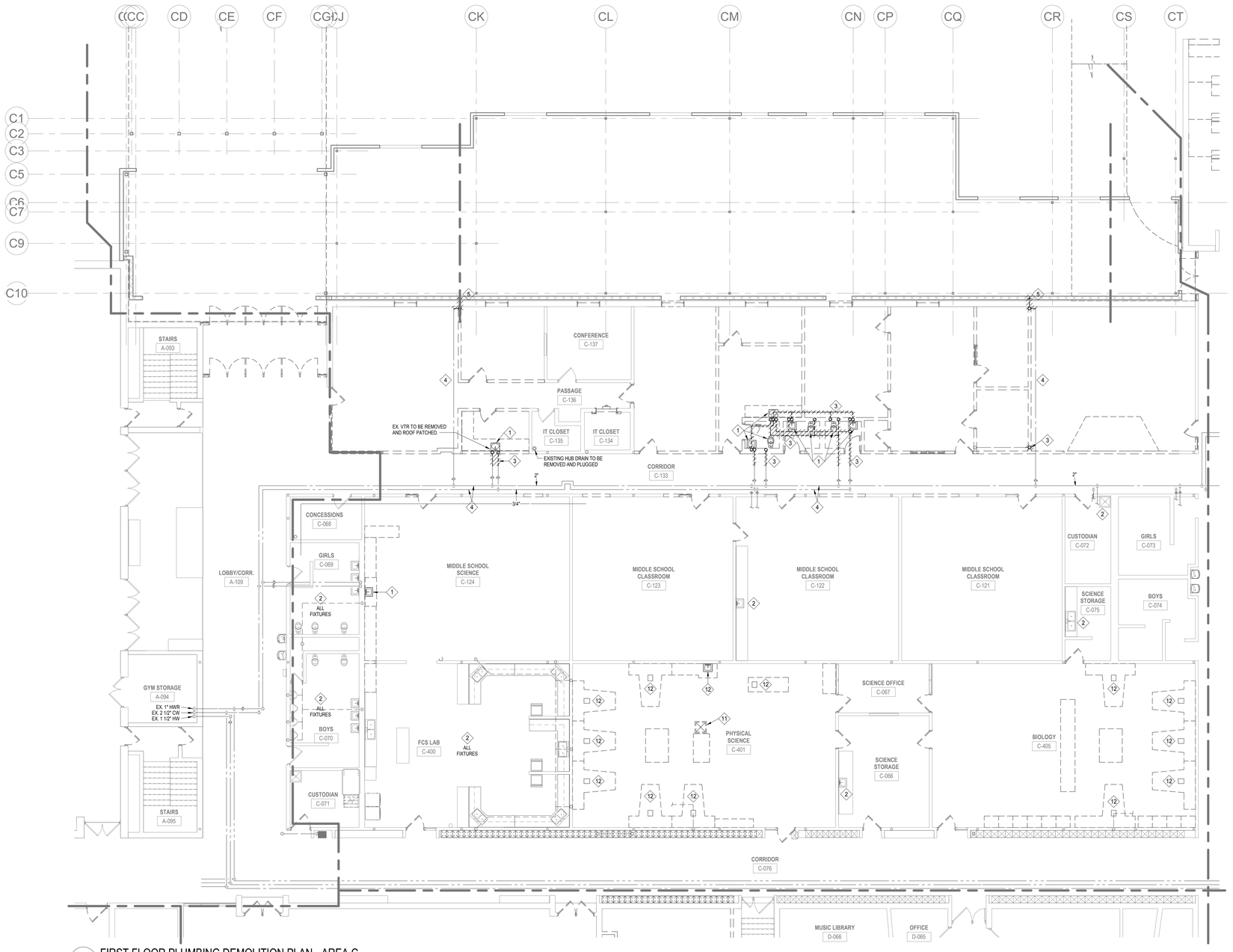
SHEET TITLE:
LOWER LEVEL PLUMBING DEMOLITION PLANS - AREA A

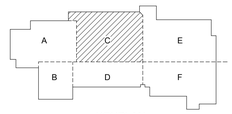
SHEET NUMBER:
2-PD-101



1 FIRST FLOOR PLUMBING DEMOLITION PLAN - AREA C
1/8" = 1'-0"

KEYED DEMOLITION NOTES:

1. EXISTING PLUMBING FIXTURE AND ASSOCIATED PIPING TO BE REMOVED TO BELOW FLOOR, ABOVE CEILING TO STRUCTURE, AND CAPPED OR PLUGGED.
2. EXISTING PLUMBING FIXTURE TO REMAIN.
3. EXISTING PIPING TO BE REMOVED.
4. EXISTING PIPING TO REMAIN.
5. EXISTING WALL HYDRANT TO BE REMOVED.
6. EXISTING WATER HEATER AND ALL ASSOCIATED PIPING TO BE REMOVED.
7. EXISTING STORAGE TANK AND ALL ASSOCIATED PIPING TO BE REMOVED.
8. EXISTING FLOOR DRAIN TO BE REMOVED. CAP PIPING BELOW SLAB.
9. EXISTING TANK CIRC PUMP AND ALL ASSOCIATED PIPING TO BE REMOVED.
10. EXISTING HWR CIRC PUMP AND ALL ASSOCIATED PIPING TO BE REMOVED.
11. EXISTING EEWISH TO BE REMOVED AND RELOCATED.
12. EXISTING SINK, SUPPLIES, STOPS, AND TRAP TO BE REMOVED. SAVE BRANCH PIPING FOR NEW SINK INSTALLATION, IF PIPING IS IN GOOD CONDITION.



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MANAWA ELEMENTARY SCHOOL - ALTERATIONS
MANAWA MIDDLE/HIGH SCHOOL - ADDITIONS & ALTERATIONS
PART 2 - MANAWA MIDDLE / HIGH SCHOOL
800 BEECH STREET
MANAWA, WI 54949

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ISSUED:	06/06/2019
PROJECT NO:	Project Number
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CHECKED BY:	SG

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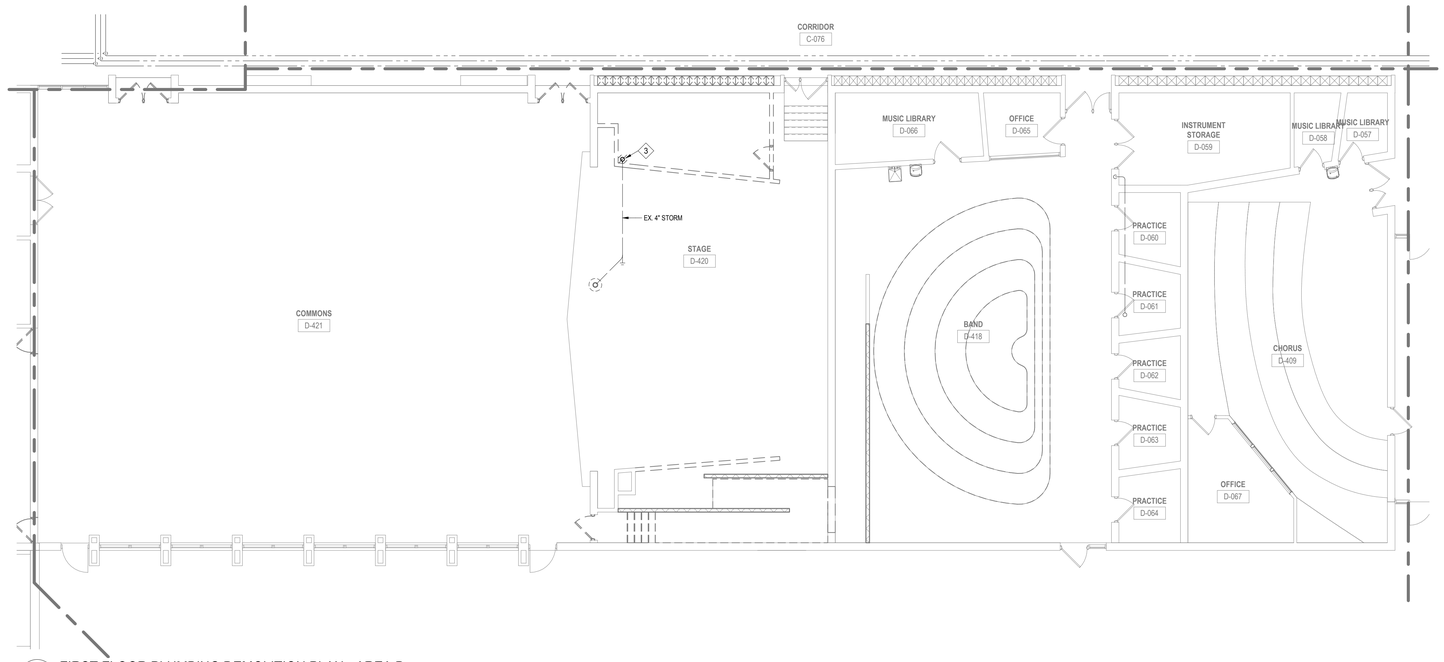
SHEET TITLE:
FIRST FLOOR PLUMBING DEMOLITION PLAN - AREA C

SHEET NUMBER:
2-PD-103



1 FIRST FLOOR PLUMBING DEMOLITION PLAN - AREA D
1/8" = 1'-0"

KEYED DEMOLITION NOTES:

1. EXISTING PLUMBING FIXTURE AND ASSOCIATED PIPING TO BE REMOVED TO BELOW FLOOR, ABOVE CEILING TO STRUCTURE, AND CAPPED OR PLUGGED.
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5. EXISTING WALL HYDRANT TO BE REMOVED.
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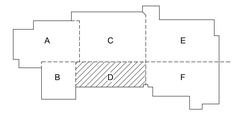

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MANAWA, WI 54949

MARK	DATE

ISSUED: 06/06/2019

PROJECT NO: Project Number

CAD DWG FILE:

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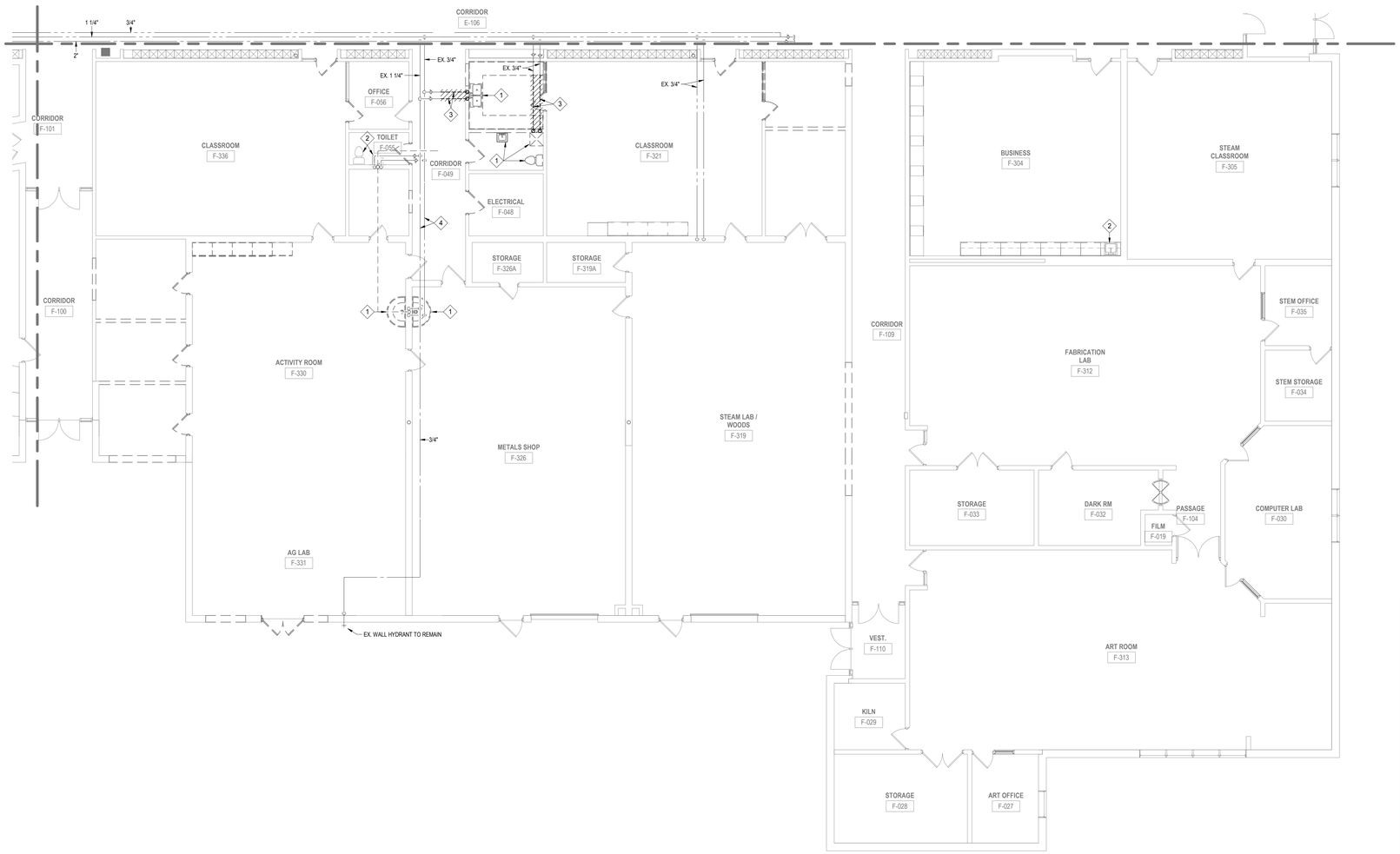
SHEET TITLE:
FIRST FLOOR PLUMBING DEMOLITION PLAN - AREA D

SHEET NUMBER:
2-PD-104



1 FIRST FLOOR PLUMBING DEMOLITION PLAN - AREA F

1/8" = 1'-0"

KEYED DEMOLITION NOTES:

1. EXISTING PLUMBING FIXTURE AND ASSOCIATED PIPING TO BE REMOVED TO BELOW FLOOR, ABOVE CEILING TO STRUCTURE, AND CAPPED OR PLUGGED.
2. EXISTING PLUMBING FIXTURE TO REMAIN.
3. EXISTING PIPING TO BE REMOVED.
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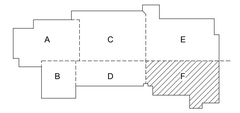

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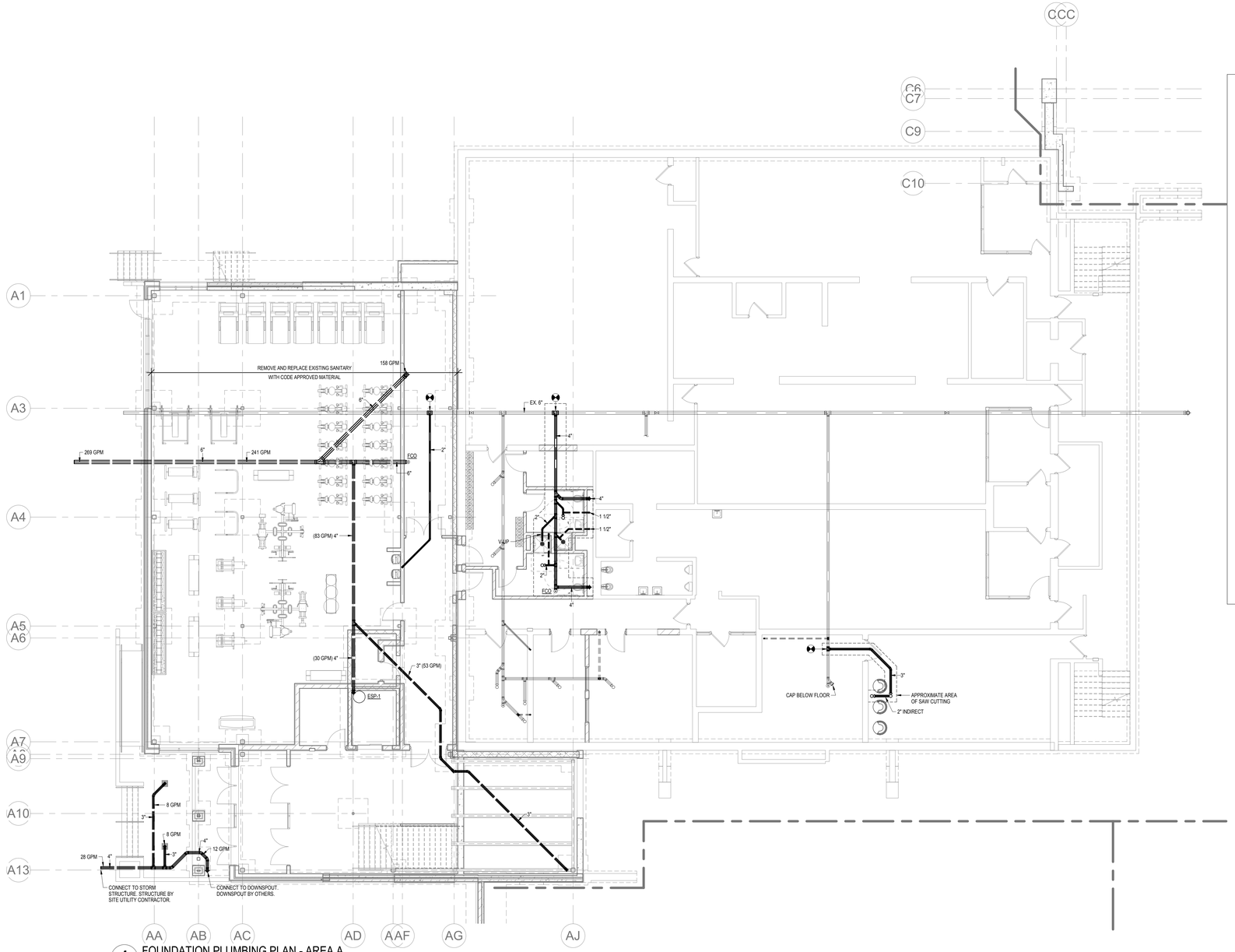
SHEET TITLE:
FIRST FLOOR PLUMBING DEMOLITION PLAN - AREA F

SHEET NUMBER:
2-PD-106



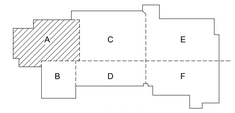
1 FOUNDATION PLUMBING PLAN - AREA A
1/8" = 1'-0"

GENERAL PLUMBING NOTES:

1. DRAWINGS OF ALL OTHER TRADES SHALL BE REVIEWED. THIS CONTRACTOR SHALL COORDINATE THE INSTALLATION AND SCHEDULING OF HIS WORK WITH OTHER TRADES TO PREVENT INTERFERENCE WITH THEIR RESPECTIVE INSTALLATIONS.
2. REFER TO ARCHITECTURAL DRAWINGS FOR EXACT LOCATION OF ALL PLUMBING FIXTURES, EQUIPMENT, STRUCTURAL DIMENSIONS, AND LAYOUT.
3. DEVIATIONS FROM THE ROUTING OF NEW PIPING SHOWN MAY BE NECESSARY IN ORDER TO CLEAR WORK OF OTHER TRADES. HOWEVER, ALL SUCH DEVIATIONS SHALL BE PREVIOUSLY APPROVED BY THE ARCHITECT/ENGINEER.
4. ALL SANITARY, STORM, AND CLEAR WATER WASTE PIPING SHALL BE PITCHED AS FOLLOWS: PIPING 2" AND SMALLER AT 1/4"/FT, PIPING 3" AND LARGER AT 1/8"/FT UNLESS OTHERWISE NOTED.
5. PENETRATIONS THROUGH FLOORS AND WALLS SHALL BE SEALED WITH A U.L. LISTED SYSTEM OF MATERIAL THAT MEETS OR EXCEEDS THE FIRE RATING OF THE WALL OR FLOOR PENETRATED. THIS SHALL INCLUDE, BUT NOT BE LIMITED TO, NEW OPENINGS OR EXISTING OPENINGS MADE OBSOLETE BY THE REMOVAL OF EXISTING PLUMBING PIPING.
6. INSTALL ALL INTERIOR HORIZONTAL STORM, WATER, WASTE, AND VENT PIPING AS HIGH AS POSSIBLE. ALL HORIZONTAL PIPING LOCATED ABOVE CEILINGS SHALL BE INSTALLED WITHIN THE JOIST SPACE UNLESS OTHERWISE INDICATED.
7. INSTALL CLEANOUT AT THE BASE OF ALL ROOF CONDUCTORS AND WASTE STACKS. ALL CLEANOUTS SHALL BE INSTALLED WHERE EASILY ACCESSIBLE. COORDINATE ALL CLEANOUT LOCATIONS WITH ALL EQUIPMENT, CABINETS, ETC. PRIOR TO INSTALLATION.
8. ALL WORK SHALL BE PERFORMED AND INSTALLED IN COMPLIANCE WITH THE WISCONSIN PLUMBING CODE AND ALL OTHER APPLICABLE CODES AS ADOPTED BY THE LOCAL INSPECTING AUTHORITIES. ALL PLUMBING FIXTURES AND EQUIPMENT SHALL COMPLY WITH THE WISCONSIN PLUMBING CODE SPS 384.
9. SAW CUTTING, REMOVAL, AND REPLACEMENT OF EXISTING FLOOR SLAB FOR THE INSTALLATION OF NEW PLUMBING WORK IS THE RESPONSIBILITY OF THIS CONTRACTOR. NEW FLOOR CONSTRUCTION SHALL MATCH EXISTING.
10. SAW CUTTING, REMOVAL, AND REPLACEMENT OF EXISTING SIDEWALKS, ROADS, PAVEMENT, ETC. FOR THE INSTALLATION OF NEW PLUMBING WORK IS THE RESPONSIBILITY OF THIS CONTRACTOR.
11. ALL SLEEVES THROUGH CONCRETE FRAMING REQUIRED FOR THE INSTALLATION OF PLUMBING WORK SHALL BE THE RESPONSIBILITY OF THIS CONTRACTOR.
12. CORE-DRILLING OR SLEEVING THROUGH BEAMS, JOISTS, OR BRIDGING SHALL NOT BE PERMITTED UNLESS SPECIFICALLY SHOWN ON STRUCTURAL DRAWINGS. INCLUDE SUFFICIENT ALLOWANCES FOR OFFSETS OF PIPING TO CLEAR STRUCTURAL MEMBERS.
13. TRAPS AT ALL SINKS AND LAVATORIES SHALL BE INSTALLED STRAIGHT BACK TO THE WALL WITH ALL PIPING OFFSETS LOCATED WITHIN THE WALL.
14. LOCATE ALL VENT TERMINALS A MINIMUM OF 10'-0" FROM ANY OUTSIDE AIR INTAKES.
15. ALL VALVES, SHOCK ARRESTORS, ETC. SHOWN IN WALLS OR ABOVE NON-ACCESSIBLE CEILINGS SHALL BE CENTRALLY LOCATED BEHIND ACCESS PANELS.
16. REFER TO PIPING ISOMETRICS FOR SIZES NOT SHOWN ON PLANS.
17. REMOVAL AND REPLACEMENT OF EXISTING CEILINGS REQUIRED FOR THE INSTALLATION OF PLUMBING SHALL BE THE RESPONSIBILITY OF THE PLUMBING CONTRACTOR. CEILING CONSTRUCTION AND FINISH SHALL MATCH EXISTING.
18. PLUMBING CONTRACTOR SHALL REMOVE & RE-ATTACH EXISTING SYSTEM ITEMS TO JOIST OR STRUCTURE TO ALLOW ALL THE WOOD BLOCKING/FRAMING TO BE REMOVED.

PLUMBING LEGEND

SYMBOL	ABBR.	DESCRIPTION
	CW	COLD WATER PIPING
	CW	COLD WATER PIPING BELOW GROUND
	HW	HOT WATER PIPING
	HW	HOT WATER PIPING BELOW GROUND
	HWR	HOT WATER RETURN PIPING
	W	SANITARY PIPING ABOVE GROUND
	W	SANITARY PIPING BELOW GROUND
	V	SANITARY VENT PIPING ABOVE GROUND
	V	SANITARY VENT PIPING BELOW GROUND
	ST	STORM PIPING ABOVE GROUND
	ST	STORM PIPING BELOW GROUND
	G	GAS PIPING
	UP	PIPING UP
	DN	PIPING DOWN
	C.O.	CLEANOUT
	HB / WH	HOSE BIBB / WALL HYDRANT
	FCO	FLOOR CLEANOUT
		BALANCING VALVE
		BALL VALVE
		BUTTERFLY VALVE
		CHECK VALVE
	FD	FLOOR DRAIN
	HD	HUB DRAIN OR SITE DRAIN
	RD	ROOF DRAIN
IE=00.00'	I.E.	INVERT ELEVATION
		POINT OF CONNECTION OF NEW PIPING TO EXISTING
		SHOCK ARRESTOR
		FIXTURE UNIT TAGS
	EWC	ELECTRIC WATER COOLER
	WC	WATER CLOSET
	LAV / Lr	LAVATORY
	MB	MOP BASIN
	SINK / Sr	SINK
	UR	URINAL
	SH	SHOWER



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800 BEECH STREET
MANAWA, WI 54949

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PROJECT NO:	Project Number
CAD DWG FILE:	
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CHECKED BY:	SG

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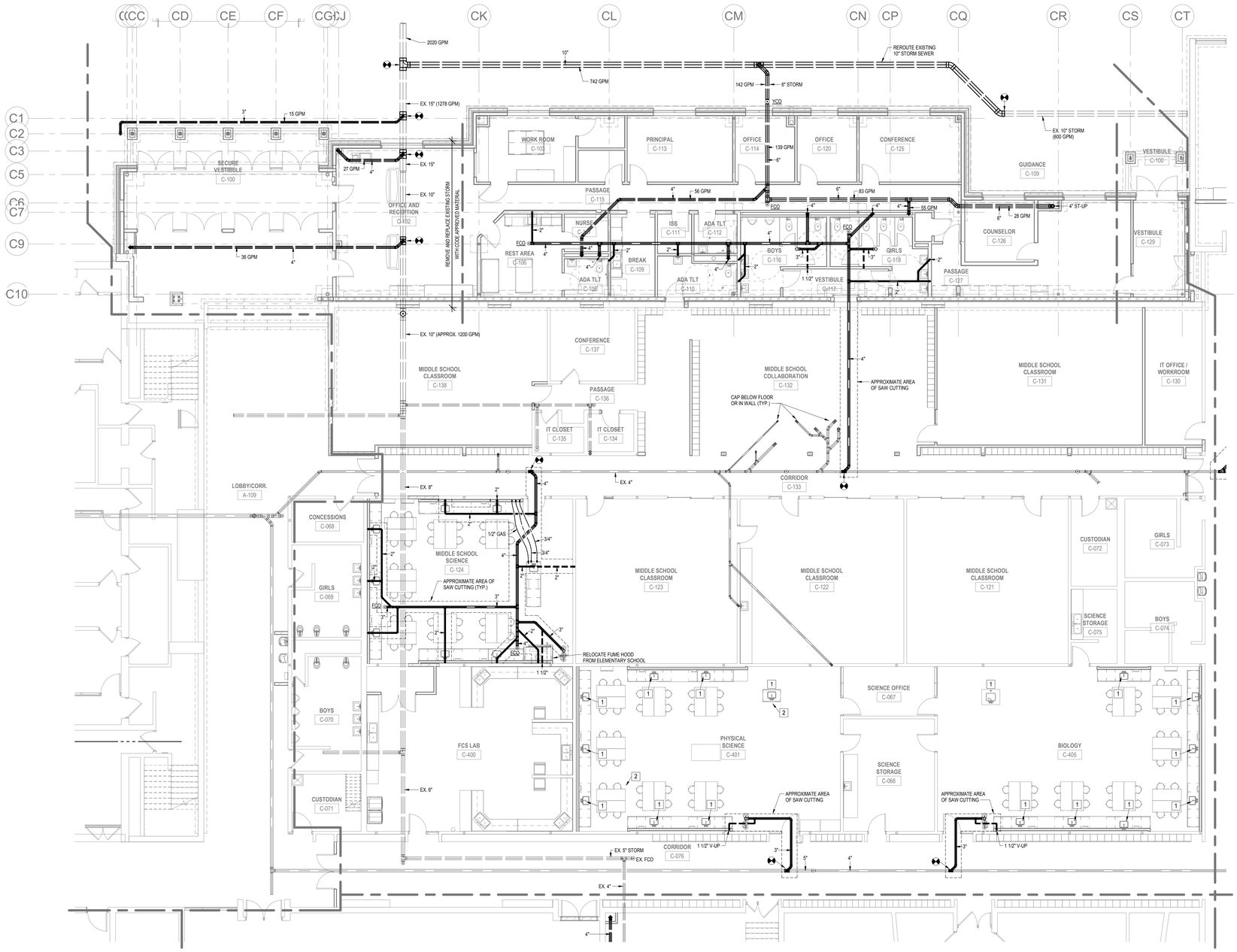
SHEET TITLE:
FOUNDATION PLUMBING PLAN - AREA A

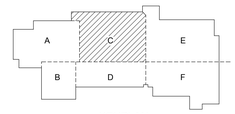
SHEET NUMBER:
2-PL-001



1 FOUNDATION PLUMBING PLAN - AREA C
1/8" = 1'-0"

NEW PLUMBING WORK KEYED NOTES:

1. CONNECT NEW LAB SINK TO EXISTING SANITARY, WATER, VENT, AND GAS. RECONFIGURE EXISTING ROUGH-IN LOCATIONS OF SANITARY, WATER, AND VENT AS REQUIRED TO MAKE FINAL CONNECTIONS TO LAB SINK, FAUCET, AND GAS OUTLET.
2. RELOCATE MASTER GAS SHUT-OFF TO TEACHER STATION. REMOVE EXISTING SHUT-OFF FROM ABOVE CEILING.
3. EXISTING PVC ROOF CONDUCTORS SHALL BE WRAPPED WITH PLENUM RATED INSULATION EQUAL TO 3M FIRE BARRIER WRAP 5A+



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HEC Project Number: 19-1004.00

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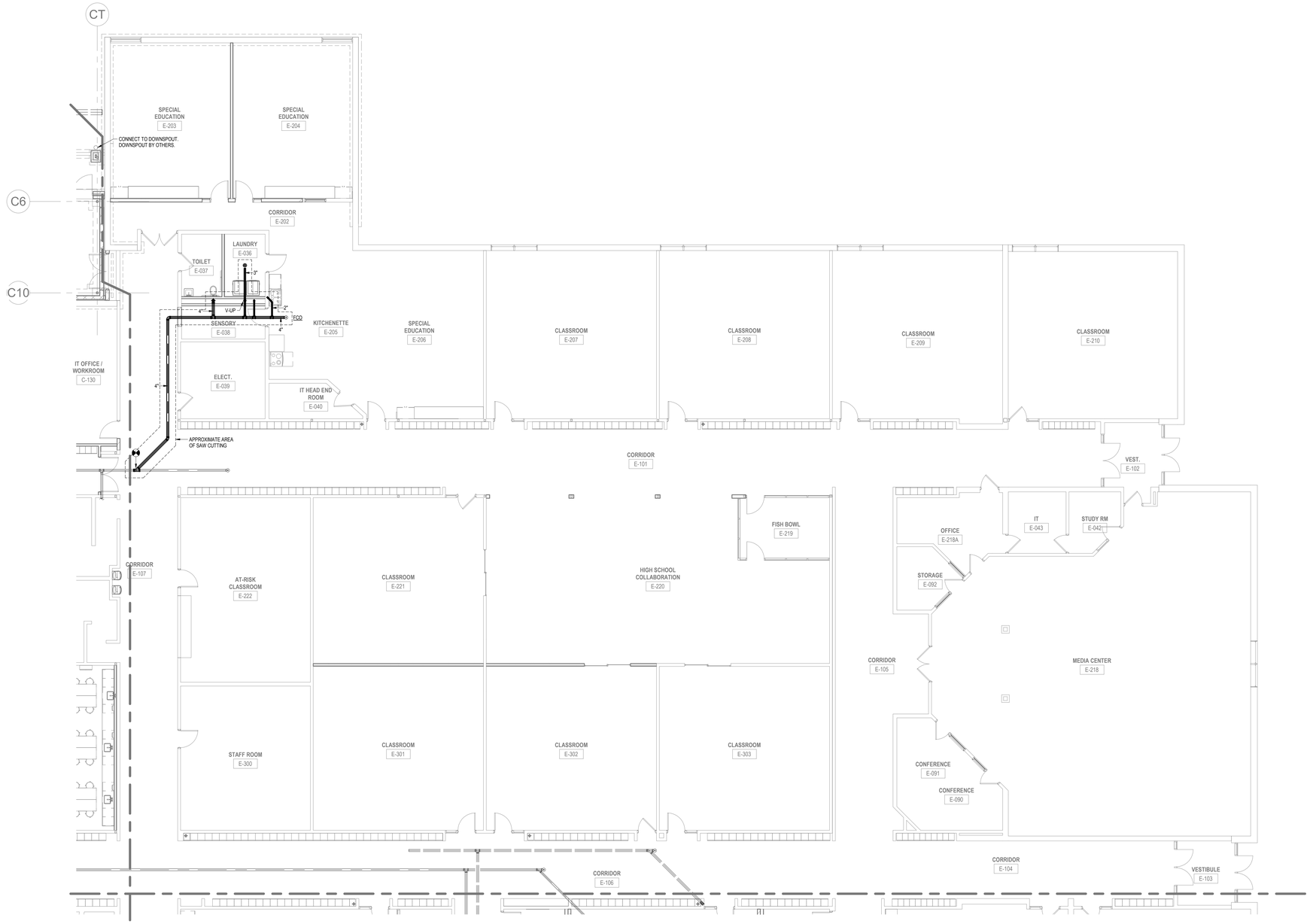
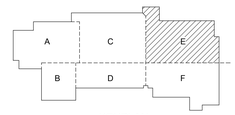
SHEET TITLE:
FOUNDATION PLUMBING PLAN - AREA C

SHEET NUMBER:
2-PL-003



1 FOUNDATION PLUMBING PLAN - AREA E
1/8" = 1'-0"



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SHEET TITLE:
FOUNDATION PLUMBING PLAN - AREA E

SHEET NUMBER:
2-PL-005

Schier Grease Interceptor Sizing

	Qty	Length	Width	Depth	Gallons
Sink 1	1	16.00	20.00	14.00	14.55
Sink 2					0.00
Sink 3					0.00
Sink 4					0.00
Sink 5					0.00

Total Gallons from sinks 14.55

	Qty	Diameter	Depth	
WOK				0.00

Holding capacity of other fixtures 0.00

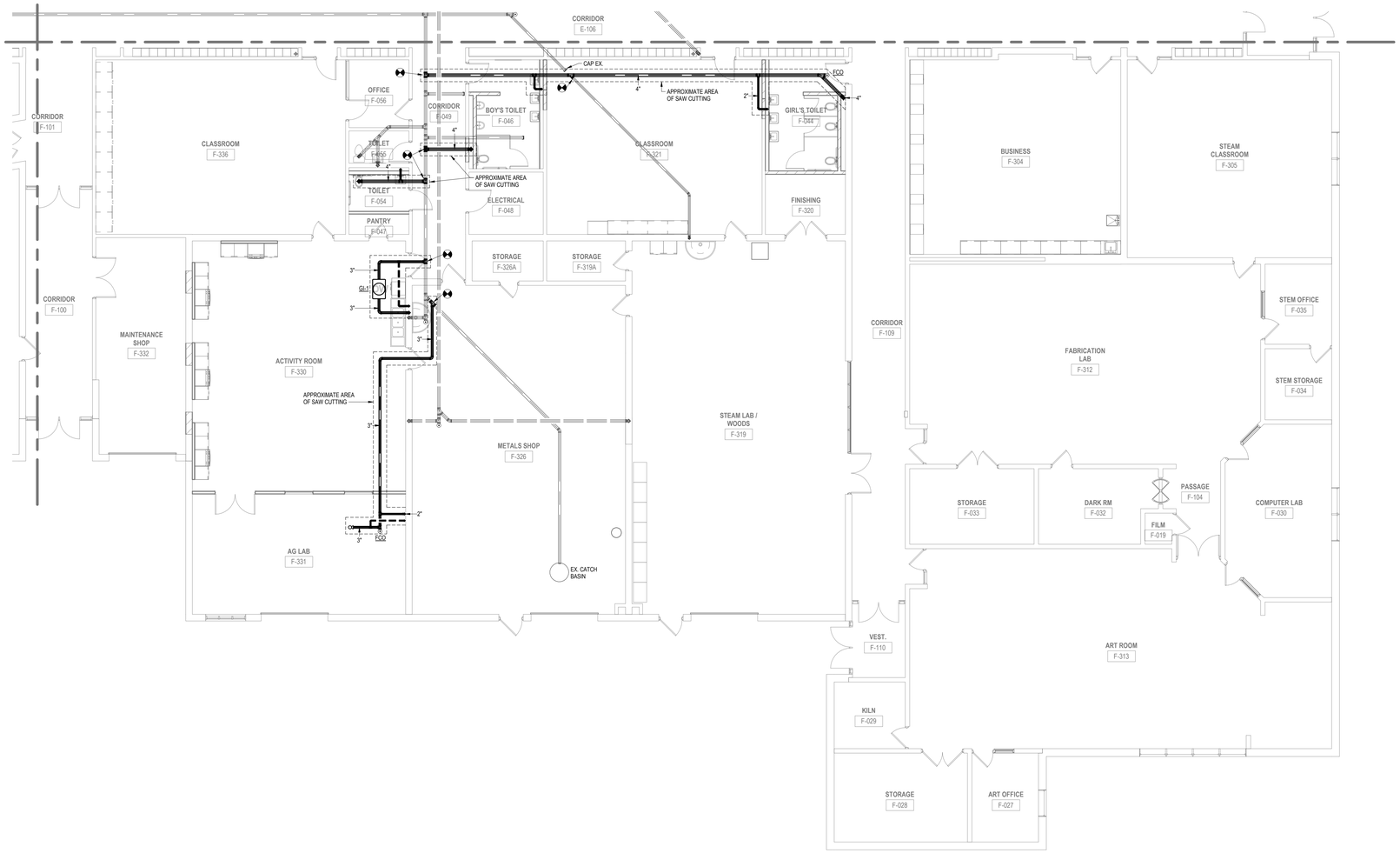
GPM of fixtures servicing floor drains 0.00

Use this GPM w/o DW **Total GPM 14.55**

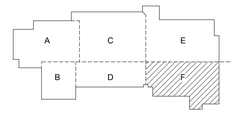
	Racks/Hr	Gal/Rack	
D W	2.00	4.00	4.00

Use Liquid holding with DW Total Holding 18.55

If receiving the discharge of a disposal the minimum holding size is 50 for 1/2hp + 20 for each 1/2hp more



1 FOUNDATION PLUMBING PLAN - AREA F
1/8" = 1'-0"



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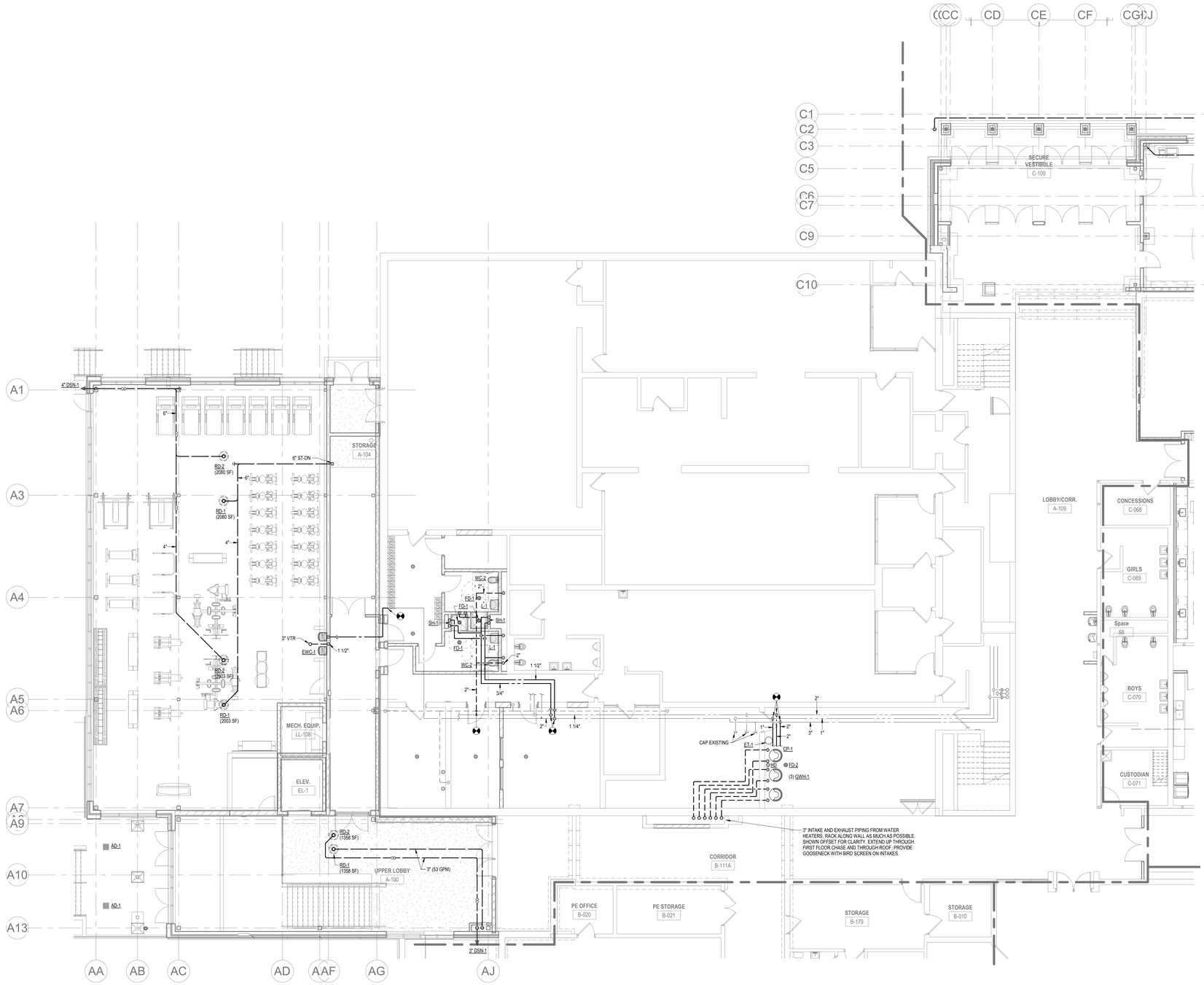
SHEET TITLE:
FOUNDATION PLUMBING PLAN - AREA F

SHEET NUMBER:
2-PL-006



1 LOWER LEVEL PLUMBING PLAN - AREA A
1/8" = 1'-0"

NEW PLUMBING WORK KEYED NOTES:

1. CONNECT NEW LAB SINK TO EXISTING SANITARY, WATER, VENT, AND GAS. RECONFIGURE EXISTING ROUGH-IN LOCATIONS OF SANITARY, WATER, AND VENT AS REQUIRED TO MAKE FINAL CONNECTIONS TO LAB SINK, FAUCET, AND GAS OUTLET.
2. RELOCATE MASTER GAS SHUT-OFF TO TEACHER STATION. REMOVE EXISTING SHUT-OFF FROM ABOVE CEILING.
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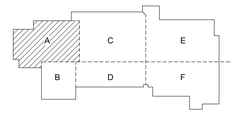

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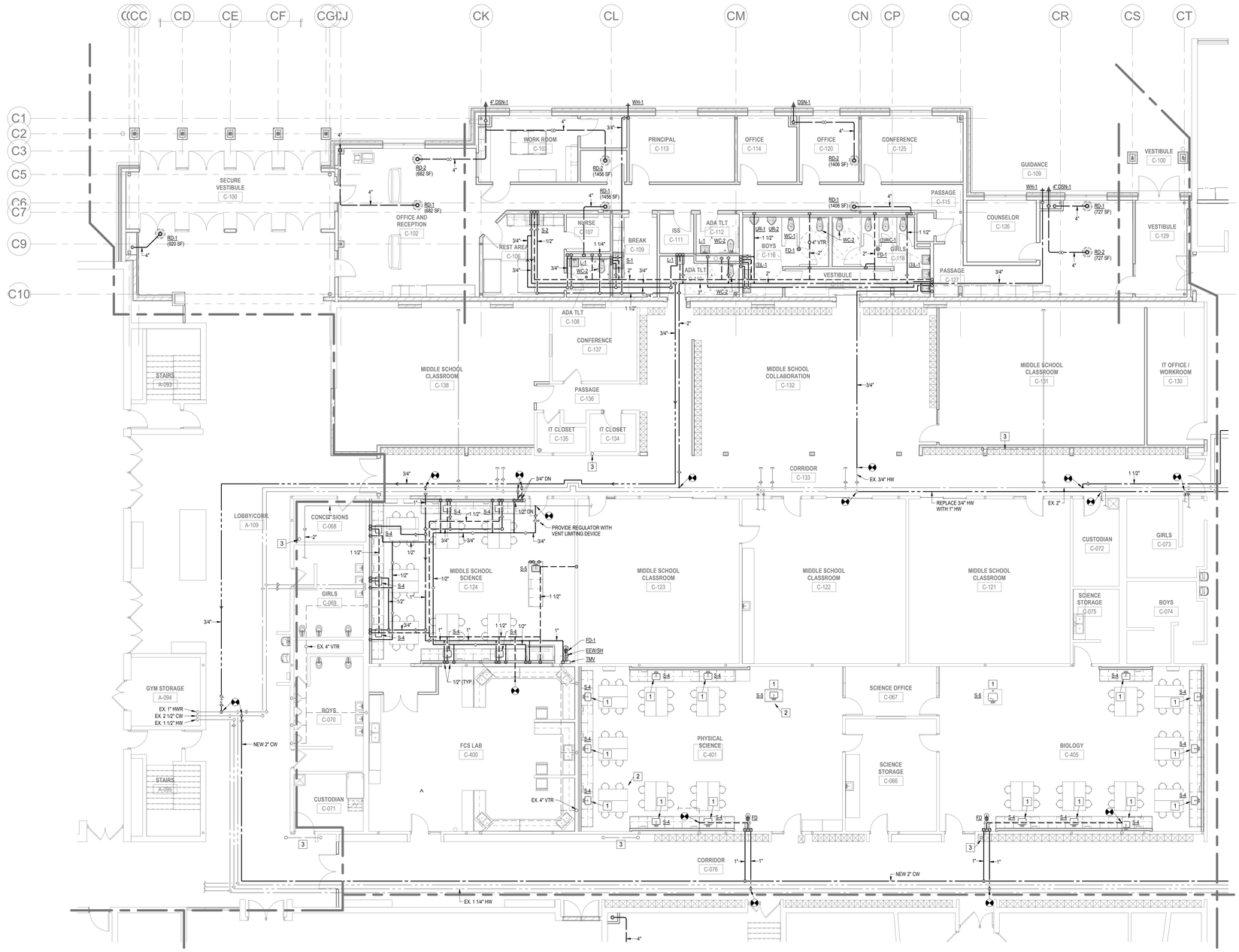
SHEET TITLE:
LOWER LEVEL PLUMBING PLAN - AREA A

SHEET NUMBER:
2-PL-100



1 FIRST FLOOR PLUMBING PLAN - AREA C
1/8" = 1'-0"

NEW PLUMBING WORK KEYED NOTES:

1. CONNECT NEW LAB SINK TO EXISTING SANITARY, WATER, VENT, AND GAS. RECONFIGURE EXISTING ROUGH-IN LOCATIONS OF SANITARY, WATER, AND VENT AS REQUIRED TO MAKE FINAL CONNECTIONS TO LAB SINK, FAUCET, AND GAS OUTLET.
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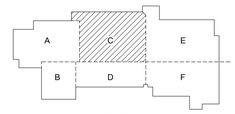

KEYPLAN

TRUE NORTH PLAN NORTH

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800.236.2370 | hoffman.net

CONSULTANT:
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HEC Project Number: 19-1004.00

MANAWA ELEMENTARY SCHOOL - ALTERATIONS
MANAWA MIDDLE/HIGH SCHOOL - ADDITIONS & ALTERATIONS
PART 2 - MANAWA MIDDLE / HIGH SCHOOL
800 BEECH STREET
MANAWA, WI 54949

MARK	DATE
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PROJECT NO:	Project Number
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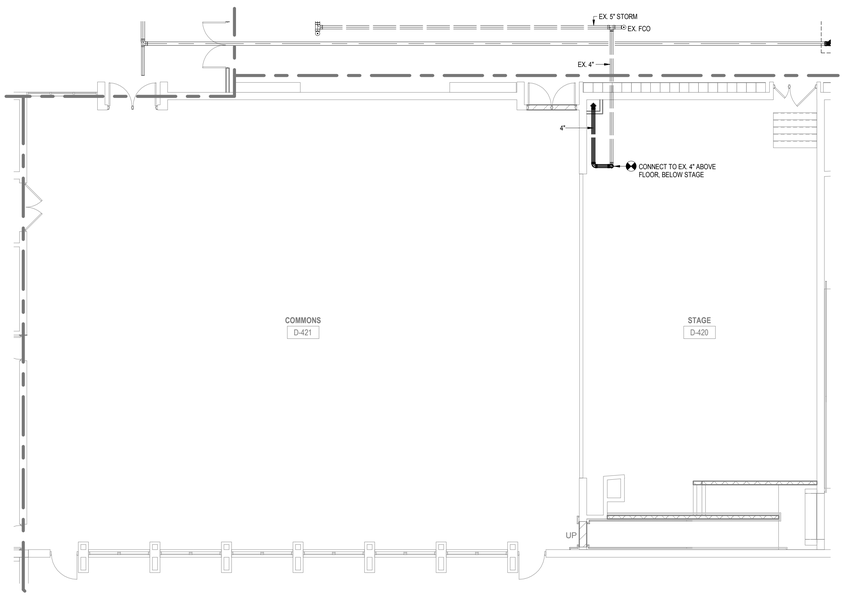
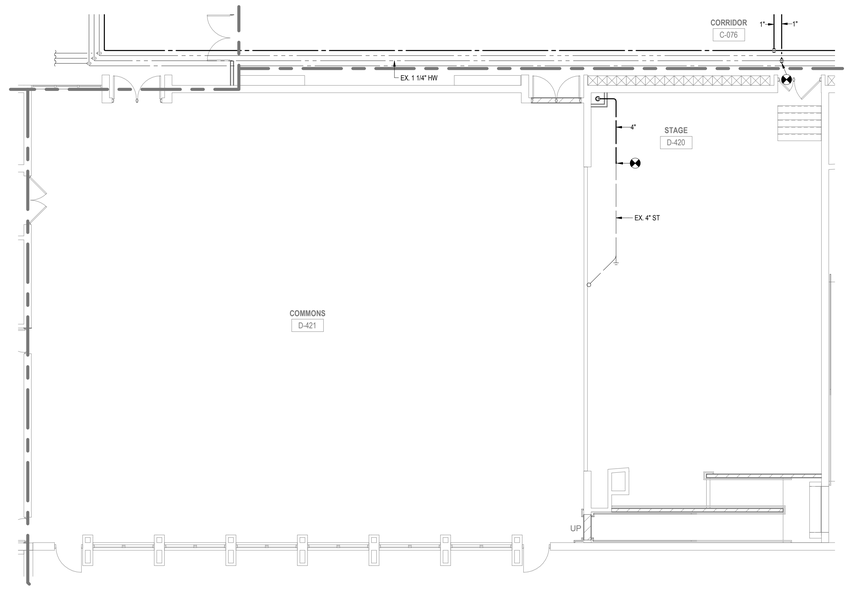
SHEET TITLE:
FIRST FLOOR PLUMBING PLAN - AREA C

SHEET NUMBER:
2-PL-103



1 FOUNDATION PLUMBING PLAN - AREA D
1/8" = 1'-0"



2 FIRST FLOOR PLUMBING PLAN - AREA D
1/8" = 1'-0"

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PROJECT NO: Project Number
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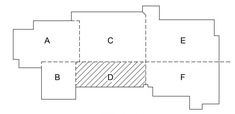
SHEET TITLE:
FOUNDATION & FIRST FLOOR PLUMBING PLANS - AREA D

SHEET NUMBER:
2-PL-104



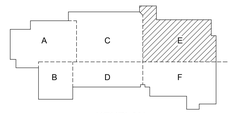
KEYPLAN

TRUE NORTH
PLAN NORTH

1 FIRST FLOOR PLUMBING PLAN - AREA E
1/8" = 1'-0"

NEW PLUMBING WORK KEYED NOTES:

1. CONNECT NEW LAB SINK TO EXISTING SANITARY, WATER, VENT, AND GAS. RECONFIGURE EXISTING ROUGH-IN LOCATIONS OF SANITARY, WATER, AND VENT AS REQUIRED TO MAKE FINAL CONNECTIONS TO LAB SINK, FAUCET, AND GAS OUTLET.
2. RELOCATE MASTER GAS SHUT-OFF TO TEACHER STATION. REMOVE EXISTING SHUT-OFF FROM ABOVE CEILING.
3. EXISTING PVC ROOF CONDUCTORS SHALL BE WRAPPED WITH PLENUM RATED INSULATION EQUAL TO 3M FIRE BARRIER WRAP 5A+



KEYPLAN

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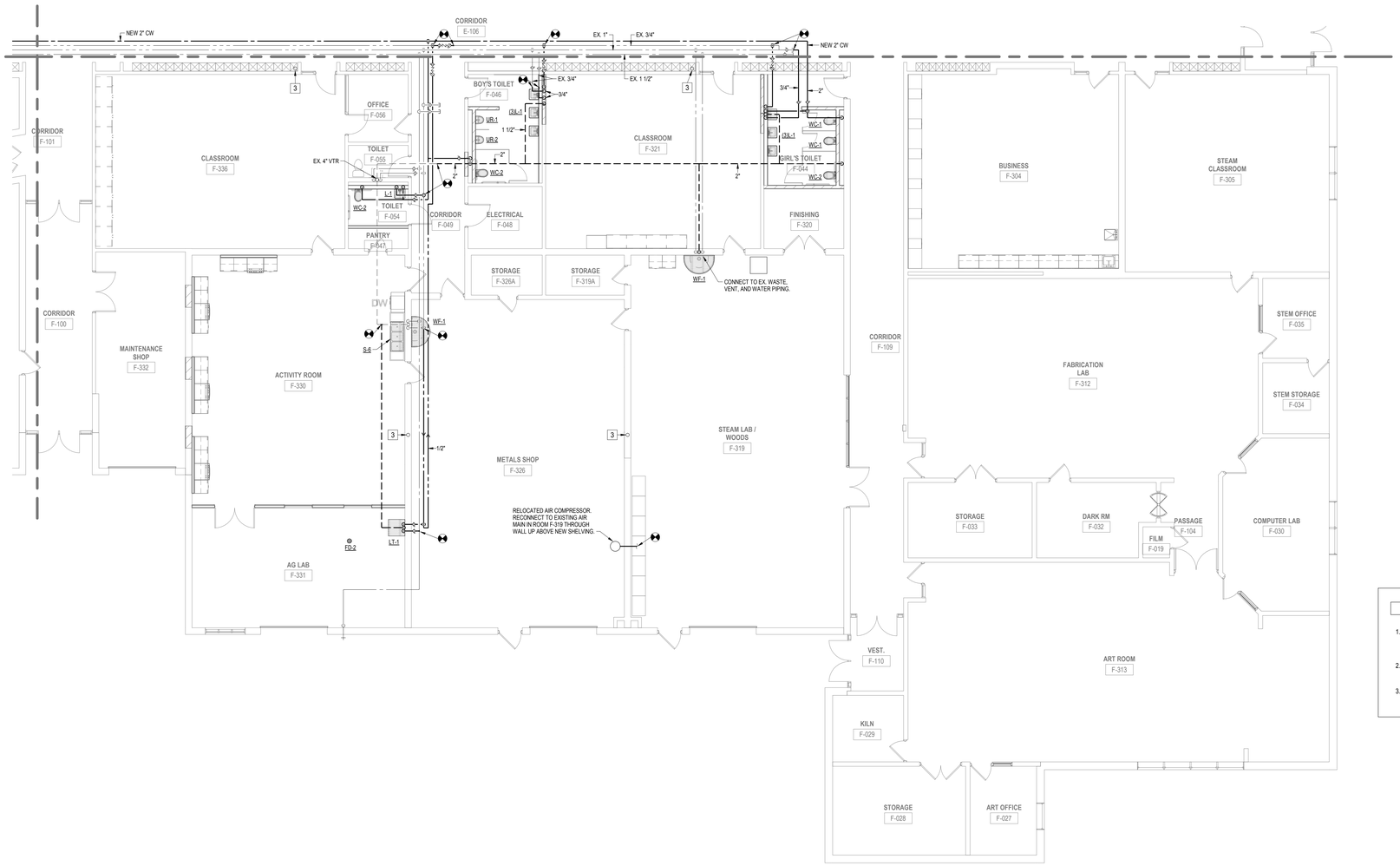
SHEET TITLE:
FIRST FLOOR PLUMBING PLAN - AREA E

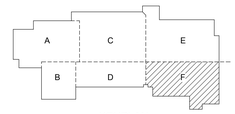
SHEET NUMBER:
2-PL-105



1 FIRST FLOOR PLUMBING PLAN - AREA F
1/8" = 1'-0"

NEW PLUMBING WORK KEYED NOTES:

1. CONNECT NEW LAB SINK TO EXISTING SANITARY, WATER, VENT, AND GAS. RECONFIGURE EXISTING ROUGH-IN LOCATIONS OF SANITARY, WATER, AND VENT AS REQUIRED TO MAKE FINAL CONNECTIONS TO LAB SINK, FAUCET, AND GAS OUTLET.
2. RELOCATE MASTER GAS SHUT-OFF TO TEACHER STATION. REMOVE EXISTING SHUT-OFF FROM ABOVE CEILING.
3. EXISTING PVC ROOF CONDUCTORS SHALL BE WRAPPED WITH PLENUM RATED INSULATION EQUAL TO 3M FIRE BARRIER WRAP 5A+



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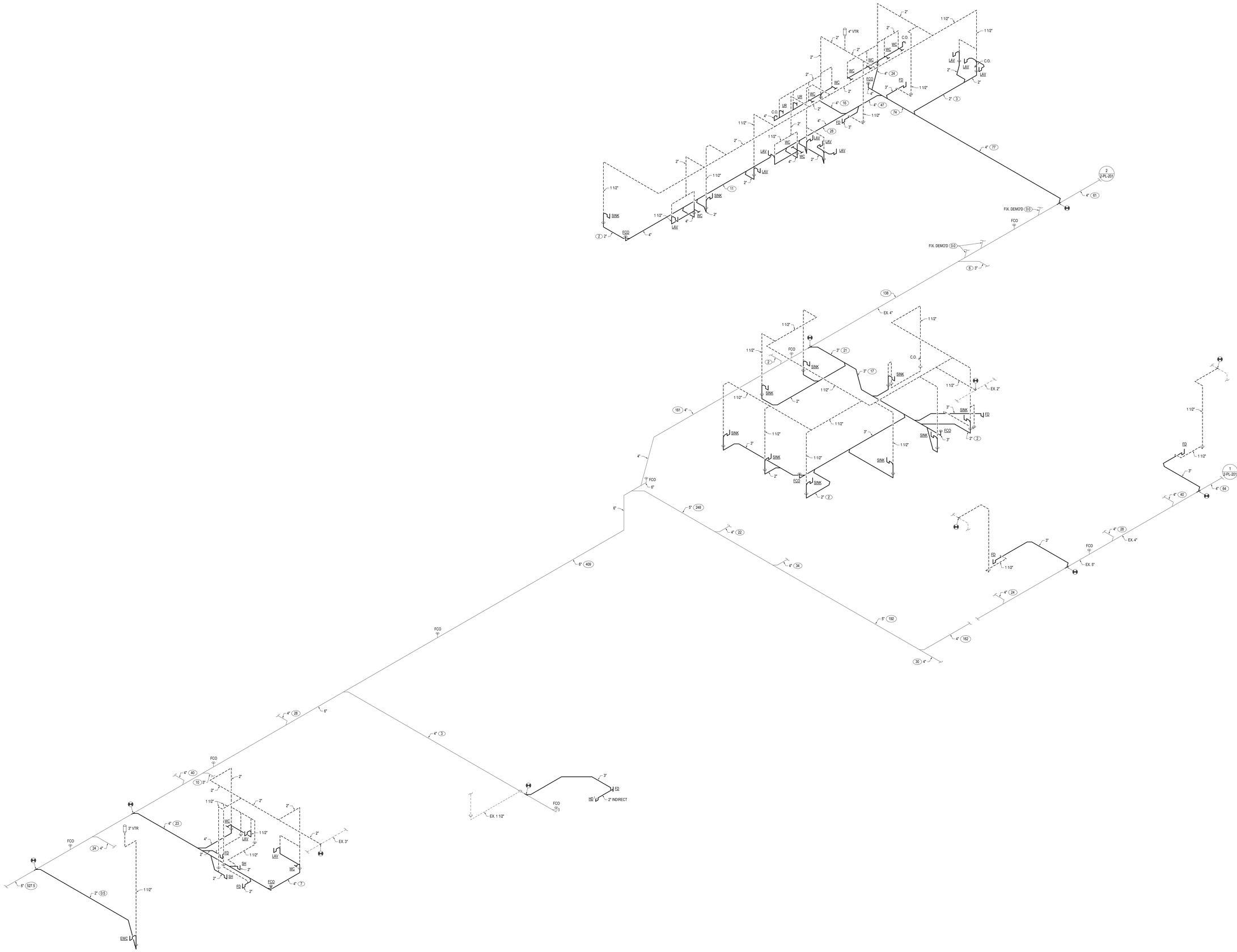
SHEET TITLE:
FIRST FLOOR PLUMBING PLAN - AREA F

SHEET NUMBER:
2-PL-106



1 WASTE AND VENT PIPING ISOMETRICS - AREAS A & C
NTS

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Planning, Design & Construction, Inc.
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CONSULTANT:
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HEC Project Number 19-1004.00

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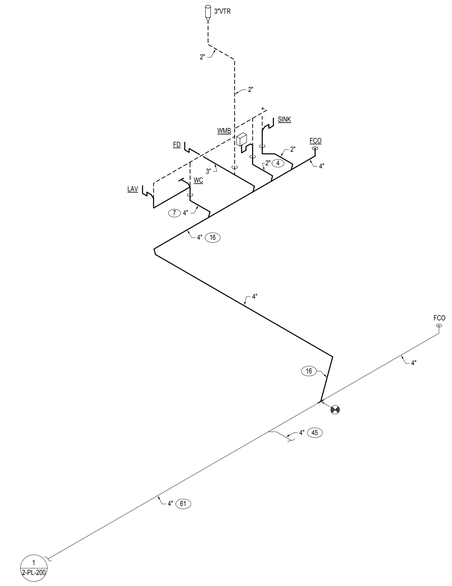
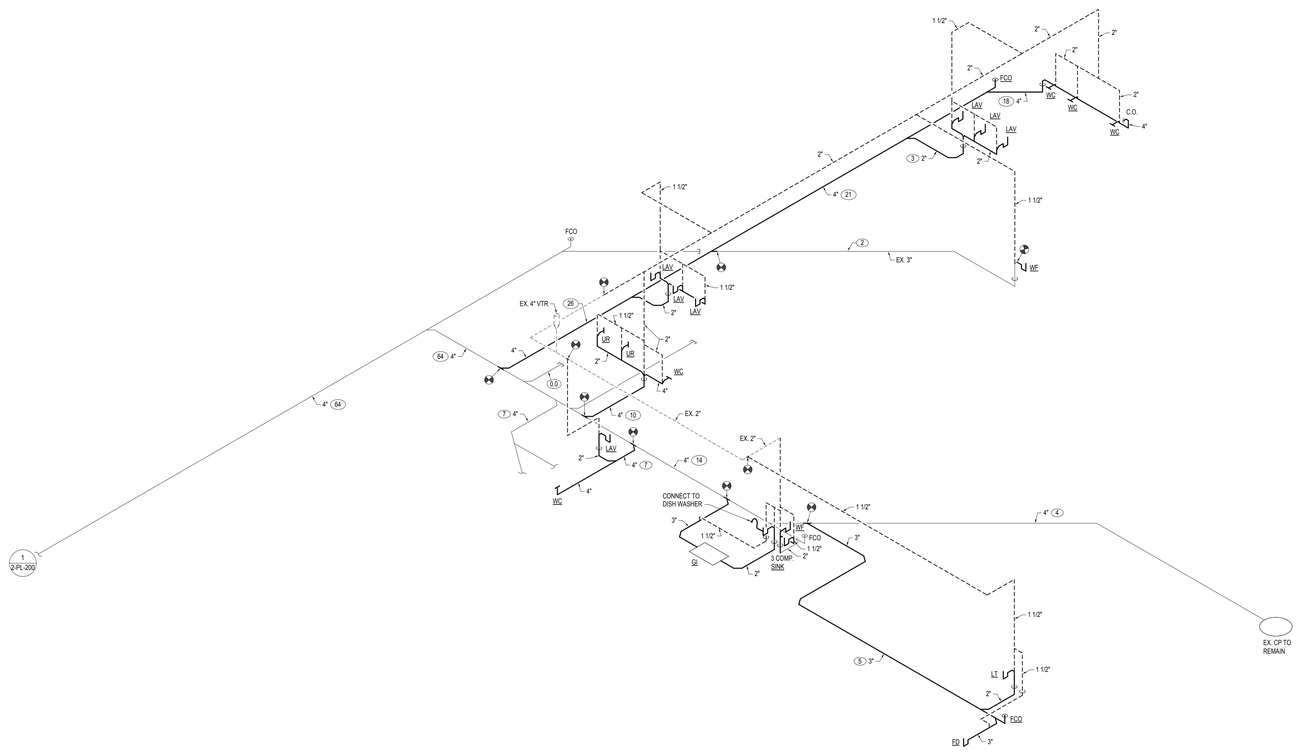
SHEET TITLE:
WASTE AND VENT PIPING ISOMETRICS

SHEET NUMBER:
2-PL-200



2 WASTE AND VENT PIPING ISOMETRICS - AREA E
NTS



1 WASTE AND VENT PIPING ISOMETRICS - AREA F
NTS

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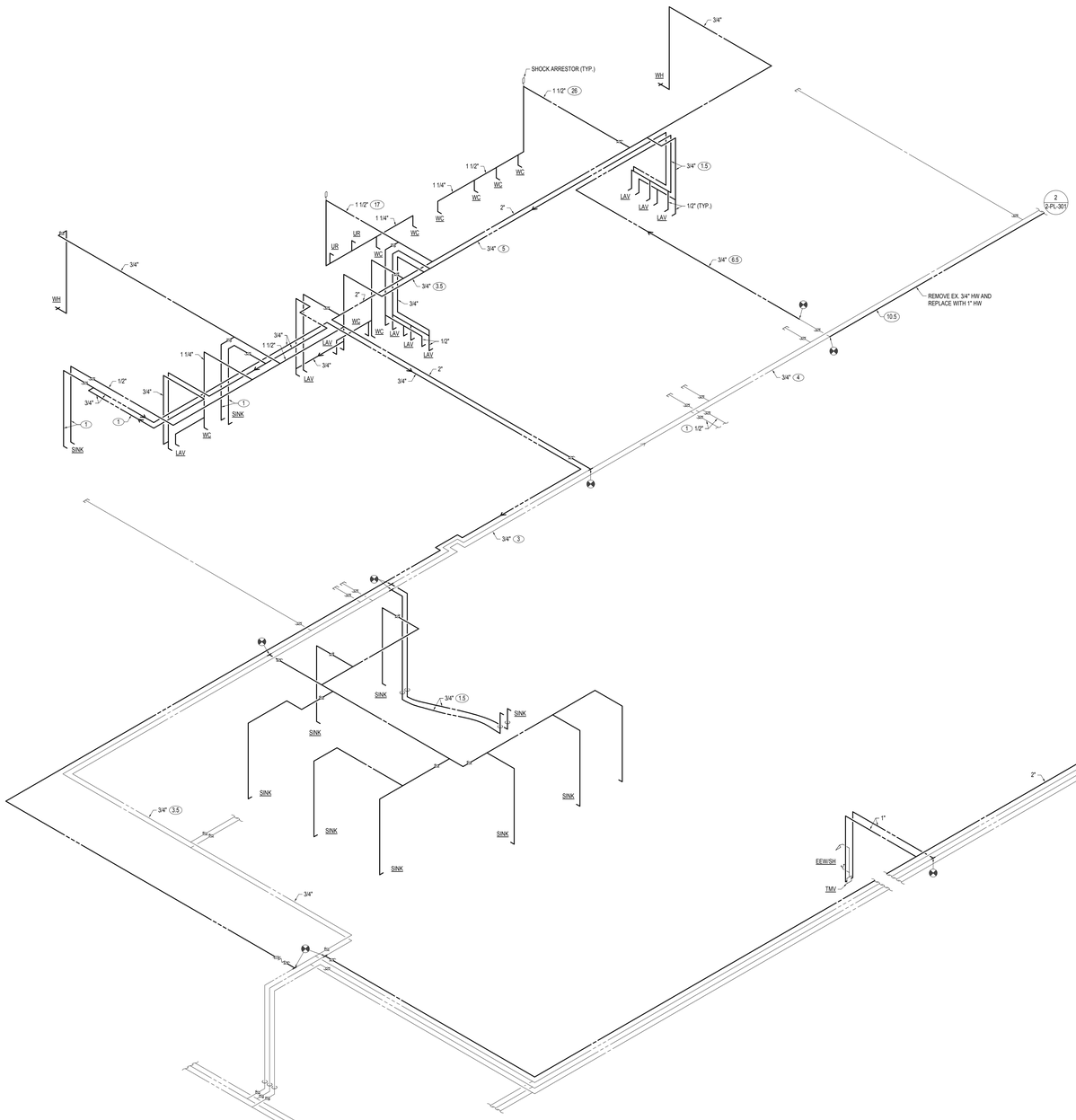
SHEET TITLE:
WASTE AND VENT PIPING ISOMETRICS

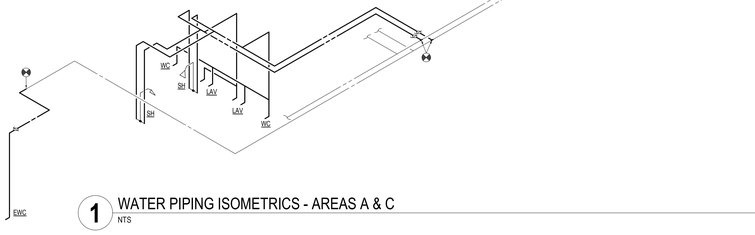
SHEET NUMBER:
2-PL-201

Calculate Pressure Available for Uniform Loss

B.	Available pressure near the point of connection					45
C.						
D.	Pressure required at controlling fixture (furthermost water closet)					25
E.	Pressure loss due to elevation between building control valve and controlling fixture	0	x	0.434		0.00
F.	Pressure loss due to water treatment devices, instantaneous water heaters, and backflow preventers serving controlling fixture					0
G.	Developed length from building control valve to controlling fixture in feet	325	x	1.5		487.5
	Type L Copper					
A.	Pressure available for uniform loss = $\frac{B - (C + D + E + F)}{G}$ X 100 =					4.10

2 WATER HEATER PIPING SCHEMATIC
NTS





1 WATER PIPING ISOMETRICS - AREAS A & C
NTS

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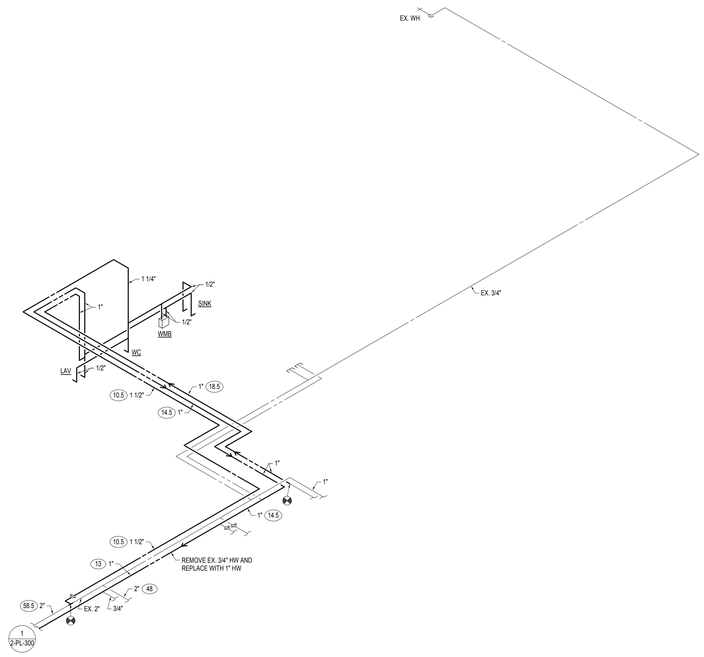
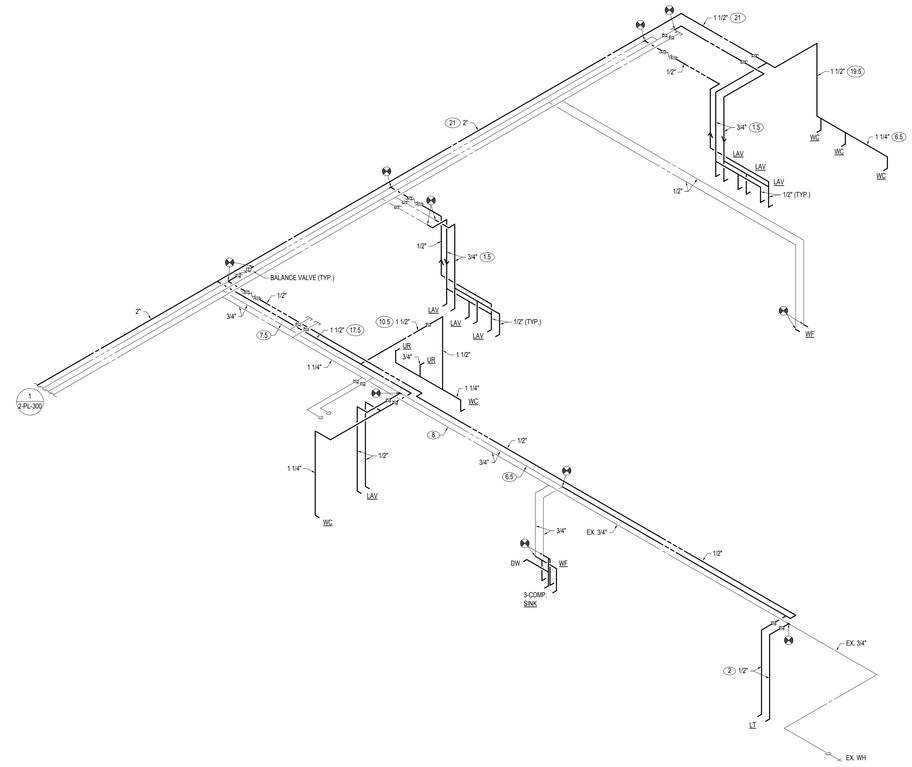
SHEET TITLE:
WATER PIPING ISOMETRICS

SHEET NUMBER:
2-PL-300



2 WATER PIPING ISOMETRICS - AREA E
NTS



1 WATER PIPING ISOMETRICS - AREA F
NTS

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HEC Project Number: 19-1004.00

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SHEET TITLE:
WATER PIPING ISOMETRICS

SHEET NUMBER:
2-PL-301

HVAC SYMBOLS

- AIRFLOW (SUPPLY/OUTSIDE AIR)
- AIRFLOW (RETURN/EXHAUST)
- DG — DOOR GRILLE
- DCO — 3/4" DOOR UNDERCUT
- SUPPLY OR OUTDOOR AIR
- RETURN OR TRANSFER
- EXHAUST
- SUPPLY DUCT TURNED AWAY
- SUPPLY DUCT TURNED TOWARD
- 12x12 — RECTANGLE DUCT SIZE (FIRST FIGURE IS SIDE SHOWN)
- 12ø — ROUND DUCT (RIGID)
- INDICATES PERFORATED DUCT
- 12/12ø — OVAL DUCT
- S — SMOKE DETECTOR
- FLEXIBLE CONNECTION
- DUCT (FLEXIBLE ROUND)
- TURNING VANES
- TRANSITION (SQUARE-TO-ROUND)
- BD — BACKDRAFT DAMPER
- VOLUME DAMPER
- AD / FD — FIRE DAMPER & ACCESS DOOR
- AD / SD — SMOKE DAMPER & ACCESS DOOR
- AD / FSD — COMBINATION FIRE/SMOKE DAMPER & ACCESS DOOR
- MOD — MOTOR OPERATED DAMPER
- AP — CEILING MOUNTED ACCESS PANEL
- A / 100 — AIR OUTLET/INLET TYPE (CFM)

MECHANICAL PIPING

- A — COMPRESSED AIR
- BFW — BOILER FEED WATER
- BSD — BOILER SURFACE BLOW DOWN
- BBD — BOILER BOTTOM BLOW DOWN
- CF — CHEMICAL FEED
- CHWS — CHILLED WATER SUPPLY
- CHWR — CHILLED WATER RETURN
- CWS — CONDENSER WATER SUPPLY
- CWR — CONDENSER WATER RETURN
- CD — CONDENSATE DRAIN
- GWS — GLYCOL WATER SUPPLY
- GWR — GLYCOL WATER RETURN
- HPCR — HIGH PRESSURE CONDENSATE RETURN
- HPS — HIGH PRESSURE STEAM
- HWS — HOT WATER SUPPLY
- HWR — HOT WATER RETURN
- IWS — ICE WATER SUPPLY
- IWR — ICE WATER RETURN
- LP — LIQUID PETROLEUM
- LPS — LOW PRESSURE STEAM
- LPCR — LOW PRESSURE CONDENSATE RETURN
- MPS — MEDIUM PRESSURE STEAM
- MPCR — MEDIUM PRESSURE CONDENSATE RETURN
- G — NATURAL GAS
- PCR — PUMPED CONDENSATE RETURN
- RL — REFRIGERANT LIQUID
- RS — REFRIGERANT SUCTION
- RHG — REFRIGERANT HOT GAS
- SV — STEAM VENT
- TWS — TOWER WATER SUPPLY
- TWR — TOWER WATER RETURN
- VAC — VACUUM

PIPING SYMBOLS

- PIPE TURNED TOWARD
- PIPE TURNED AWAY
- PIPE TURNED AWAY
- PIPE TURNED TOWARD
- FLEXIBLE CONNECTOR
- UNION
- FLANGES
- REDUCER (CONCENTRIC)
- REDUCER (ECCENTRIC)
- PIPE CAP/CLEAN OUT
- PIPE PLUG
- FLUID FLOW DIRECTION
- PG — PIPE GUIDE
- PA — PIPE ANCHOR
- PITCH — PIPE PITCH DIRECTION
- PRESSURE GAUGE
- TEMPERATURE GAUGE
- WATER HAMMER ARRESTOR
- AV — AIR VENT (AUTO)
- HMV — AIR VENT (MANUAL)
- AUTOMATIC CONTROL VALVE (2-WAY)
- AUTOMATIC CONTROL VALVE (3-WAY)
- BALL VALVE
- BALANCING VALVE
- BUTTERFLY VALVE
- BACKFLOW PREVENTION VALVE
- CHECK VALVE
- EQUIPMENT DRAIN VALVE
- FILTER
- FLOW MEASUREMENT STATION
- GATE VALVE
- GAUGE CONNECTION
- GLOBE ANGLE VALVE
- GLOBE VALVE
- ISOLATION/SHUT-OFF/MANUAL VALVE
- PLUG VALVE
- PRESSURE REDUCING VALVE
- PRESSURE REGULATING VALVE
- RELIEF VALVE
- S — SOLENOID VALVE ONE-WAY (ELECTRIC)
- STRAINER
- STRAINER WITH BLOW OFF VALVE AND NIPPLE
- THROTTLING VALVE
- VACUUM BREAKER
- PUMP
- FS — FLOW SENSOR
- LS — LEVEL SENSOR
- PS — PRESSURE SENSOR
- TS — TEMPERATURE SENSOR

GENERAL SYMBOLS

- CO — CARBON MONOXIDE (CO) SENSOR
- CO2 — CARBON DIOXIDE (CO2) SENSOR
- DP — DIFFERENTIAL PRESSURE SENSOR
- NO2 — NITROGEN DIOXIDE (NO2) SENSOR
- RS — ROOM SENSOR
- SP — STATIC PRESSURE SENSOR
- H — HUMIDISTAT
- TS — TEMPERATURE SENSOR
- T — THERMOSTAT
- T — INSULATED BASE THERMOSTAT
- $ — SWITCH
- NEW CONNECTION TO EXISTING
- EXISTING TO REMAIN
- EXISTING TO BE REMOVED
- NEW TO BE INSTALLED

GENERAL NOTES

1. THE MECHANICAL CONTRACTOR SHALL EXAMINE ALL CONTRACT DOCUMENTS AND IS REQUIRED TO DO ALL WORK WHICH IS SHOWN ON THE DRAWINGS, STATED IN THE SPECIFICATIONS, OR REASONABLY IMPLIED AS NECESSARY TO COMPLETE THEIR DIVISION OF WORK FOR THIS PROJECT REGARDLESS OF WHERE IN THE CONTRACT DOCUMENTS THE WORK IS REPRESENTED. MECHANICAL CONTRACTOR TO COORDINATE WORK WITH ALL OTHER TRADES. ALL OTHER TRADE DOCUMENTS ARE TO BE CONSIDERED PART OF THIS CONTRACTORS DOCUMENTS WITH RESPECT TO COORDINATION OF WORK BETWEEN TRADES OF WORK.
2. ABBREVIATIONS AND SYMBOLS INDICATED HERE AND NOT USED IN THE CONTRACT DOCUMENTS DO NOT APPLY TO THIS PROJECT. ADDITIONAL ABBREVIATIONS MAY BE INDICATED IN THE CONTRACT DOCUMENTS.
3. THESE DRAWINGS ARE DESIGN DRAWINGS AND ARE DIAGRAMMATIC, THEY MAY NOT SHOW ALL PHYSICAL ARRANGEMENTS, OFFSETS, BENDS, OR ELBOWS WHICH MAY BE REQUIRED FOR PROPER INSTALLATION OF VARIOUS MATERIALS, EQUIPMENT, PIPING AND DUCTWORK SYSTEMS IN ALLOTTED SPACES. EXAMINE THESE AND OTHER AVAILABLE DRAWINGS TO DETERMINE SPACE LIMITATIONS AND INTERFERENCES. MAKE ANY MINOR CHANGES IN LOCATIONS OF EQUIPMENT, PIPING, AND DUCTWORK FROM THAT SHOWN ON DRAWINGS AND FOR ALL PHYSICAL DETAILS REQUIRED FOR INSTALLATION. COST FOR ADAPTING WORK TO JOB SITE CONDITIONS SHALL NOT BE CONSIDERED AS BASIS OF AN EXTRA COST TO CONTRACT.
4. ELEVATION OF PIPING AND DUCTWORK INDICATED ON THESE DRAWINGS ARE TO BE USED AS GUIDELINES TO ASSIST WITH INSTALLATIONS. MINOR CHANGES TO THESE ELEVATIONS MAY BE NECESSARY TO ELIMINATE UNFORESEEN INTERFERENCES. ANY CHANGE IN ELEVATION SHALL BE APPROVED PRIOR TO CHANGE.
5. ANY AND ALL INFORMATION SHOWN ON THESE DRAWINGS WITH RESPECT TO EXISTING STRUCTURES, UTILITIES, AND MECHANICAL SYSTEMS, IS AS EXACT AS COULD BE SECURED. THE INFORMATION IS NOT WARRANTED NOR GUARANTEED ACCURATE, FIELD VERIFY ALL EXISTING CONDITIONS PRIOR TO PROCEEDING WITH WORK.
6. ACCURATE AND LEGIBLE AS-BUILT DRAWING MARKUPS SHALL BE MAINTAINED AT THE JOB SITE, AND BE SUBMITTED PRIOR TO FINAL PAYMENT FOR THE CREATION OF FINAL RECORD DRAWINGS.
7. ALL NEW AND EXISTING ROOFING SYSTEMS SHALL BE PROTECTED FROM DAMAGE DURING CONSTRUCTION ACTIVITIES.
8. TEMPORARILY PATCH ALL ROOF OPENINGS WATERTIGHT UNTIL FINAL CLOSURE CAN BE MADE.
9. VERIFY ALL EQUIPMENT LOCATIONS AND PIPE AND DUCT ROUTING WITH OWNER PRIOR TO INSTALLATION.
10. SEQUENCE OF WORK AND/OR PLACE OF COMMENCEMENT OF WORK SHALL BE APPROVED PRIOR TO WORK BEING STARTED. SCHEDULED SHUTDOWNS SHALL BE CLOSELY COORDINATED WITH EXISTING OPERATIONS.
11. MAINTAIN 3'-0" CLEAR HORIZONTALLY IN FRONT OF ALL ELECTRICAL EQUIPMENT.
12. COORDINATE POWER REQUIREMENTS FOR ALL POWER TO MECHANICAL EQUIPMENT INCLUDING CONTROL SYSTEM WITH ELECTRICAL CONTRACTOR AND INSURE ALL COSTS ASSOCIATED WITH SUCH ARE INCLUDED IN THE PROJECT BID COST. PROVIDE ELECTRICAL POWER, TRANFORMERS, RELAYS, ETC. AS NECESSARY TO ALL HVAC AND MECHANICAL CONTROLS.
13. PROVIDE MANUFACTURER'S RECOMMENDED CLEARANCES ON ALL EQUIPMENT.

ABBREVIATIONS

A	AMPS
ABI	ALTERNATE BID ITEM
AC	DUCTLESS SPLIT SYSTEM
ACC	AIR COOLED CONDENSER
ACCU	AIR COOLED CONDENSING UNIT
ACH	AIR COOLED CHILLER
ACOMP	AIR COMPRESSOR
ACU	AIR CONDITIONING UNIT
ACV	AUTOMATIC CONTROL VALVE
AD	AIR DROP
AF	AIR FILTER OR AIR FOIL
AFC	AFTER COOLER
AFF	ABOVE FINISHED FLOOR
AHJ	AUTHORITY HAVING JURISDICTION
AHU	AIR HANDLING UNIT
AL	ALUMINUM
AMD	AIR MIXING DEVICE
ANG	AIR NATIONAL GUARD
APPROX	APPROXIMATELY
AS	AIR SEPARATOR
ASTM	AMERICAN SOCIETY FOR TESTING AND MATERIALS
AT	AIR TERMINAL
AWC	ABSORPTION CHILLER
BC	BOOSTER COIL
BH	BOOSTER HUMIDIFIER
BHP	BRAKE HORSEPOWER
BHR	CONTINUOUS BLOWDOWN HEAT RECOVERY SYSTEM
BI	BACKWARD INCLINED
BLD	BOILER BLOWDOWN SEPARATOR
BPD	BACKFLOW PREVENTION DEVICE
BRS	BRASS
BRZ	BRONZE
BS	BLACK (MILD) STEEL
BSB	BRANCH SELECTOR BOX
BTU	BUFFER TANK
BTU	BRITISH THERMAL UNIT
BTUH	BRITISH THERMAL UNIT PER HOUR
BW	BUTTWELD
BZ	BRONZE
C	CONVECTOR
CA	COMBUSTION AIR
CAD	COMPRESSED AIR DRYER
CAF	COMPRESSED AIR FILTER
CC	COOLING COIL OR CONTROLS CONTRACTOR
CD	CEILING DIFFUSER
CFM	CUBIC FEET PER MINUTE
CI	CAST IRON
COMP	COMPRESSOR
COND	CONDENSATE
COR	CONTRACTING OFFICER'S REPRESENTATIVE
CRAC	COMPUTER ROOM AIR CONDITIONING UNIT
CRP	CONDENSATE RETURN PUMP
CS	CENTRIFUGAL SEPARATOR
CT	COOLING TOWER
CTCLG	CLOSE TO CEILING
CTCLM	CLOSE TO COLUMN
CTW	CLOSE TO WALL
CU	COPPER
CUH	CABINET UNIT HEATER
DAC	DOOR AIR CURTAIN
DBA	DECIBELS, BAND A
DC	DUST COLLECTOR
DCVA	DOUBLE CHECK VALVE ASSEMBLY BPD
DDC	DIRECT DIGITAL CONTROL
DDH	DESICCANT DEHUMIDIFIER
DEMO	DEMOLISH
DF	DESTRATIFICATION FAN
DFD	DIVISION OF FACILITIES DEVELOPMENT
DIA	DIAMETER
DIM	DIMENSION
DISCH	DISCHARGE
DMPR	DAMPER
DN	DOWN
DOD	DEPARTMENT OF DEFENSE
DRC	DRY COOLER
DWG	DRAWING
DX	DIRECT EXPANSION
E	EXISTING
EA	EXHAUST AIR
EAT	ENTERING AIR TEMPERATURE
EBH	ELECTRIC BASEBOARD HEATER
EC	EVAPORATIVE COOLER OR ELECTRICAL CONTRACTOR
EDH	ELECTRIC DUCT HEATER
EF	EXHAUST FAN
EFF	EFFICIENCY
EFT	ENTERING FLUID TEMPERATURE
EG	EXHAUST GRILLE
EGLY	ETHYLENE GLYCOL
EHC	ELECTRIC HEATING COIL
EJ	EXPANSION JOINT
EL	ELEVATION
ELEC	ELECTRIC
EOM	END OF MAIN
EPDM	ETHYLENE PROPYLENE DIENE MONOMER
ERV	AIR-TO-AIR HEAT EXCHANGER
ESP	EXTERNAL STATIC PRESSURE
ET	EXPANSION TANK
ETR	EXISTING TO REMAIN
EWH	ELECTRIC WALL HEATER
EWT	ENTERING WATER TEMPERATURE
°F	FAHRENHEIT
FAF	FORCED AIR FURNACE
FC	FLUID COOLER
FCU	FAN COIL UNIT
FE	FUME EXTRACTOR
FLA	FULL LOAD AMPS
FLR	FLOOR
FM	FLOW METER
FOP	FUEL OIL PUMP
FPM	FEET PER MINUTE
FRP	FIBERGLASS REINFORCED PLASTIC
FT	FLASH TANK OR FEET
FTC	FINNED TUBE CONVECTOR
FTWC	FEET WATER COLUMN PRESSURE
GA	GAUGE
GAL	GALLON
GC	GENERAL CONTRACTOR
GFT	GLYCOL FILL TANK
GPM	GALLONS PER MINUTE
GS	GALVANIZED STEEL
H	HEIGHT
HB	HUMIDIFICATION BOILER
HC	HEATING COIL
HD	HEAD (FT)
HDB	HYDROSTATIC DESIGN BASIS
HP	HEAT PUMP OR HORSEPOWER
HPC	ERV HEAT PUMP COIL
HR	HOSE REEL
HRW	ROTARY AIR-TO-AIR EXCHANGER
HUM	HUMIDIFIER
HWB	HOT WATER BOILER
HX	FLUID HEAT EXCHANGER
HZ	HERTZ
IAW	IN ACCORDANCE WITH
ID	INSIDE DIAMETER
IE	INVERT ELEVATION
IH	INTAKE HOOD
IN	INCH
INHG	INCHES MERCURY PRESSURE
INWC	INCHES WATER COLUMN PRESSURE
IR	INFRARED HEATER
KH	KITCHEN HOOD
KW	KILOWATT
L	LOUVER OR LENGTH
LAT	LEAVING AIR TEMPERATURE
LB	POUNDS
LD	LINEAR DIFFUSER
LFT	LEAVING FLUID TEMPERATURE
LPG	LIQUIFIED PETROLEUM GAS
LS	LEVEL SWITCH
LWT	LEAVING WATER TEMPERATURE
MADP	MAXIMUM ALLOWABLE DIFFERENTIAL PRESSURE
MAU	MAKE-UP AIR UNIT
MAWP	MAXIMUM ALLOWABLE WORKING PRESSURE
MAX	MAXIMUM
MBH	THOUSANDS BTU'S PER HOUR
MC	MECHANICAL CONTRACTOR OR MECHANICAL COUPLING
MCA	MINIMUM CIRCUIT AMPACITY
MCC	MOTOR CONTROL CENTER
MFR	MANUFACTURER
MIN	MINIMUM
MMBH	MILLION BTU PER HOUR
MOCP	MINIMUM OVER CURRENT PROTECTION
MOD	MOTOR OPERATED CONTROL DAMPER
MSS	MANUFACTURERS STANDARDIZATION SOCIETY
MTL	MATERIAL
NA	NOT APPLICABLE
NC	NORMALLY CLOSED
NFPA	NATIONAL FIRE PROTECTION ASSOCIATION
NH	NO-HUB
NIC	NOT IN CONTRACT
NO	NORMALLY OPEN
NOM	NOMINAL
NPSH	NET POSITIVE SUCTION HEAD
NPSHA	NPSH AVAILABLE
NPSHR	NPSH REQUIRED
OA	OUTSIDE AIR
OC	ON CENTER
OD	OUTSIDE DIAMETER
OED	OPEN ENDED DUCT
P	HYDRONIC PUMP OR PRESSURE
PC	PLUMBING CONTRACTOR
PCP	PRESSURE POWERED CONDENSATE PUMP
PD	PRESSURE DROP/DIFFERENTIAL
PG	PROPYLENE GLYCOL
PH	PHASE
PPH	POUND PER HOUR
PROP	PROPELLER
PRV	PRESSURE REDUCING VALVE
PSI	POUNDS PER SQUARE INCH
PSIA	PSI ABSOLUTE
PSID	PSI DIFFERENTIAL
PSIG	PSI GAGE
PTAC	PACKAGED TERMINAL AIR CONDITIONER
PTHP	PACKAGED TERMINAL HEAT PUMP
PVC	POLYVINYL CHLORIDE
RA	RETURN AIR
RCP	RADIANT CEILING PANEL
RDH	REFRIGERATED DEHUMIDIFIER
RG	RETURN GRILLE
RH	RELIEF HOOD
RPM	REVOLUTIONS PER MINUTE
RTD	RESISTIVE THERMAL DEVICE
RTU	ROOF TOP UNIT
RZ	RADIANT FLOOR HEATING ZONE
SA	SUPPLY AIR
SAD	SOUND ATTENUATING DEVICE
SB	SECURITY BARRIER
SCFM	STANDARD CFM
SCH	SCHEDULE
SD	SLOT DIFFUSER/SOLDER
SF	STEAM FILTER OR SUPPLY FAN
SG	SUPPLY GRILLE
SHT	SHEET
SMLS	SEAMLESS
SMS	SNOW MELTING SYSTEM DISTRIBUTION MANIFOLD
SP	STATIC PRESSURE
SPEC	SPECIFICATIONS
SQ	SQUARE
SRV	SAFETY RELIEF VALVE
SS	STAINLESS STEEL
ST	STEAM TRAP
STD	STANDARD
STL	STEEL
SV	SOLVENT WELD
SW	SOCKET WELD
T	TEMPERATURE
TA	TRANSFER AIR
TCP	TEMPERATURE CONTROL PANEL
TDH	TOTAL DEVELOPED HEAD
TDS	TOTAL DISSOLVED SOLIDS
TEMP	TEMPERATURE
TG	TRANSFER GRILLE
TH	THREADED
TMC	TECHNOLOGY MANAGEMENT CENTER
TMV	THERMOSTATIC MIXING VALVE
TONR	TONS COOLING
TYP	TYPICAL
UC	UNIT COOLER
UFC	UNIFIED FACILITIES CRITERIA
UGD	UNDERGROUND
UH	UNIT HEATER
UNO	UNLESS NOTED OTHERWISE
UV	UNIT VENTILATOR OR ULTRAVIOLET
V	VOLTS
VA	VENT AIR
VER	VEHICLE EXHAUST REEL
VFD	VARIABLE FREQUENCY DRIVE
VI	VIBRATION ISOLATORS
VLV	VALVE
VRF	VARIABLE REFRIGERANT FLOW
W	WATTS OR WIDTH
WC	WATER COLUMN
WCC	WATER COOLED CONDENSER
WCH	WATER COOLED CHILLER
WF	WATER FILTER
WIV	WATER INLET VALVE
WHA	WATER HAMMER ARRESTOR

PRELIMINARY
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2019-06-06

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MANAWA

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MANAWA MIDDLE/HIGH SCHOOL - ADDITIONS & ALTERATIONS
PART 2 - MANAWA MIDDLE / HIGH SCHOOL
515 E. 4th STREET
MANAWA, WI 54949

MARK	DATE

ISSUED: June 6, 2019
PROJECT NO: 18268
CAD DWG FILE:
DRAWN BY: RRW
CHECKED BY: DJG

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SHEET TITLE:
NOTES, SYMBOLS AND ABBREVIATIONS

SHEET NUMBER:
2-MS-001

GENERAL HVAC DEMOLITION NOTES:

1. COMPLETELY DEMOLISH ALL EXISTING DUCTWORK AS SHOWN WITH BOLD DASHED LINES, INCLUDING ALL ABANDONED AND UNUSED ACCESSORIES, INSULATION, HANGER SUPPORTS, ETC. FOR REMAINING DUCT SYSTEM. PLUG OR CAP ALL OPENINGS CREATED BY DUCT DEMOLITION. TEST DUCTWORK AS SPECIFIED, AND INSULATE OR PAINT SAME AS NEW WORK. PATCH EXISTING WALLS, ROOFS, CEILINGS, AND FLOORS DISTURBED BY DEMOLITION TO ORIGINAL CONDITION.

2. COMPLETELY DEMOLISH ALL EXISTING EQUIPMENT AS SHOWN WITH BOLD DASHED LINES, INCLUDING ALL ABANDONED AND UNUSED ACCESSORIES, INSULATION, HANGERS, SUPPORTS, BASES, CONTROLS, ETC. PATCH EXISTING WALLS, ROOFS, CEILINGS, AND FLOORS DISTURBED BY DEMOLITION TO ORIGINAL CONDITION.

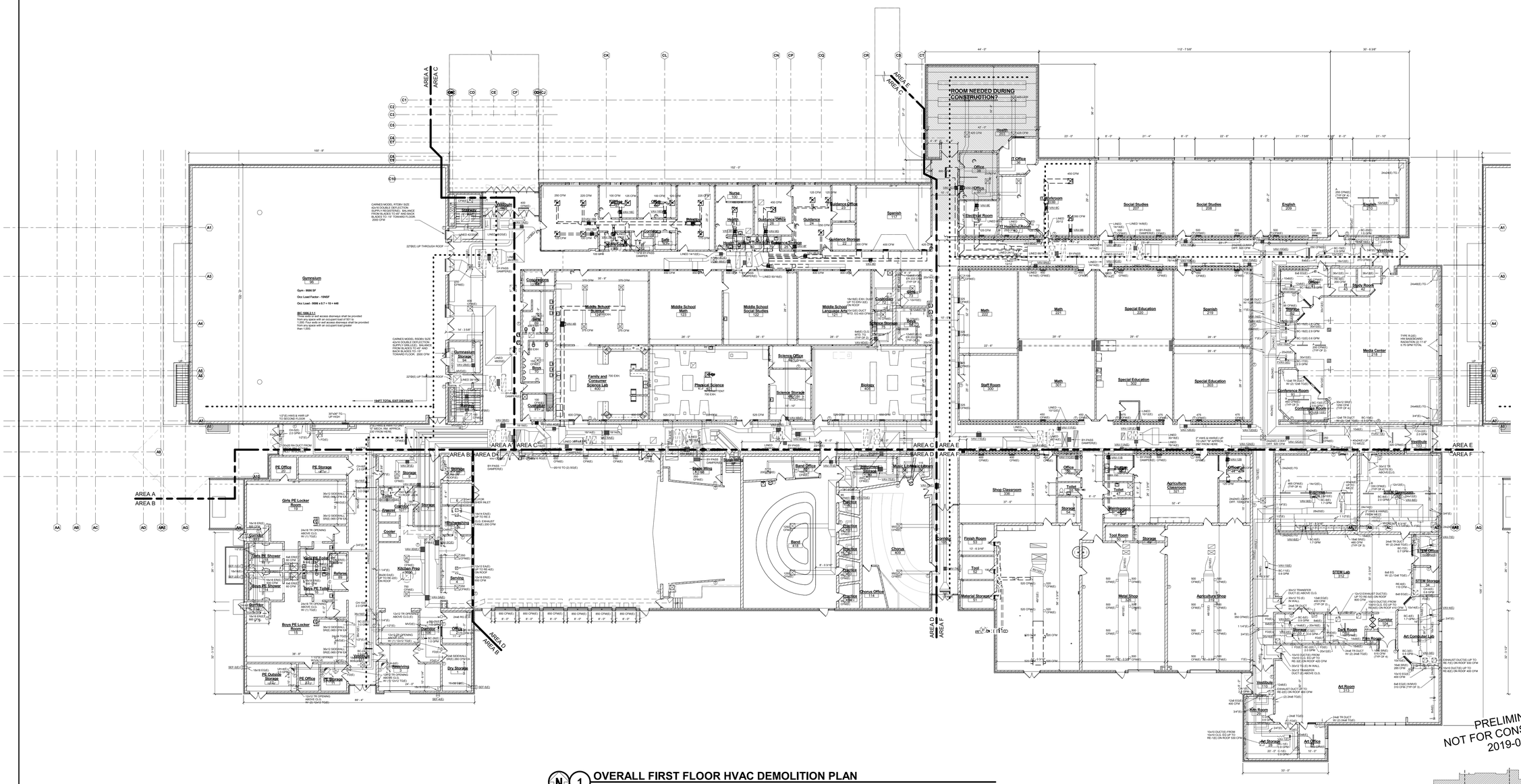
3. DELIVER INDICATED EQUIPMENT TO OWNER'S DESIGNATED STORAGE SPACE ON SITE, PLUG OR CAP ALL EQUIPMENT OPENINGS TO PREVENT DIRT AND MOISTURE FROM ENTERING EQUIPMENT.

4. REINSTALL INDICATED EQUIPMENT, SAME AS NEW WORK, IN NEW LOCATION WHERE INDICATED. COMPLETELY CLEAN AND RESTORE EQUIPMENT TO GOOD OPERATING CONDITION.

5. INSTALL TEMPORARY COVERS OVER EXISTING EXTERIOR ENVELOPE OPENINGS CREATED BY REMOVED EQUIPMENT/DUCT. COVER SHALL BE WATERTIGHT, AND MEET OSHA AND OWNER REQUIREMENTS. COMPLETELY REMOVE TEMPORARY COVER WHEN OPENINGS ARE PATCHED TO FINAL CONDITION. REPAIR ANY DAMAGE TO EXISTING BUILDING COMPONENTS CAUSED BY TEMPORARY COVER.

6. WHERE BRANCH DUCTWORK IS SHOWN TO BE DEMOLISHED BACK TO THE MAIN DUCT AND THE EXISTING MAIN DUCT OPENING IS NOT TO BE RE-USED, CAP AND SEAL THE MAIN DUCT BRANCH OPENING AIRTIGHT.

KEYED NOTES



N 1 **OVERALL FIRST FLOOR HVAC DEMOLITION PLAN**
1/16" = 1'-0"

PRELIMINARY
NOT FOR CONSTRUCTION
2019-06-06

FOR BIDS
NOT FOR CONSTRUCTION

KEY PLAN

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Planning, Design & Construction, Inc.
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MANAWA

MANAWA ELEMENTARY SCHOOL - ALTERATIONS
MANAWA MIDDLE/HIGH SCHOOL - ADDITIONS & ALTERATIONS
PART 2 - MANAWA MIDDLE / HIGH SCHOOL
515 E. 4th STREET
MANAWA, WI 54949

MARK	DATE
ISSUED:	June 6, 2019
PROJECT NO:	18268
CAD DWG FILE:	
DRAWN BY:	RRW
CHECKED BY:	DJG

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SHEET TITLE:
OVERALL FIRST FLOOR HVAC DEMOLITION PLAN

SHEET NUMBER:
2-MHD-100

GENERAL HVAC DEMOLITION NOTES:

1. COMPLETELY DEMOLISH ALL EXISTING DUCTWORK AS SHOWN WITH BOLD DASHED LINES, INCLUDING ALL ABANDONED AND UNUSED ACCESSORIES, INSULATION, HANGER SUPPORTS, ETC. FOR REMAINING DUCT SYSTEM. PLUG OR CAP ALL OPENINGS CREATED BY DUCT DEMOLITION. TEST DUCTWORK AS SPECIFIED, AND INSULATE OR PAINT SAME AS NEW WORK. PATCH EXISTING WALLS, ROOFS, CEILINGS, AND FLOORS DISTURBED BY DEMOLITION TO ORIGINAL CONDITION.

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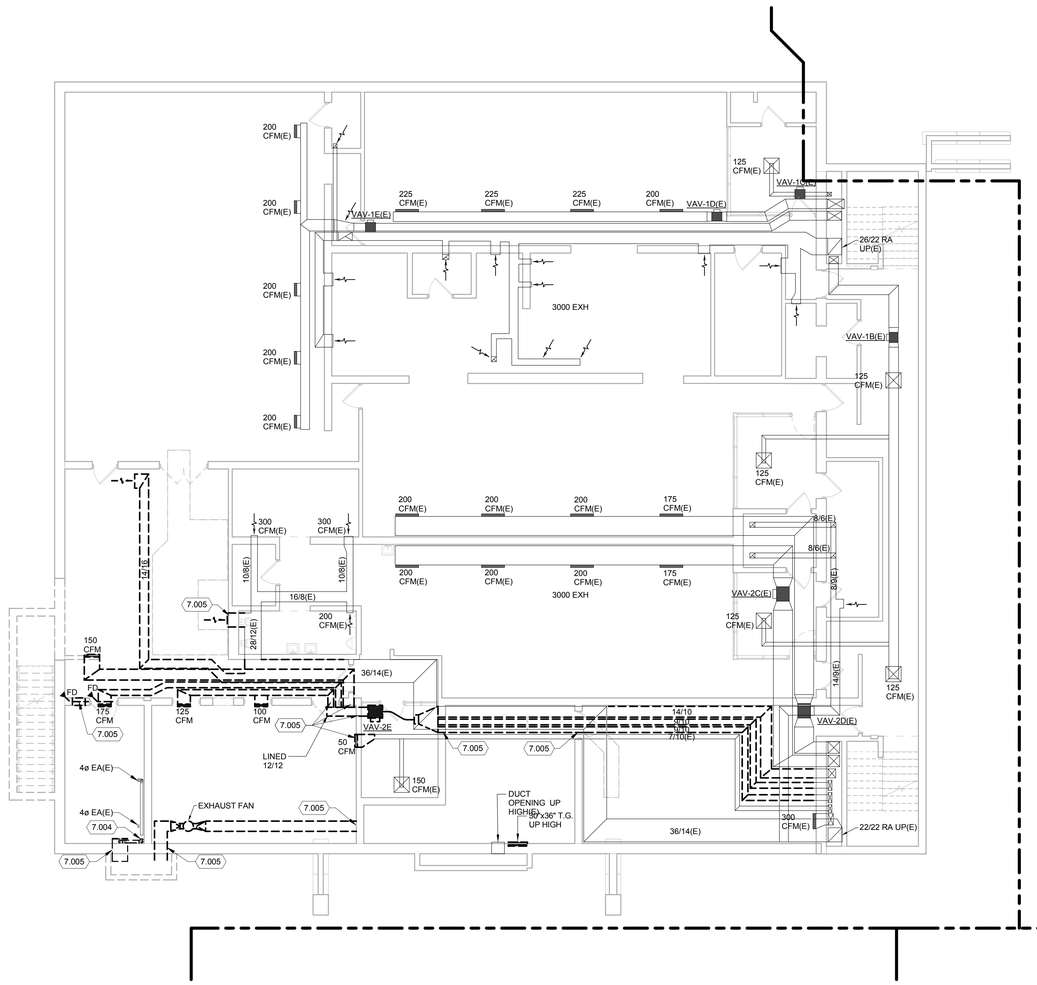
6. WHERE BRANCH DUCTWORK IS SHOWN TO BE DEMOLISHED BACK TO THE MAIN DUCT AND THE EXISTING MAIN DUCT OPENING IS NOT TO BE RE-USED, CAP AND SEAL THE MAIN DUCT BRANCH OPENING AIRTIGHT.

KEYED NOTES

7.004 CONTRACTOR SHALL DEMO EXISTING DUCTWORK AS SHOWN FROM APPROXIMATELY THIS LOCATION.

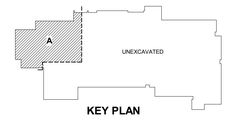
7.005 CONTRACTOR SHALL PATCH AND PAINT WALL OPENING TO MATCH EXISTING.



N 1 **LOWER LEVEL HVAC DEMOLITION PLAN**
1/8" = 1'-0"

PRELIMINARY
NOT FOR CONSTRUCTION
2019-06-06

FOR BIDS
NOT FOR CONSTRUCTION



KEY PLAN

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PART 2 - MANAWA MIDDLE / HIGH SCHOOL

515 E. 4th STREET
MANAWA, WI 54949

MARK	DATE

ISSUED: June 6, 2019
PROJECT NO: 18268
CAD DWG FILE:
DRAWN BY: RRW
CHECKED BY: DJG

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SHEET TITLE:
LOWER LEVEL HVAC DEMOLITION PLAN

SHEET NUMBER:
2-MHD-101

GENERAL HVAC DEMOLITION NOTES:

1. COMPLETELY DEMOLISH ALL EXISTING DUCTWORK AS SHOWN WITH BOLD DASHED LINES, INCLUDING ALL ABANDONED AND UNUSED ACCESSORIES, INSULATION, HANGER SUPPORTS, ETC. FOR REMAINING DUCT SYSTEM. PLUG OR CAP ALL OPENINGS CREATED BY DUCT DEMOLITION. TEST DUCTWORK AS SPECIFIED, AND INSULATE OR PAINT SAME AS NEW WORK. PATCH EXISTING WALLS, ROOFS, CEILINGS, AND FLOORS DISTURBED BY DEMOLITION TO ORIGINAL CONDITION.
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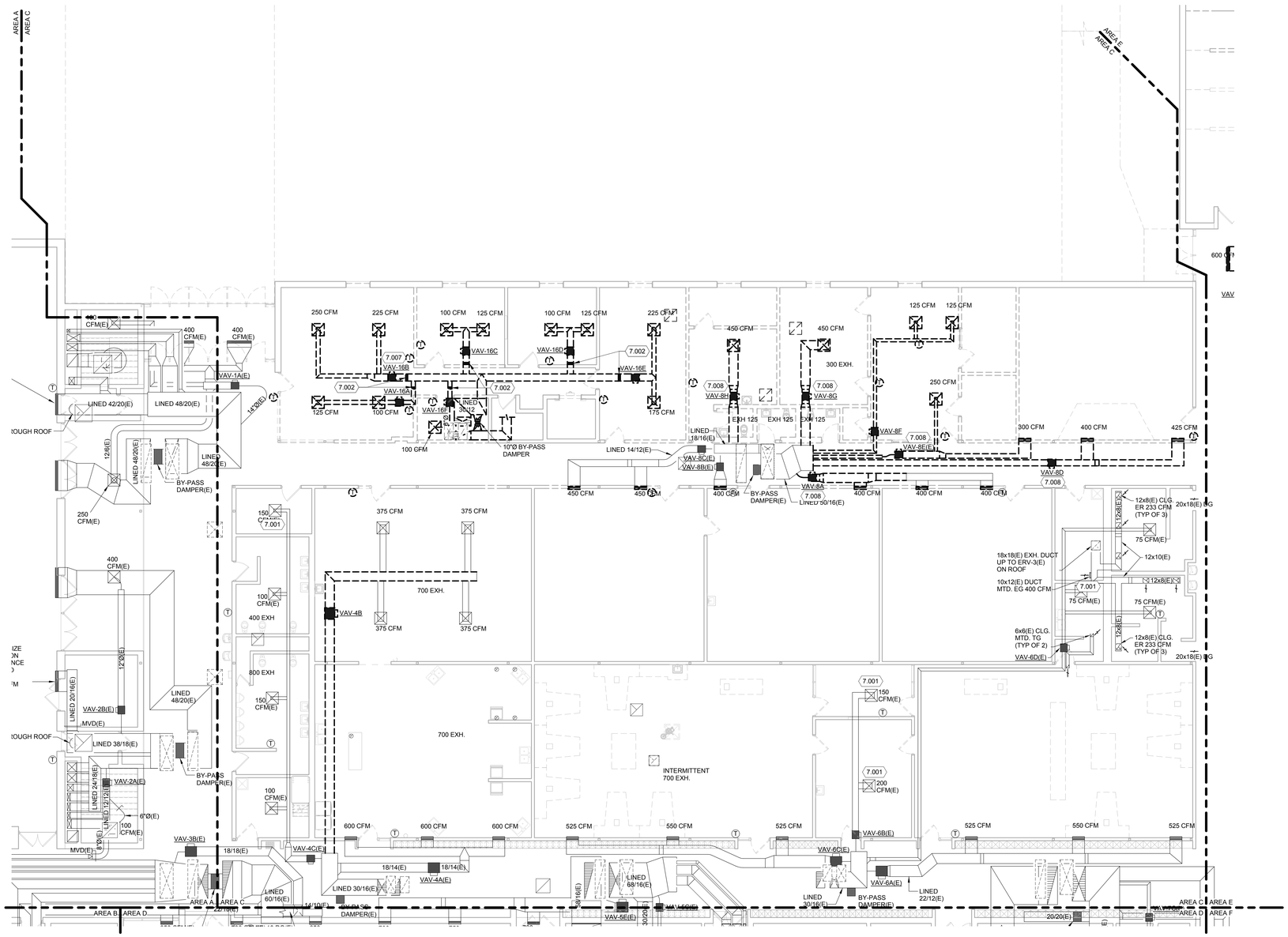
KEYED NOTES

7.001 CONTRACTOR SHALL CAREFULLY REMOVE ALL CEILING DIFFUSERS SERVING THIS ROOM, CLEAN AND REINSTALL IN NEW CEILING GRID.

7.002 CONTRACTOR SHALL DEMO DUCT MOUNTED ELECTRIC REHEAT COIL AND COORDINATE THE REMOVAL OF WIRING BACK TO SOURCE.

7.007 CONTRACTOR SHALL REMOVE VAV-16B(E) FROM THIS LOCATION. REMOVE VAV-16B DESIGNATION FROM UNIT, RE-MARK UNIT AS VAV-17C AND REINSTALL IN NEW LOCATION AS SHOWN ON SHEET 2-MH-104.

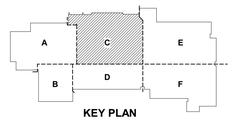
7.008 CONTRACTOR SHALL REMOVE EXISTING VAV FROM THIS LOCATION AND REINSTALL IN NEW LOCATION AS SHOWN ON SHEET 2-MH-104.



N 1 **FIRST FLOOR HVAC DEMOLITION PLAN - AREA C**
1/8" = 1'-0"

PRELIMINARY
NOT FOR CONSTRUCTION
2019-06-06

FOR BIDS
NOT FOR CONSTRUCTION



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PART 2 - MANAWA MIDDLE / HIGH SCHOOL
515 E. 4th STREET
MANAWA, WI 54949

MARK	DATE
ISSUED:	June 6, 2019
PROJECT NO:	18268
CAD DWG FILE:	
DRAWN BY:	RRW
CHECKED BY:	DJG

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SHEET TITLE:
FIRST FLOOR HVAC DEMOLITION PLAN - AREA C

SHEET NUMBER:
2-MHD-104

GENERAL HVAC DEMOLITION NOTES:

1. COMPLETELY DEMOLISH ALL EXISTING DUCTWORK AS SHOWN WITH BOLD DASHED LINES, INCLUDING ALL ABANDONED AND UNUSED ACCESSORIES, INSULATION, HANGER SUPPORTS, ETC. FOR REMAINING DUCT SYSTEM. PLUG OR CAP ALL OPENINGS CREATED BY DUCT DEMOLITION. TEST DUCTWORK AS SPECIFIED, AND INSULATE OR PAINT SAME AS NEW WORK. PATCH EXISTING WALLS, ROOFS, CEILINGS, AND FLOORS DISTURBED BY DEMOLITION TO ORIGINAL CONDITION.
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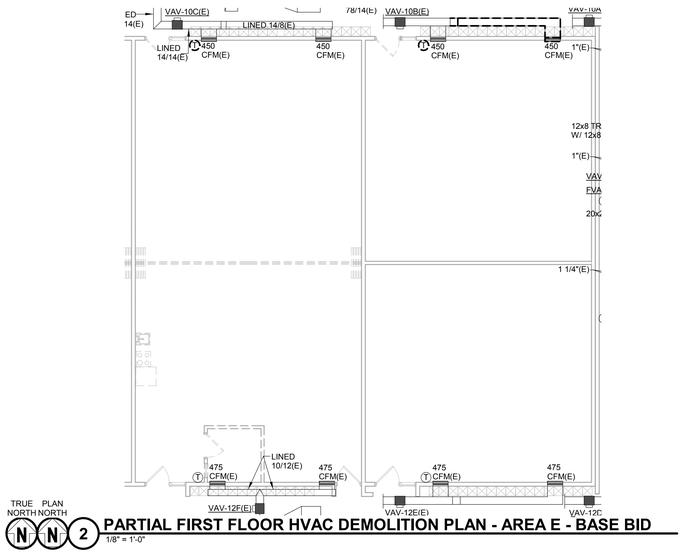
KEYED NOTES

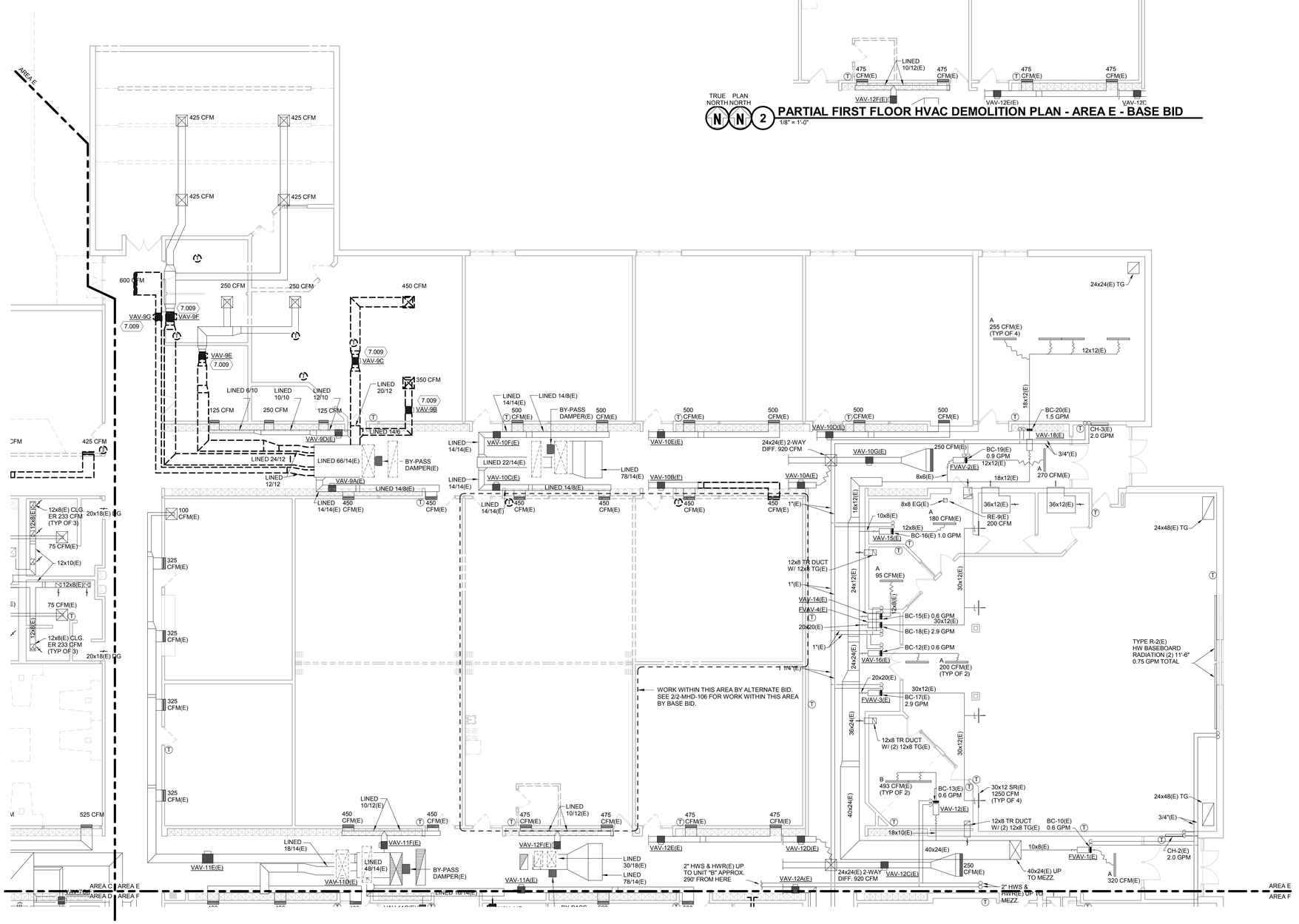
7.009 CONTRACTOR SHALL REMOVE EXISTING VAV FROM THIS LOCATION AND REINSTALL IN NEW LOCATION AS SHOWN ON SHEET 2-MH-106.



TRUE NORTH PLAN NORTH

N N 2 **PARTIAL FIRST FLOOR HVAC DEMOLITION PLAN - AREA E - BASE BID**

1/8" = 1'-0"

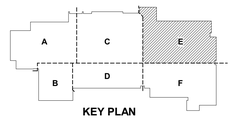


N 1 **FIRST FLOOR HVAC DEMOLITION PLAN - AREA E**

1/8" = 1'-0"

PRELIMINARY
NOT FOR CONSTRUCTION
2019-06-06

FOR BIDS
NOT FOR CONSTRUCTION



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ISSUED:	June 6, 2019
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CAD DWG FILE:	
DRAWN BY:	RRW
CHECKED BY:	DJG

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SHEET TITLE:
FIRST FLOOR HVAC DEMOLITION PLAN - AREA E

SHEET NUMBER:
2-MHD-106

GENERAL HVAC DEMOLITION NOTES:

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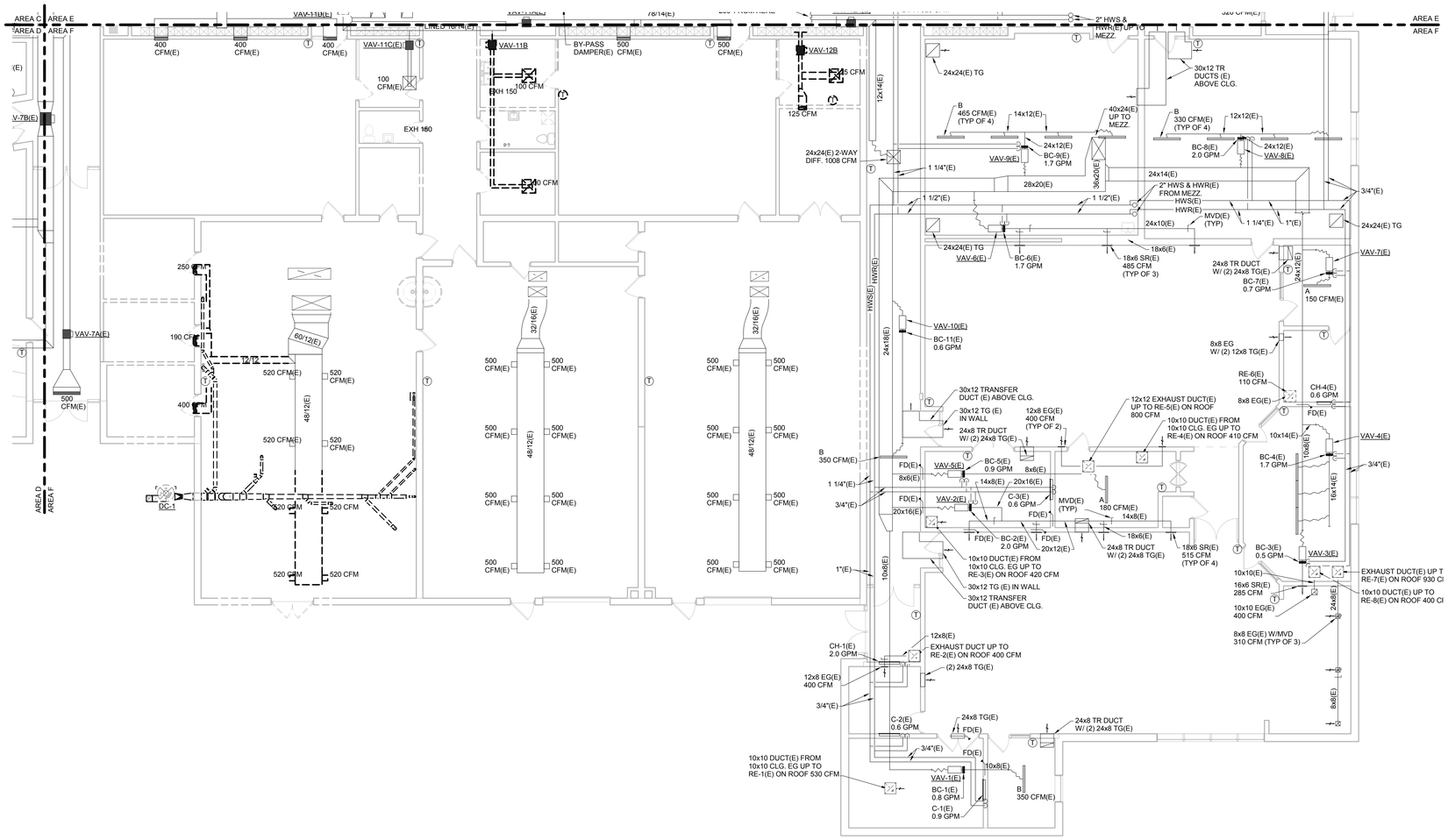
6. WHERE BRANCH DUCTWORK IS SHOWN TO BE DEMOLISHED BACK TO THE MAIN DUCT AND THE EXISTING MAIN DUCT OPENING IS NOT TO BE RE-USED, CAP AND SEAL THE MAIN DUCT BRANCH OPENING AIRTIGHT.

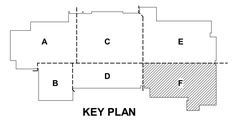
KEYED NOTES



N 1 **FIRST FLOOR HVAC DEMOLITION PLAN - AREA F**
1/8" = 1'-0"

PRELIMINARY
NOT FOR CONSTRUCTION
2019-06-06

FOR BIDS
NOT FOR CONSTRUCTION



KEY PLAN

Hoffman
Planning, Design & Construction, Inc.
800.236.2370 | hoffman.net

CONSULTANT:
Mead & Hunt, Inc.
2440 Deming Way
Middleton, WI 53562
phone: 608-273-6380
meadhunt.com

MANAWA

MANAWA ELEMENTARY SCHOOL - ALTERATIONS
MANAWA MIDDLE/HIGH SCHOOL - ADDITIONS & ALTERATIONS
PART 2 - MANAWA MIDDLE / HIGH SCHOOL
515 E. 4th STREET
MANAWA, WI 54949

MARK	DATE
ISSUED:	June 6, 2019
PROJECT NO:	18268
CAD DWG FILE:	
DRAWN BY:	RRW
CHECKED BY:	DJG

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SHEET TITLE:
FIRST FLOOR HVAC DEMOLITION PLAN - AREA F

SHEET NUMBER:
2-MHD-107

GENERAL HVAC DEMOLITION NOTES:

1. COMPLETELY DEMOLISH ALL EXISTING DUCTWORK AS SHOWN WITH BOLD DASHED LINES, INCLUDING ALL ABANDONED AND UNUSED ACCESSORIES, INSULATION, HANGER SUPPORTS, ETC. FOR REMAINING DUCT SYSTEM. PLUG OR CAP ALL OPENINGS CREATED BY DUCT DEMOLITION. TEST DUCTWORK AS SPECIFIED, AND INSULATE OR PAINT SAME AS NEW WORK. PATCH EXISTING WALLS, ROOFS, CEILINGS, AND FLOORS DISTURBED BY DEMOLITION TO ORIGINAL CONDITION.
2. COMPLETELY DEMOLISH ALL EXISTING EQUIPMENT AS SHOWN WITH BOLD DASHED LINES, INCLUDING ALL ABANDONED AND UNUSED ACCESSORIES, INSULATION, HANGERS, SUPPORTS, BASES, CONTROLS, ETC. PATCH EXISTING WALLS, ROOFS, CEILINGS, AND FLOORS DISTURBED BY DEMOLITION TO ORIGINAL CONDITION.
3. DELIVER INDICATED EQUIPMENT TO OWNER'S DESIGNATED STORAGE SPACE ON SITE, PLUG OR CAP ALL EQUIPMENT OPENINGS TO PREVENT DIRT AND MOISTURE FROM ENTERING EQUIPMENT.
4. REINSTALL INDICATED EQUIPMENT, SAME AS NEW WORK, IN NEW LOCATION WHERE INDICATED. COMPLETELY CLEAN AND RESTORE EQUIPMENT TO GOOD OPERATING CONDITION.
5. INSTALL TEMPORARY COVERS OVER EXISTING EXTERIOR ENVELOPE OPENINGS CREATED BY REMOVED EQUIPMENT/DUCT. COVER SHALL BE WATERTIGHT, AND MEET OSHA AND OWNER REQUIREMENTS. COMPLETELY REMOVE TEMPORARY COVER WHEN OPENINGS ARE PATCHED TO FINAL CONDITION. REPAIR ANY DAMAGE TO EXISTING BUILDING COMPONENTS CAUSED BY TEMPORARY COVER.
6. WHERE BRANCH DUCTWORK IS SHOWN TO BE DEMOLISHED BACK TO THE MAIN DUCT AND THE EXISTING MAIN DUCT OPENING IS NOT TO BE RE-USED, CAP AND SEAL THE MAIN DUCT BRANCH OPENING AIRTIGHT.

KEYED NOTES

7.001 CONTRACTOR SHALL CAREFULLY REMOVE ALL CEILING DIFFUSERS SERVING THIS ROOM, CLEAN AND REINSTALL IN NEW CEILING GRID.

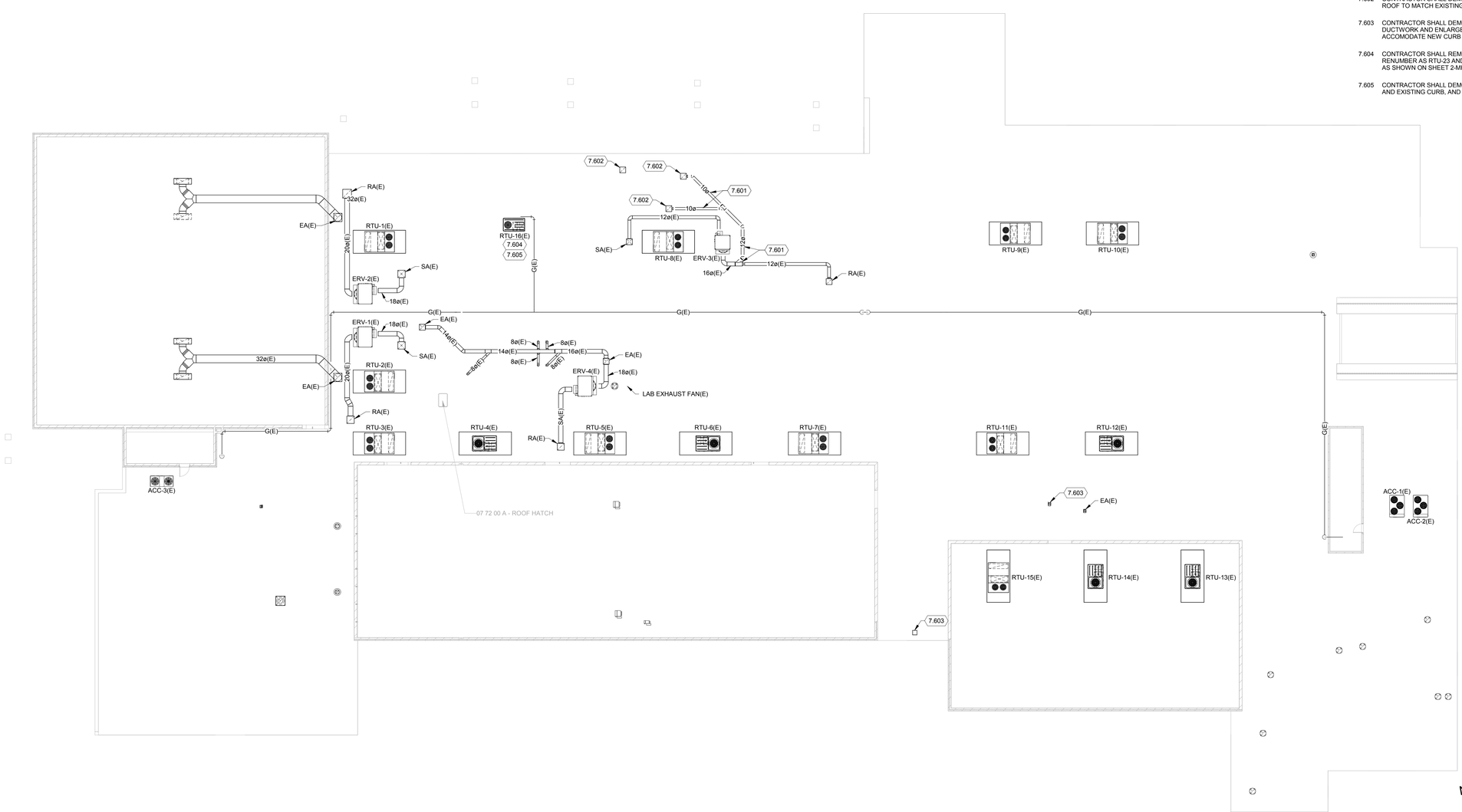
7.601 CONTRACTOR SHALL DEMO EXISTING DUCTWORK AS SHOWN, INCLUDING ALL ASSOCIATED ROOF SUPPORTS. CONTRACTOR SHALL PATCH ROOF TO MATCH EXISTING.

7.602 CONTRACTOR SHALL DEMO EXISTING ROOF CURB AND RE-ROOF EXISTING ROOF TO MATCH EXISTING.

7.603 CONTRACTOR SHALL DEMO EXISTING ROOF CURB AND ASSOCIATED DUCTWORK AND ENLARGE ROOF OPENING, IF NECESSARY, TO ACCOMODATE NEW CURB AND DUCTWORK.

7.604 CONTRACTOR SHALL REMOVE RTU-16 FROM THIS LOCATION AND RENUMBER AS RTU-23 AND RELOCATE TO NEW POSITION ONTO NEW CURB AS SHOWN ON SHEET 2-MH-108.

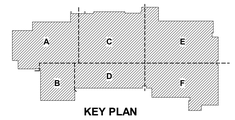
7.605 CONTRACTOR SHALL DEMO ASSOCIATED DUCTWORK, PIPING & VALVING AND EXISTING CURB, AND PATCH AND SEAL ROOF TO SAME AS EXISTING.



N 1 **OVERALL ROOF HVAC DEMOLITION PLAN**
1/16" = 1'-0"

PRELIMINARY
NOT FOR CONSTRUCTION
2019-06-06

FOR BIDS
NOT FOR CONSTRUCTION



KEY PLAN

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PART 2 - MANAWA MIDDLE / HIGH SCHOOL
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MANAWA, WI 54949

MARK	DATE
ISSUED:	June 6, 2019
PROJECT NO:	18268
CAD DWG FILE:	
DRAWN BY:	RRW
CHECKED BY:	DJG

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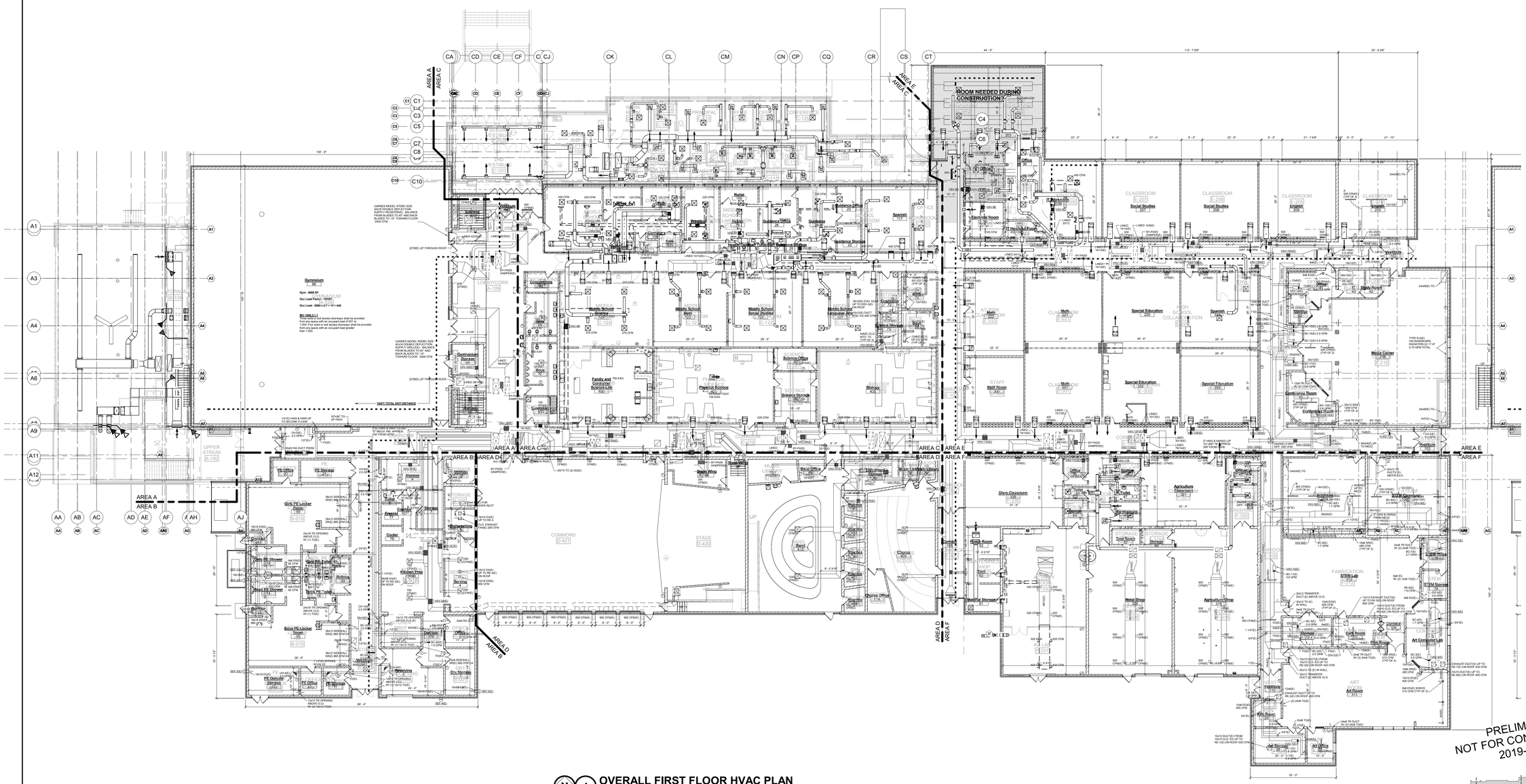
SHEET TITLE:
OVERALL ROOF HVAC DEMOLITION PLAN

SHEET NUMBER:
2-MHD-108

GENERAL HVAC NOTES:

1. INLET DUCT SIZE TO AIR TERMINAL DEVICES SHALL BE SAME AS INLET SIZE UNLESS OTHERWISE NOTED. IF RUNOUT TO AIR TERMINAL BOX IS GREATER THAN 6 FEET IN LENGTH, SIZE RUNOUT ONE EVEN INCREMENT SIZE LARGER (MINIMUM 2" LARGER) UNLESS OTHERWISE NOTED TO WITHIN 3 FEET OF BOX BEFORE REDUCING TO BOX INLET SIZE.
2. DUCTWORK DOWNSTREAM OF AIR TERMINAL BOXES TO BE INTERNALLY LINED FOR A MINIMUM OF 6'-0" FOR SOUND ATTENUATION. OUTLET DUCT SIZES TO MATCH AIR TERMINAL BOX OUTLET UNLESS NOTED OTHERWISE.
3. PROVIDE MANUAL BALANCE DAMPER AT EACH DIFFUSER, GRILLE, AND BRANCH TAKE-OFF IN ALL SUPPLY, RETURN, AND EXHAUST DUCTWORK EXCEPT KITCHEN GREASE EXHAUST DUCT. LOCATE BALANCE DAMPER AS CLOSE TO BRANCH TAKE-OFF AS POSSIBLE.
4. DUCT SIZE TO DIFFUSERS, REGISTERS, AND GRILLES SHALL BE SAME AS NECK SIZE UNLESS NOTED OR DETAILED OTHERWISE.
5. COORDINATE DIFFUSER, REGISTER, AND GRILLE LOCATIONS WITH REFLECTED CEILING PLAN.
6. PROVIDE FLEXIBLE DUCTWORK FOR FINAL CONNECTIONS TO SUPPLY AIR DIFFUSERS UNLESS NOTED OTHERWISE ON DRAWINGS OR IN SPECIFICATIONS. FLEXIBLE DUCT SIZE SHALL BE SAME AS NECK SIZE OF DIFFUSER AND SHALL NOT EXCEED 5 FEET IN LENGTH.
7. PROVIDE PLENUM RATED INSULATION AND WIRING IN RETURN AIR CEILING PLENUM. MATERIALS WITHIN PLENUMS SHALL BE NON-COMBUSTIBLE OR SHALL HAVE A FLAME AND SMOKE SPREAD INDEX OF NOT MORE THAN 25/50 WHEN TESTED IN ACCORDANCE WITH ASTM E84.

KEYED NOTES


ROOM NEEDED DURING CONSTRUCTION?
AREA A
AREA B
AREA C
AREA D
AREA E
AREA F
Gymnasium
Gym - 9599 SF
Occ Load Factor - 10 NET
Occ Load - 9599 x 0.7 = 10 = 448
IBC 1006.2.1.1
Two exits or exit access doorways shall be provided from any space with an occupant load of 501 to 1,000. Four exits or exit access doorways shall be provided from any space with an occupant load greater than 1,000
1M/FT TOTAL EXIT DISTANCE
CARRIES MODEL RYSBV SIZE 40x16 DOUBLE DEFLECTION SUPPLY GRILLE(S). BALANCE FROM BLADES TO 45° AND BACK BLADES TO -15° TOWARD FLOOR. 2000 CFM
32"(BD) UP THROUGH ROOF
Middle School Math
Middle School Science
Middle School Social Studies
Middle School Language Arts
Family and Consumer Science Lab
Physical Science
Biology
Science Storage
Science Office
Guidance Office
Guidance
Guidance Storage
Nurse
Health Office
Health Treatment
Conference Room
Custodian
Custodial Storage
Janitor
Science Storage
Middle School Math
Middle School Social Studies
Middle School Language Arts
Custodian
Science Storage
Boys
Girls
Staff
Office
Principal
Assistant Principal
Secretary
Reception
Waiting
Conference Room
Workroom
Copier
Storage
Vestibule
Corridor
Commons
Stage
Band
Chorus
Orchestra
Kitchen
Kitchen Prep
Servery
Dishwashing
Cooler
Freezer
Serving
Shop Storage
Gymnasium Storage
Boys PE Locker Room
Girls PE Locker Room
Boys PE Toilet
Girls PE Toilet
Boys PE Shower
Girls PE Shower
PE Office
PE Storage
Scorekeeping
Custodian
Janitor
Boys
Girls
Corridor
Vestibule
Office
Conference Room
Workroom
Copier
Storage
Reception
Waiting
Principal
Assistant Principal
Secretary
Nurse
Health Office
Health Treatment
Guidance Office
Guidance
Guidance Storage
Spanish
Custodian
Custodial Storage
Janitor
Boys
Girls
Staff
Office

GENERAL HVAC NOTES:

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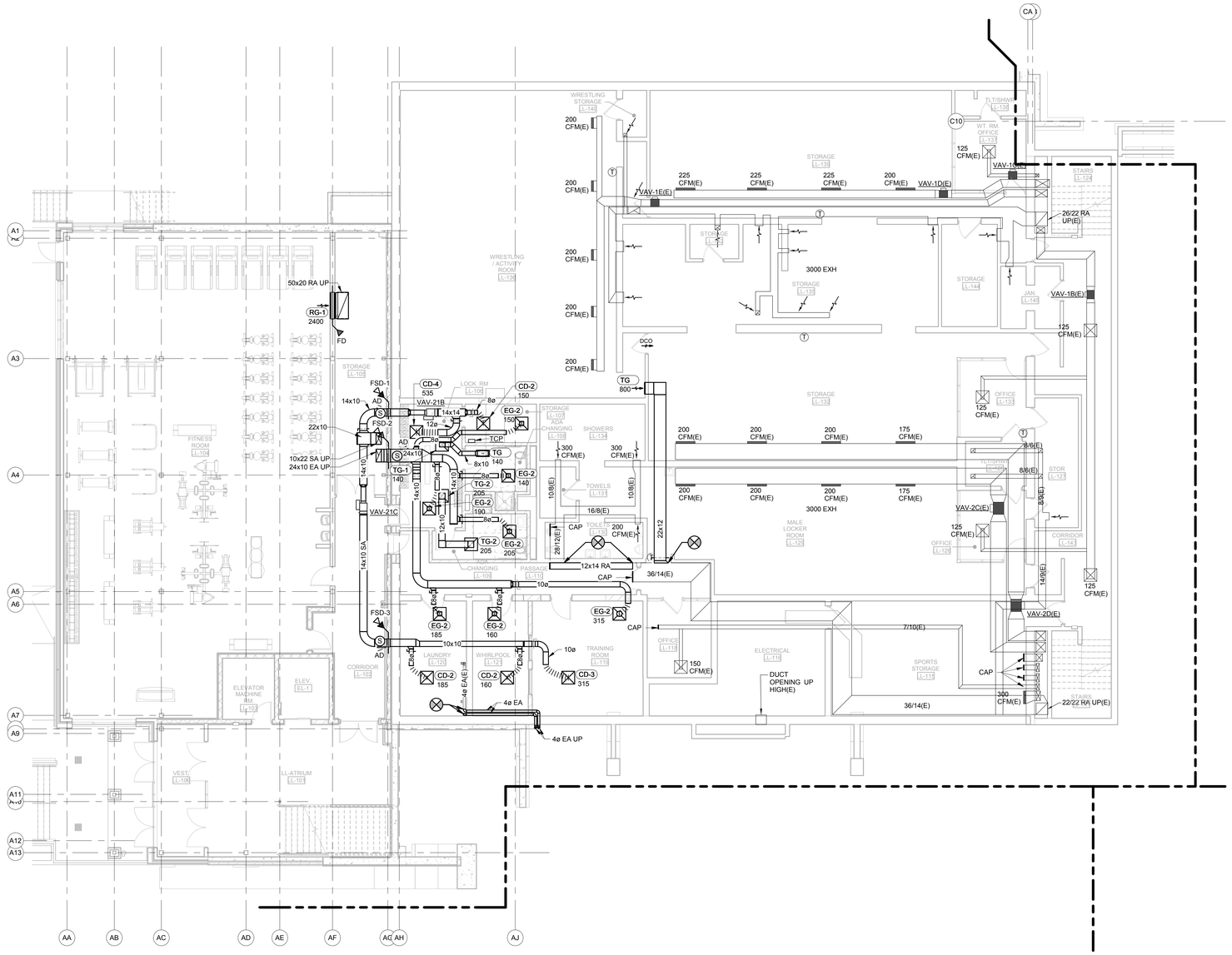
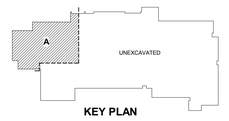


N 1 LOWER LEVEL HVAC PLAN
1/8" = 1'-0"

PRELIMINARY
NOT FOR CONSTRUCTION
2019-06-06

FOR BIDS
NOT FOR CONSTRUCTION



KEY PLAN

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MANAWA

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515 E. 4th STREET
MANAWA, WI 54949

MARK	DATE
ISSUED:	June 6, 2019
PROJECT NO:	18268
CAD DWG FILE:	
DRAWN BY:	RRW
CHECKED BY:	DJG

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SHEET TITLE:
LOWER LEVEL HVAC PLAN

SHEET NUMBER:
2-MH-101

6/6/2019 5:42:52 PM C:\Revit Local\4531800-190225.01-M-HS-Central-2018_roger.wisinger@meadhunt.com.rvt

GENERAL HVAC NOTES:

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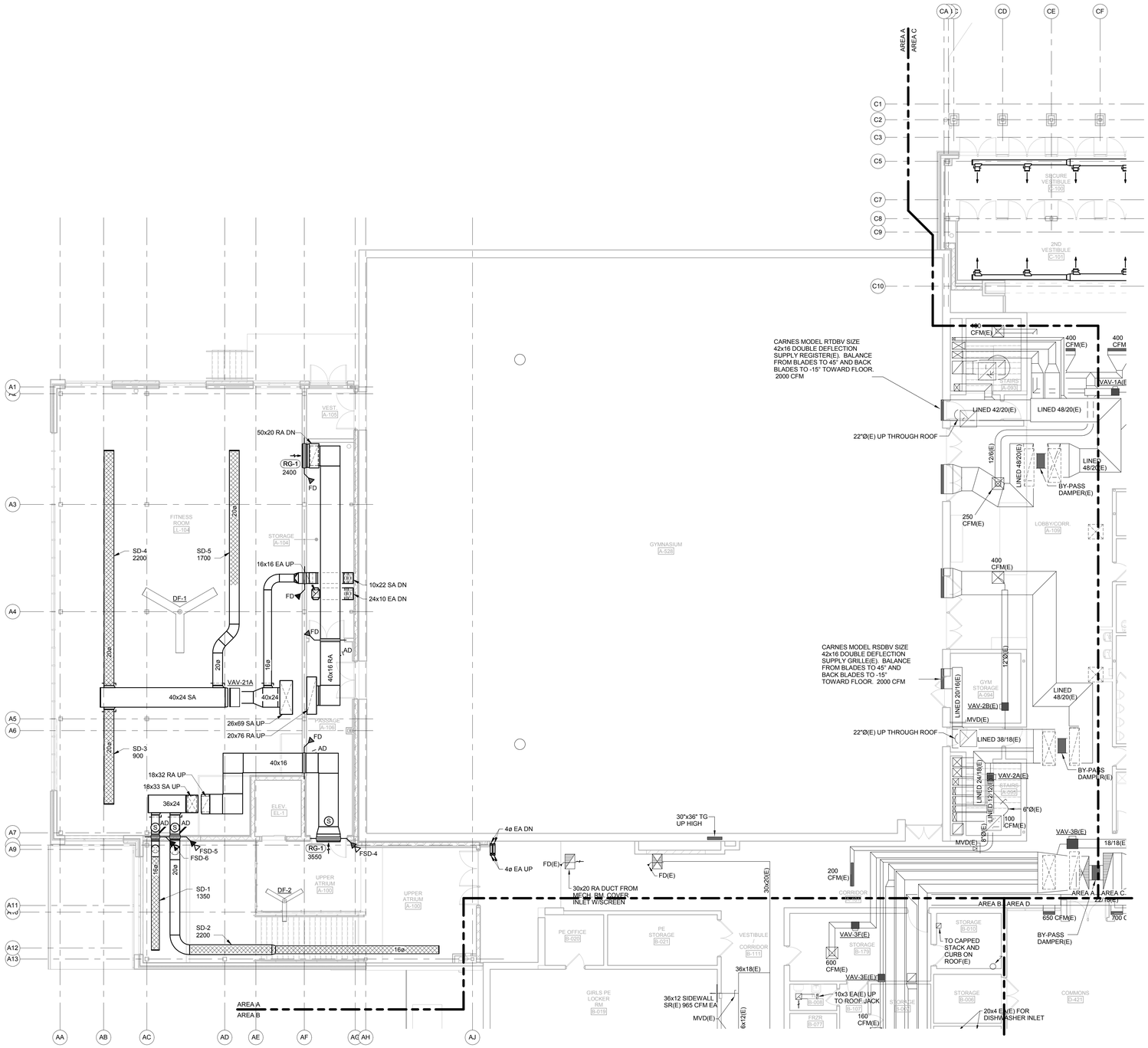
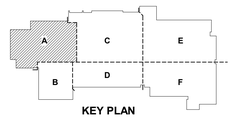
KEYED NOTES



N 1 **FIRST FLOOR HVAC PLAN - AREA A**
1/8" = 1'-0"

PRELIMINARY
NOT FOR CONSTRUCTION
2019-06-06

FOR BIDS
NOT FOR CONSTRUCTION



KEY PLAN

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MANAWA, WI 54949

MARK	DATE
ISSUED:	June 6, 2019
PROJECT NO:	18268
CAD DWG FILE:	
DRAWN BY:	RRW
CHECKED BY:	DJG

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SHEET TITLE:
FIRST FLOOR HVAC PLAN - AREA A

SHEET NUMBER:
2-MH-102

GENERAL HVAC NOTES:

1. INLET DUCT SIZE TO AIR TERMINAL DEVICES SHALL BE SAME AS INLET SIZE UNLESS OTHERWISE NOTED. IF RUNOUT TO AIR TERMINAL BOX IS GREATER THAN 6 FEET IN LENGTH, SIZE RUNOUT ONE EVEN INCREMENT SIZE LARGER (MINIMUM 2" LARGER) UNLESS OTHERWISE NOTED TO WITHIN 3 FEET OF BOX BEFORE REDUCING TO BOX INLET SIZE.
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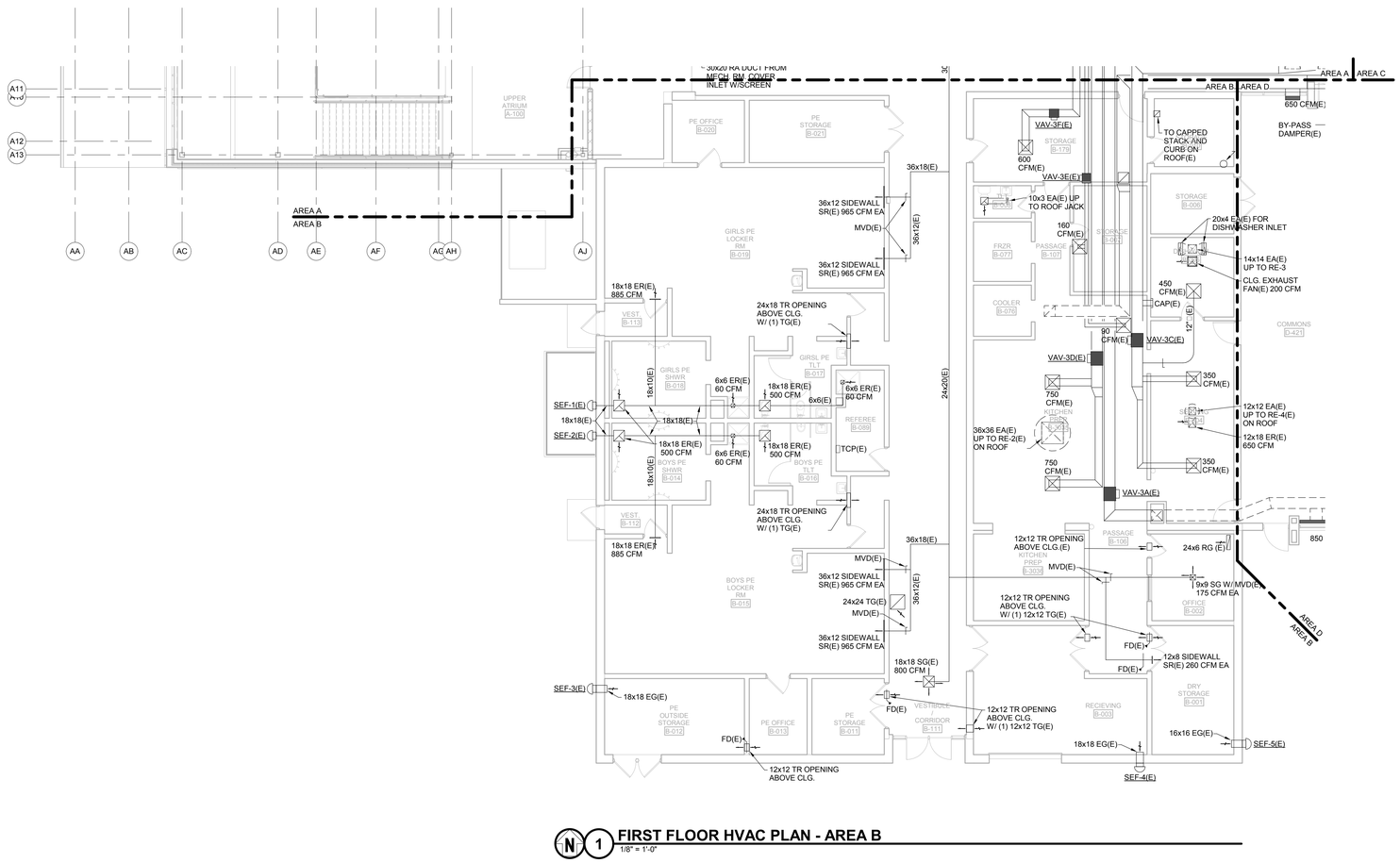
KEYED NOTES



FIRST FLOOR HVAC PLAN - AREA B
1/8" = 1'-0"

Hoffman
Planning, Design & Construction, Inc.
800.236.2370 | hoffman.net

CONSULTANT:
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mead@hunt.com

MANAWA

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515 E. 4th STREET
MANAWA, WI 54949

MARK	DATE
ISSUED:	June 6, 2019
PROJECT NO:	18268
CAD DWG FILE:	
DRAWN BY:	RRW
CHECKED BY:	DJG

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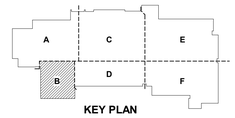
SHEET TITLE:
FIRST FLOOR HVAC PLAN - AREA B

SHEET NUMBER:
2-MH-103

PRELIMINARY
NOT FOR CONSTRUCTION
2019-06-06

FOR BIDS
NOT FOR CONSTRUCTION



KEY PLAN

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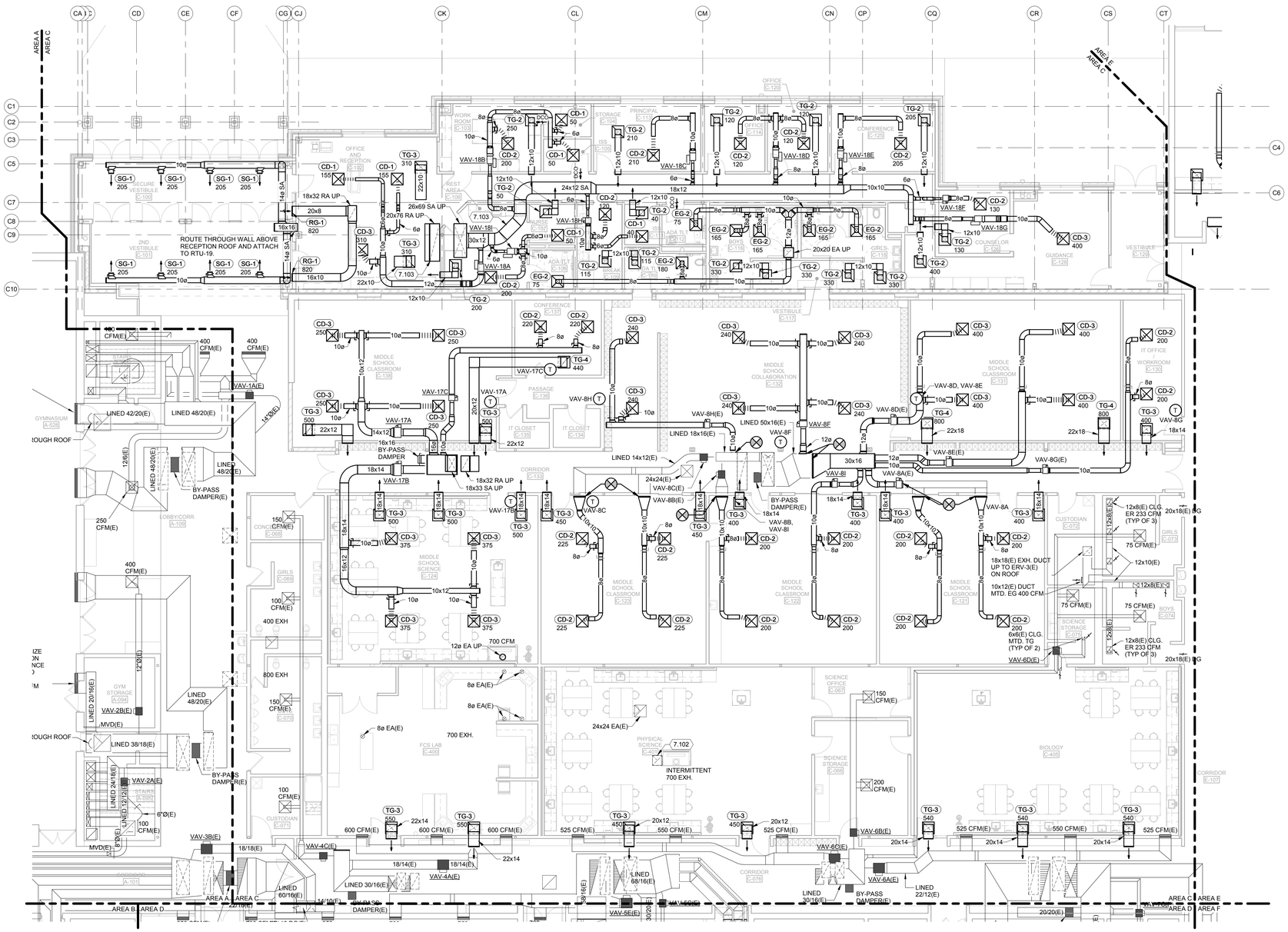
KEYED NOTES

7.102 CONTRACTOR SHALL ROTATE HOOD AND RECONNECT WITH NEW TRANSITION.

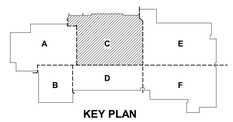
7.103 THIS PORTION OF DUCTWORK SHALL BE LINED AS INDICATED.



N 1 **FIRST FLOOR HVAC PLAN - AREA C**
1/8" = 1'-0"

PRELIMINARY
NOT FOR CONSTRUCTION
2019-06-06

FOR BIDS
NOT FOR CONSTRUCTION



KEY PLAN

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CHECKED BY:	DJG

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SHEET TITLE:
FIRST FLOOR HVAC PLAN - AREA C

SHEET NUMBER:
2-MH-104

GENERAL HVAC NOTES:

1. INLET DUCT SIZE TO AIR TERMINAL DEVICES SHALL BE SAME AS INLET SIZE UNLESS OTHERWISE NOTED. IF RUNOUT TO AIR TERMINAL BOX IS GREATER THAN 6 FEET IN LENGTH, SIZE RUNOUT ONE EVEN INCREMENT SIZE LARGER (MINIMUM 2" LARGER) UNLESS OTHERWISE NOTED TO WITHIN 3 FEET OF BOX BEFORE REDUCING TO BOX INLET SIZE.
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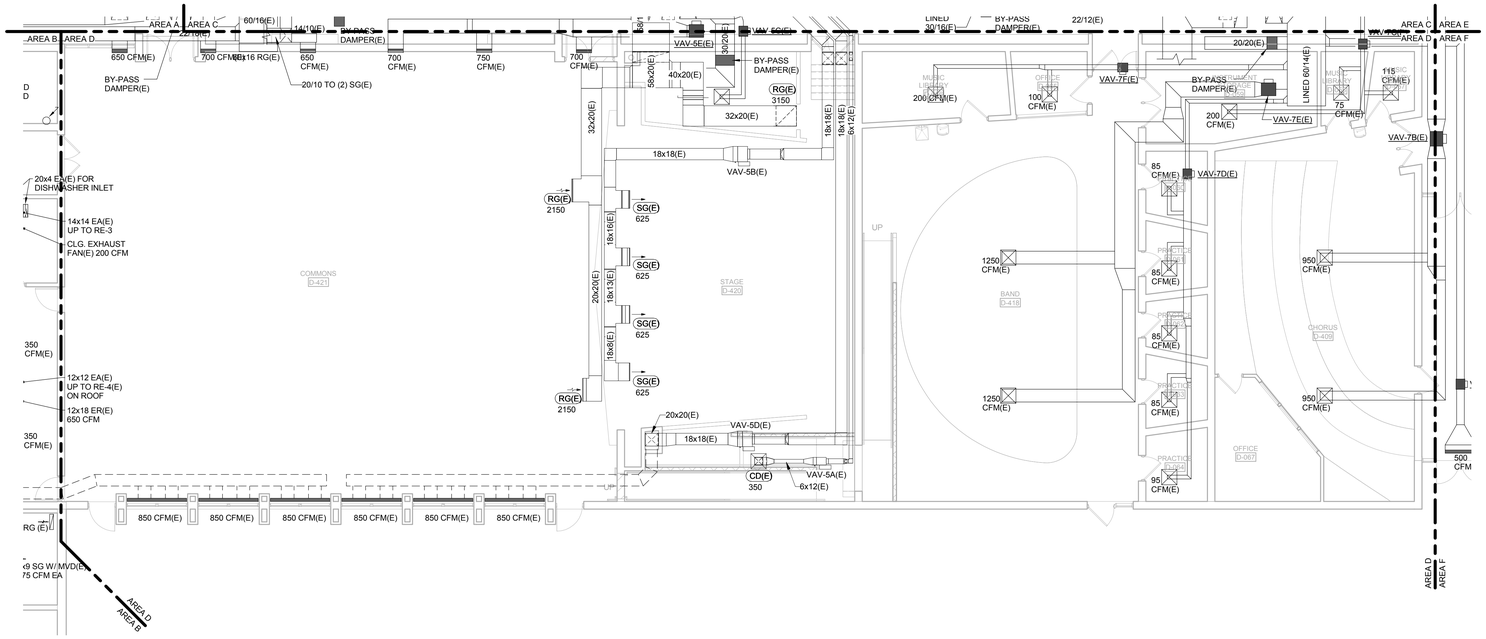
5. COORDINATE DIFFUSER, REGISTER, AND GRILLE LOCATIONS WITH REFLECTED CEILING PLAN.
6. PROVIDE FLEXIBLE DUCTWORK FOR FINAL CONNECTIONS TO SUPPLY AIR DIFFUSERS UNLESS NOTED OTHERWISE ON DRAWINGS OR IN SPECIFICATIONS. FLEXIBLE DUCT SIZE SHALL BE SAME AS NECK SIZE OF DIFFUSER AND SHALL NOT EXCEED 5 FEET IN LENGTH.
7. PROVIDE PLENUM RATED INSULATION AND WIRING IN RETURN AIR CEILING PLENUM. MATERIALS WITHIN PLENUMS SHALL BE NON-COMBUSTIBLE OR SHALL HAVE A FLAME AND SMOKE SPREAD INDEX OF NOT MORE THAN 25/50 WHEN TESTED IN ACCORDANCE WITH ASTM E84.

KEYED NOTES



N 1 **FIRST FLOOR HVAC PLAN - AREA D**
1/8" = 1'-0"

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MANAWA MIDDLE/HIGH SCHOOL - ADDITIONS & ALTERATIONS
PART 2 - MANAWA MIDDLE / HIGH SCHOOL
515 E. 4th STREET
MANAWA, WI 54949

MARK	DATE
ISSUED:	June 6, 2019
PROJECT NO:	18268
CAD DWG FILE:	
DRAWN BY:	RRW
CHECKED BY:	DJG

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SHEET TITLE:
FIRST FLOOR HVAC PLAN - AREA D

SHEET NUMBER:
2-MH-105

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2019-06-06

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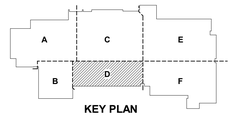

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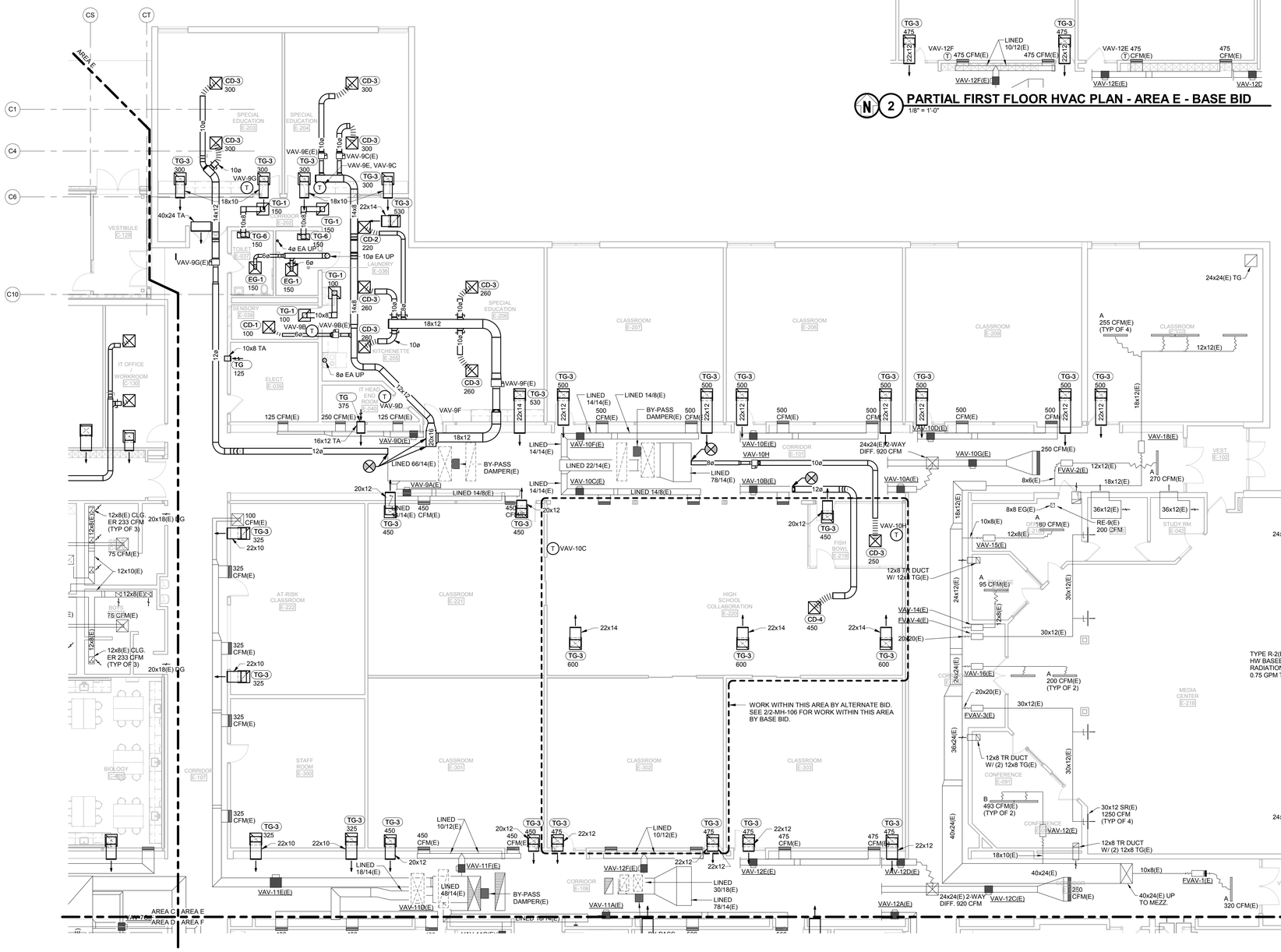
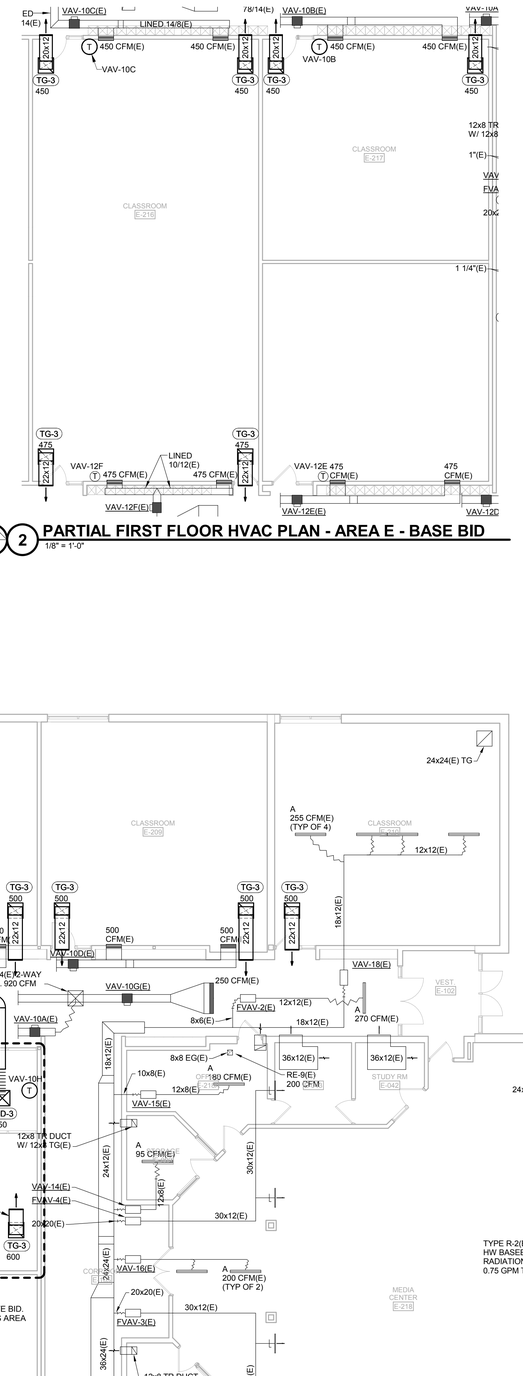


N 1 FIRST FLOOR HVAC PLAN - AREA E

1/8" = 1'-0"



N 2 PARTIAL FIRST FLOOR HVAC PLAN - AREA E - BASE BID

1/8" = 1'-0"

GENERAL HVAC NOTES:

1. INLET DUCT SIZE TO AIR TERMINAL DEVICES SHALL BE SAME AS INLET SIZE UNLESS OTHERWISE NOTED. IF RUNOUT TO AIR TERMINAL BOX IS GREATER THAN 6 FEET IN LENGTH, SIZE RUNOUT ONE EVEN INCREMENT SIZE LARGER (MINIMUM 2" LARGER) UNLESS OTHERWISE NOTED TO WITHIN 3 FEET OF BOX BEFORE REDUCING TO BOX INLET SIZE.
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KEYED NOTES

PRELIMINARY
NOT FOR CONSTRUCTION
2019-06-06

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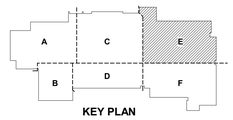
NOT FOR CONSTRUCTION



KEY PLAN

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515 E. 4th STREET
MANAWA, WI 54949

MARK	DATE
ISSUED:	June 6, 2019
PROJECT NO:	18268
CAD DWG FILE:	
DRAWN BY:	RRW
CHECKED BY:	DJG

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SHEET TITLE:
FIRST FLOOR HVAC PLAN - AREA E

SHEET NUMBER:
2-MH-106

GENERAL HVAC NOTES:

1. INLET DUCT SIZE TO AIR TERMINAL DEVICES SHALL BE SAME AS INLET SIZE UNLESS OTHERWISE NOTED. IF RUNOUT TO AIR TERMINAL BOX IS GREATER THAN 6 FEET IN LENGTH, SIZE RUNOUT ONE EVEN INCREMENT SIZE LARGER (MINIMUM 2" LARGER) UNLESS OTHERWISE NOTED TO WITHIN 3 FEET OF BOX BEFORE REDUCING TO BOX INLET SIZE.
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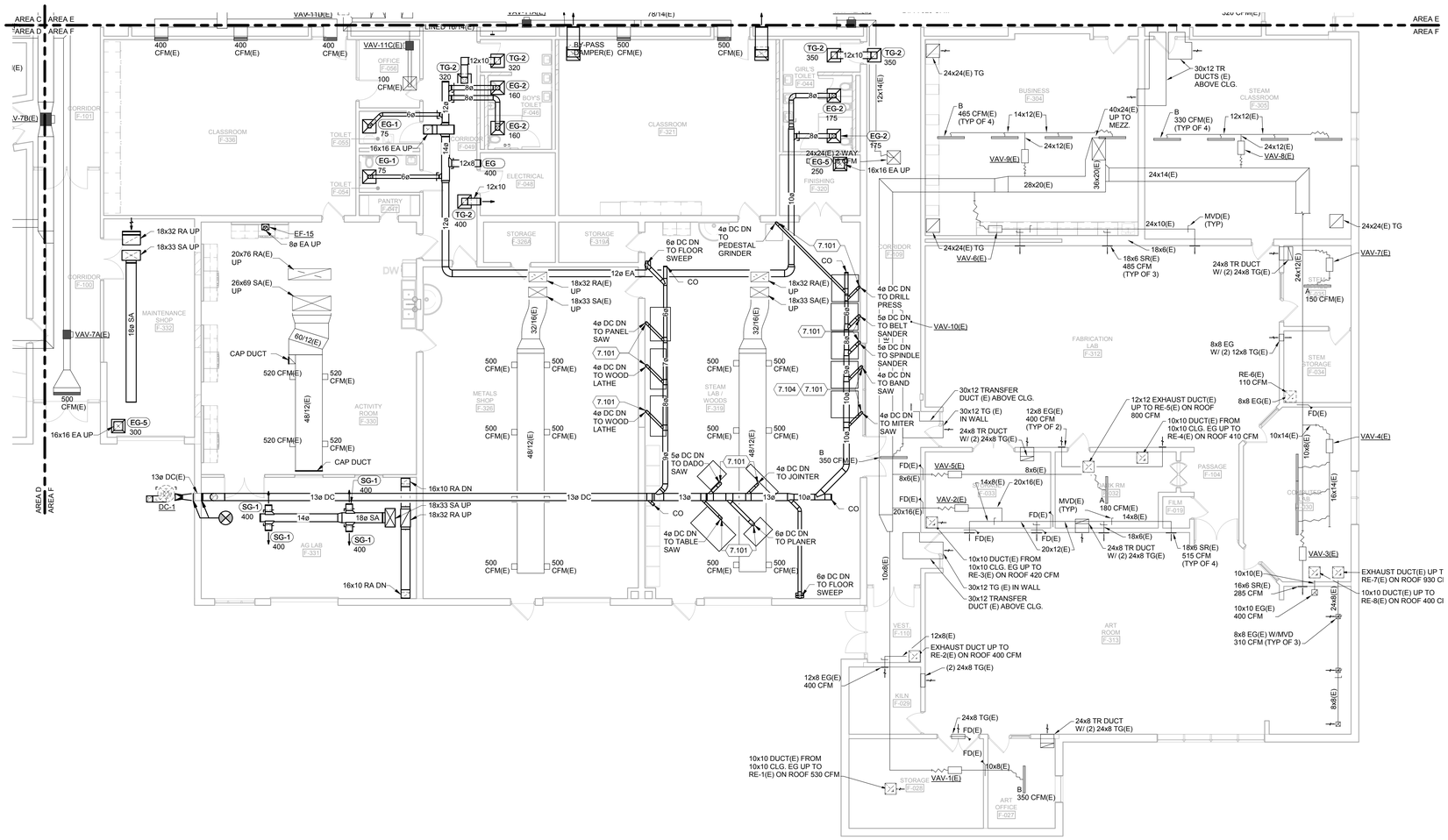
KEYED NOTES

7.101 CONTRACTOR SHALL FABRICATE NECESSARY DUST COLLECTION CONNECTION TO SHOP EQUIPMENT.

7.104 CONTRACTOR SHALL MOUNT DUST COLLECTION DUCT TO VERTICAL WINDOW MULLION PER OWNERS SATISFACTION.



N 1 **FIRST FLOOR HVAC PLAN - AREA F**
1/8" = 1'-0"

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NOT FOR CONSTRUCTION
2019-06-06

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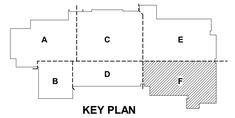
NOT FOR CONSTRUCTION



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PART 2 - MANAWA MIDDLE / HIGH SCHOOL
515 E. 4th STREET
MANAWA, WI 54949

MARK	DATE

ISSUED: June 6, 2019
PROJECT NO: 18268
CAD DWG FILE:
DRAWN BY: RRW
CHECKED BY: DJG

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SHEET TITLE:
FIRST FLOOR HVAC PLAN - AREA F

SHEET NUMBER:
2-MH-107

GENERAL HVAC NOTES:

1. INLET DUCT SIZE TO AIR TERMINAL DEVICES SHALL BE SAME AS INLET SIZE UNLESS OTHERWISE NOTED. IF RUNOUT TO AIR TERMINAL BOX IS GREATER THAN 6 FEET IN LENGTH, SIZE RUNOUT ONE EVEN INCREMENT SIZE LARGER (MINIMUM 2" LARGER) UNLESS OTHERWISE NOTED TO WITHIN 3 FEET OF BOX BEFORE REDUCING TO BOX INLET SIZE.
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KEYED NOTES

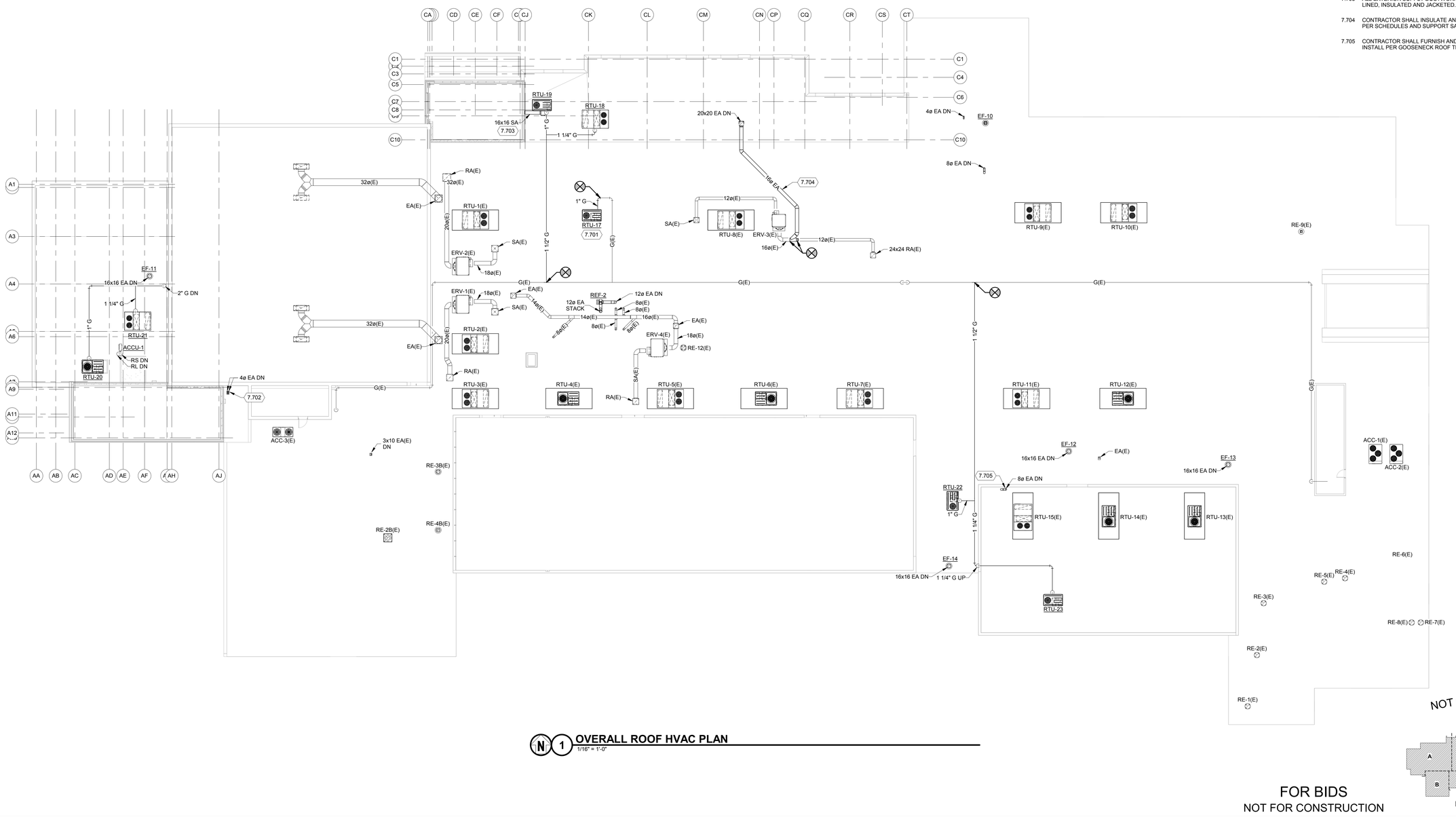
7.701 CONTRACTOR SHALL FIELD VERIFY AND INSTALL NEW RTU-17 ON NEW CURB, IN APPROXIMATLY THIS LOCATION AND EXTEND PIPING AS SHOWN.

7.702 CONTRACTOR SHALL PROVIDE AND INSTALL ROOF CURB FOR DRYER VENT PENTRATIONS.

7.703 ALL EXTERIOR SUPPLY DUCTWORK ON ROOF SERVING ENTRY SHALL BE LINED, INSULATED AND JACKETED.

7.704 CONTRACTOR SHALL INSULATE AND JACKET ROOF MOUNTED DUCTWORK PER SCHEDULES AND SUPPORT SAME AS EXISTING.

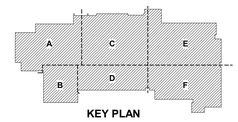
7.705 CONTRACTOR SHALL FURNISH AND INSTALL 42" HIGH ROOF CURB AND INSTALL PER GOOSENECK ROOF TERMINATION DETAIL.



N 1 OVERALL ROOF HVAC PLAN
1/16" = 1'-0"

PRELIMINARY
NOT FOR CONSTRUCTION
2019-06-06

FOR BIDS
NOT FOR CONSTRUCTION



KEY PLAN

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MANAWA, WI 54949

MARK	DATE
ISSUED:	June 6, 2019
PROJECT NO:	18268
CAD DWG FILE:	
DRAWN BY:	RRW
CHECKED BY:	DJG

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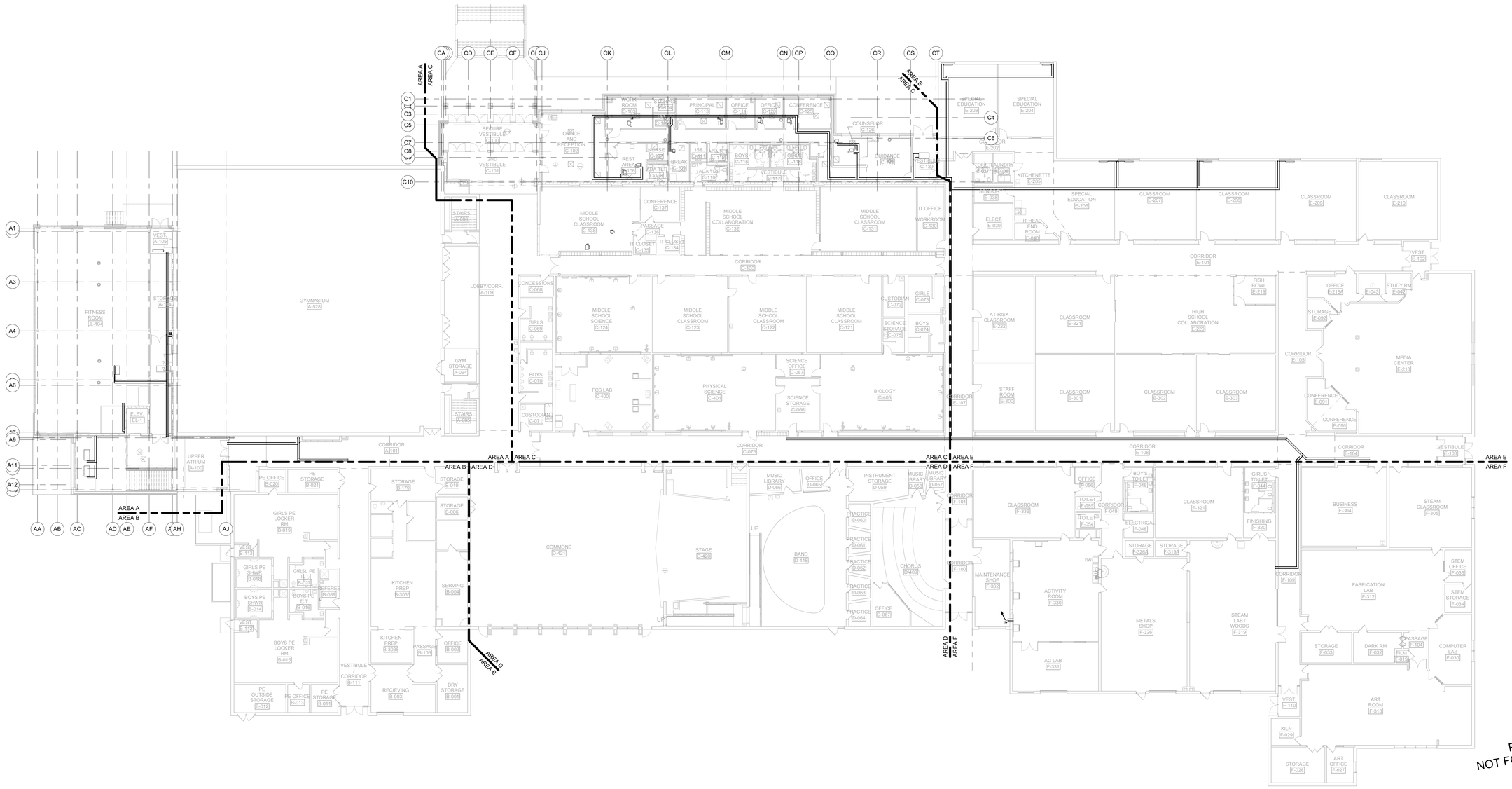
SHEET TITLE:
OVERALL ROOF HVAC PLAN

SHEET NUMBER:
2-MH-108

GENERAL PIPING NOTES:

1. PIPING RUNOUTS TO ALL EQUIPMENT TO BE 3/4" UNLESS NOTED OTHERWISE.
2. WELD-O-LETS AND THREAD-O-LETS MAY BE USED FOR BRANCH TAKE-OFFS UP TO ONE-HALF THE DIAMETER OF THE MAIN.
3. INSTALL DIELECTRIC FITTINGS WHERE PIPING OF DIFFERENT MATERIALS IS JOINED.
4. INSTALL PIPING FREE OF SAGS AND BENDS.
5. LOCATE ALL VALVES FOR EASY ACCESS. INSTALL VALVES WITH STEM UP OR HORIZONTAL.
6. INSTALL DRAIN VALVES AT ALL LOW POINTS IN PIPING SYSTEM AND ELSEWHERE AS REQUIRED FOR SYSTEM DRAINAGE. INSTALL MANUAL AIR VENTS AT ALL HIGH POINTS IN PIPING, AT HEAT-TRANSFER COILS, AND ELSEWHERE AS REQUIRED FOR SYSTEM AIR VENTING.

KEYED NOTES



1 OVERALL FIRST FLOOR PIPING PLAN
1/16" = 1'-0"

PRELIMINARY
NOT FOR CONSTRUCTION
2019-06-06

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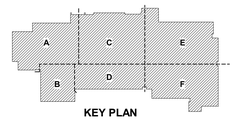

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SHEET TITLE:
OVERALL FIRST FLOOR PIPING PLAN

SHEET NUMBER:
2-MP-100

GENERAL PIPING NOTES:

1. PIPING RUNOUTS TO ALL EQUIPMENT TO BE 3/4" UNLESS NOTED OTHERWISE.
2. WELD-O-LETS AND THREAD-O-LETS MAY BE USED FOR BRANCH TAKE-OFFS UP TO ONE-HALF THE DIAMETER OF THE MAIN.
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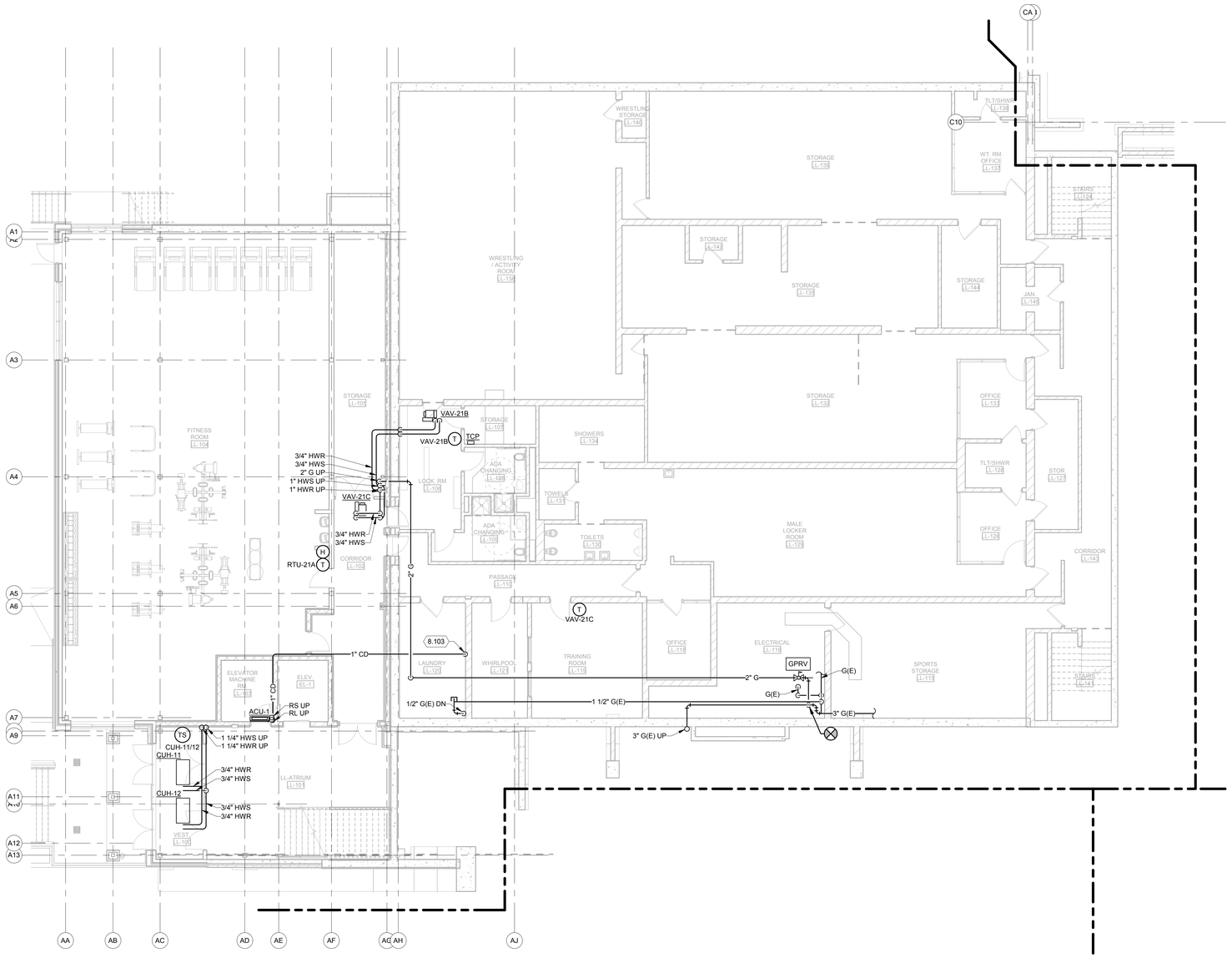
KEYED NOTES

8.103 CONTRACTOR SHALL DROP CONDENSATE DRAIN PIE CLOSE TO WALL AND ROUTE TO NEAREST HUB DRAIN.



N 1 **LOWER LEVEL PIPING PLAN**
1/8" = 1'-0"

PRELIMINARY
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2019-06-06

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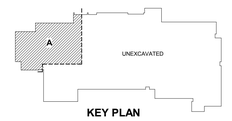

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SHEET TITLE:
LOWER LEVEL PIPING PLAN

SHEET NUMBER:
2-MP-101

GENERAL PIPING NOTES:

1. PIPING RUNOUTS TO ALL EQUIPMENT TO BE 3/4" UNLESS NOTED OTHERWISE.
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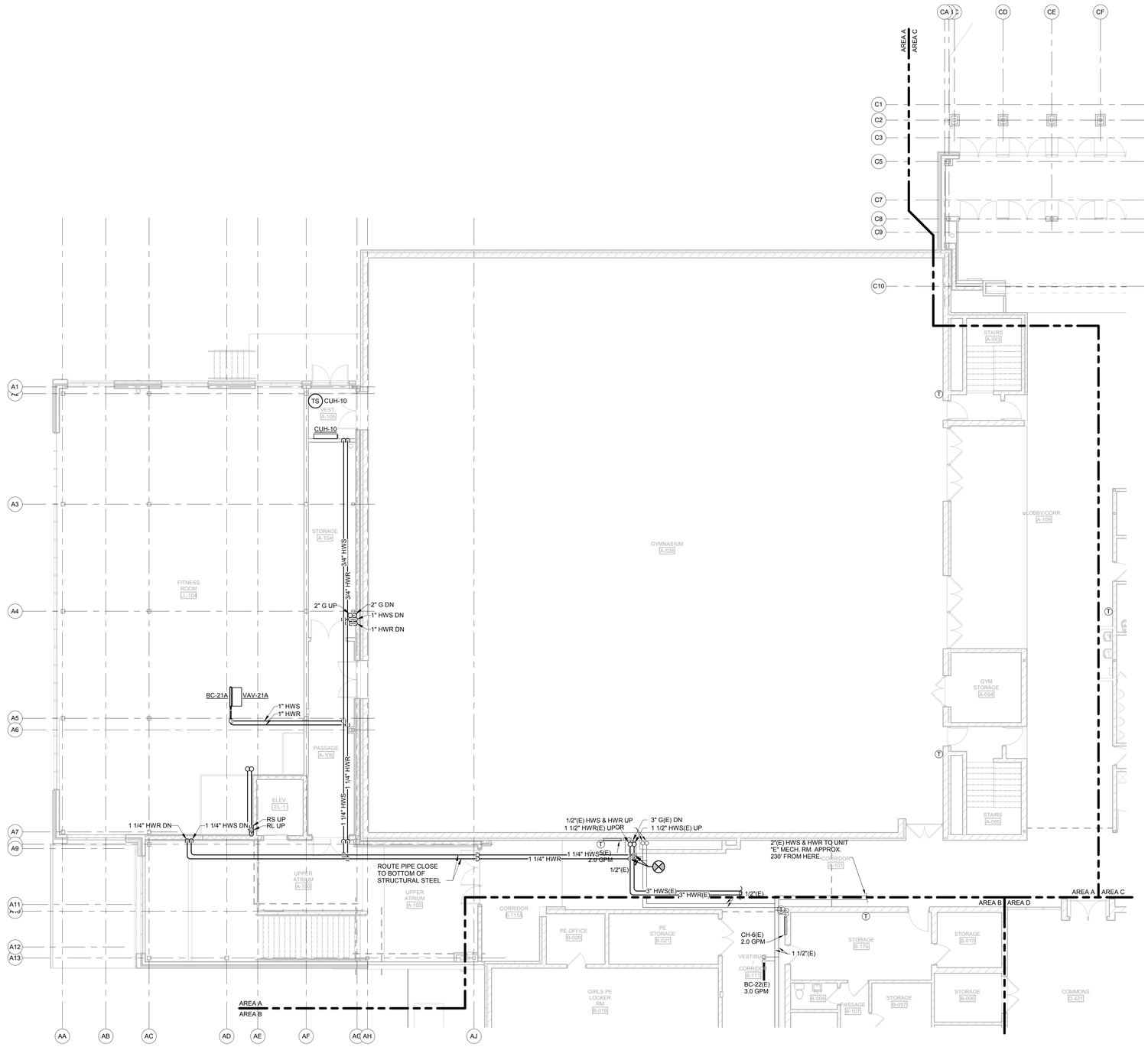
KEYED NOTES



N 1 **FIRST FLOOR PIPING PLAN - AREA A**
1/8" = 1'-0"

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MANAWA, WI 54949

MARK	DATE

ISSUED: June 6, 2019
PROJECT NO: 18268
CAD DWG FILE:
DRAWN BY: RRW
CHECKED BY: DJG

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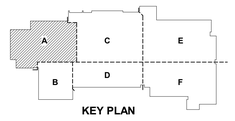
SHEET TITLE:
FIRST FLOOR PIPING PLAN - AREA A

SHEET NUMBER:
2-MP-102

PRELIMINARY
NOT FOR CONSTRUCTION
2019-06-06

FOR BIDS
NOT FOR CONSTRUCTION



KEY PLAN

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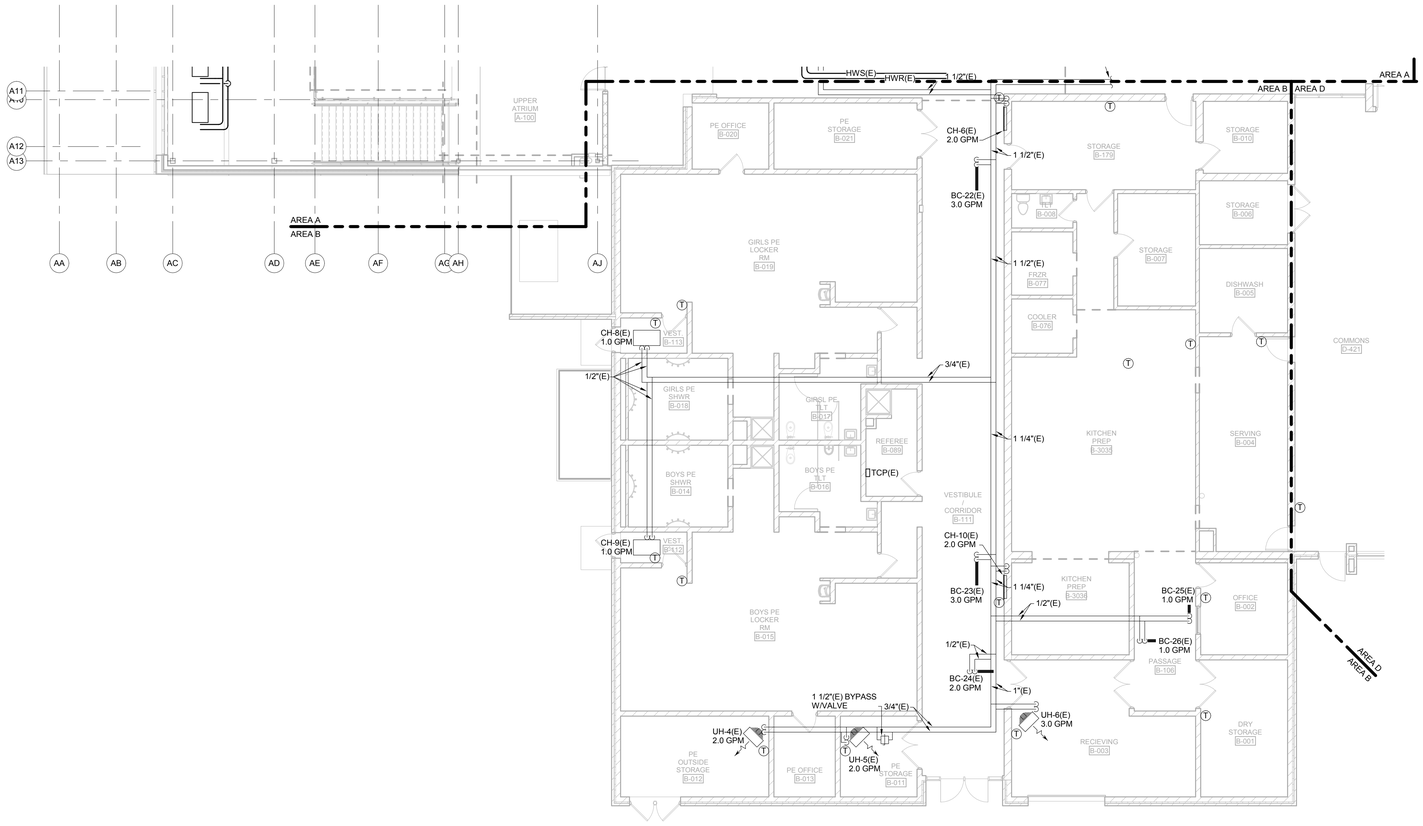
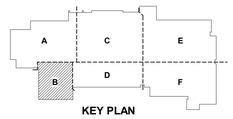


N 1 **FIRST FLOOR PIPING PLAN - AREA B**
1/8" = 1'-0"

PRELIMINARY
NOT FOR CONSTRUCTION
2019-06-06

FOR BIDS
NOT FOR CONSTRUCTION



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MANAWA ELEMENTARY SCHOOL - ALTERATIONS
MANAWA MIDDLE/HIGH SCHOOL - ADDITIONS & ALTERATIONS
PART 2 - MANAWA MIDDLE / HIGH SCHOOL
515 E. 4th STREET
MANAWA, WI 54949

MARK	DATE
ISSUED:	June 6, 2019
PROJECT NO:	18268
CAD DWG FILE:	
DRAWN BY:	RRW
CHECKED BY:	DJG

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SHEET TITLE:
FIRST FLOOR PIPING PLAN - AREA B

SHEET NUMBER:
2-MP-103

GENERAL PIPING NOTES:

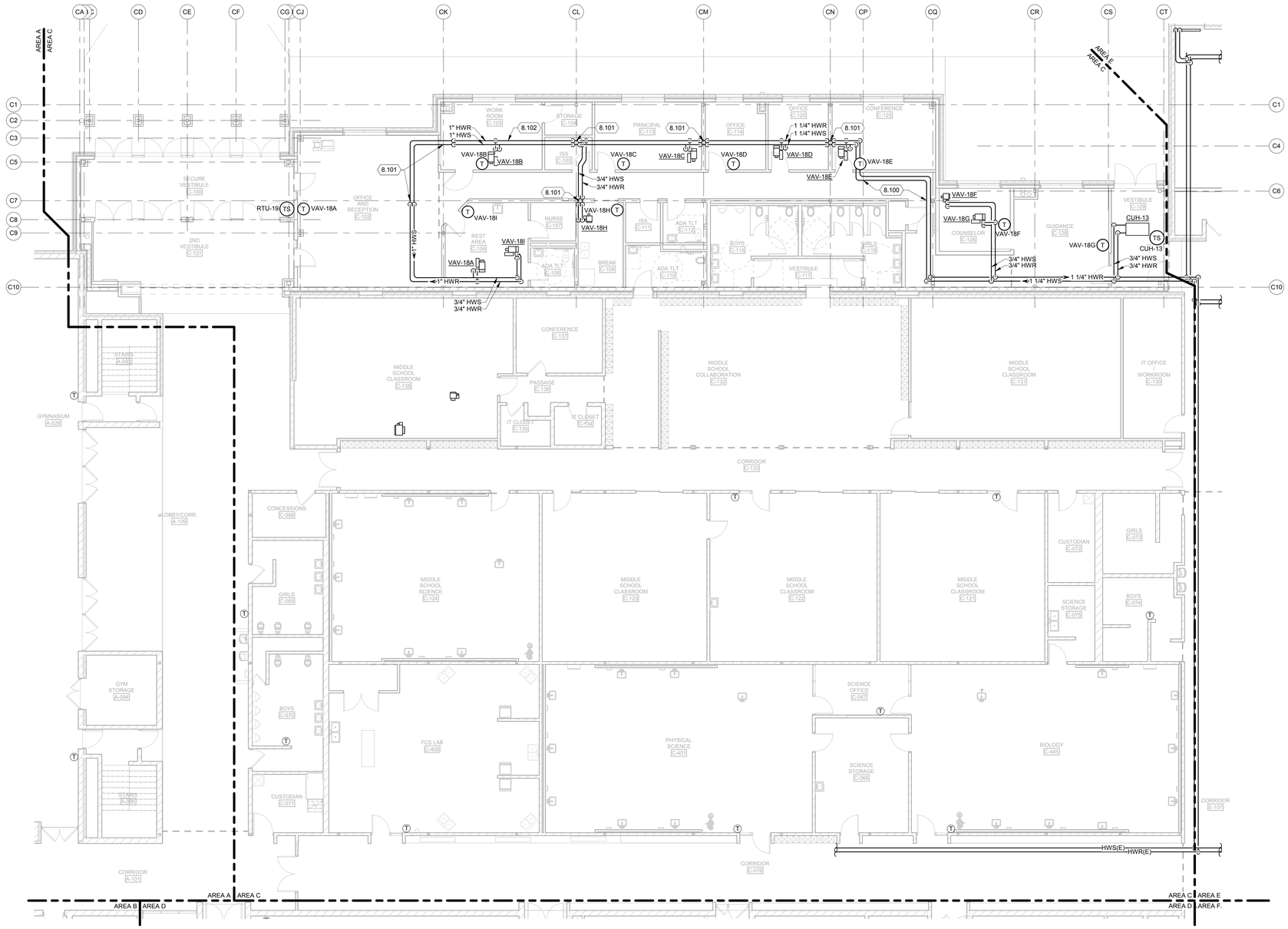
1. PIPING RUNOUTS TO ALL EQUIPMENT TO BE 3/4" UNLESS NOTED OTHERWISE.
2. WELD-O-LETS AND THREAD-O-LETS MAY BE USED FOR BRANCH TAKE-OFFS UP TO ONE-HALF THE DIAMETER OF THE MAIN.
3. INSTALL DIELECTRIC FITTINGS WHERE PIPING OF DIFFERENT MATERIALS IS JOINED.
4. INSTALL PIPING FREE OF SAGS AND BENDS.
5. LOCATE ALL VALVES FOR EASY ACCESS. INSTALL VALVES WITH STEM UP OR HORIZONTAL.
6. INSTALL DRAIN VALVES AT ALL LOW POINTS IN PIPING SYSTEM AND ELSEWHERE AS REQUIRED FOR SYSTEM DRAINAGE. INSTALL MANUAL AIR VENTS AT ALL HIGH POINTS IN PIPING, AT HEAT-TRANSFER COILS, AND ELSEWHERE AS REQUIRED FOR SYSTEM AIR VENTING.

KEYED NOTES

8.100 PIPING PLAN NOTES

8.101 CONTRACTOR SHALL ROUTE HWS/HWR PIPING UNDER STRUCTURAL STEEL BEAM AT THIS LOCATION.

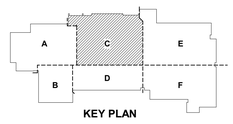
8.102 WHEREVER NECESSARY, CONTRACTOR SHALL ROUTE HWS/HWR PIPING THROUGH STRUCTURAL STEEL JOISTS ALONG THIS RUN.



N 1 **FIRST FLOOR PIPING PLAN - AREA C**
1/8" = 1'-0"

PRELIMINARY
NOT FOR CONSTRUCTION
2019-06-06

FOR BIDS
NOT FOR CONSTRUCTION



KEY PLAN

Hoffman
Planning, Design & Construction, Inc.
800.236.2370 | hoffman.net

CONSULTANT:
Mead & Hunt, Inc.
2440 Deming Way
Middleton, WI 53562
phone: 608-273-6380
meadhunt.com

MANAWA

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CHECKED BY:	DJG

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SHEET TITLE:
FIRST FLOOR PIPING PLAN - AREA C

SHEET NUMBER:
2-MP-104

GENERAL PIPING NOTES:

1. PIPING RUNOUTS TO ALL EQUIPMENT TO BE 3/4" UNLESS NOTED OTHERWISE.
2. WELD-O-LETS AND THREAD-O-LETS MAY BE USED FOR BRANCH TAKE-OFFS UP TO ONE-HALF THE DIAMETER OF THE MAIN.
3. INSTALL DIELECTRIC FITTINGS WHERE PIPING OF DIFFERENT MATERIALS IS JOINED.
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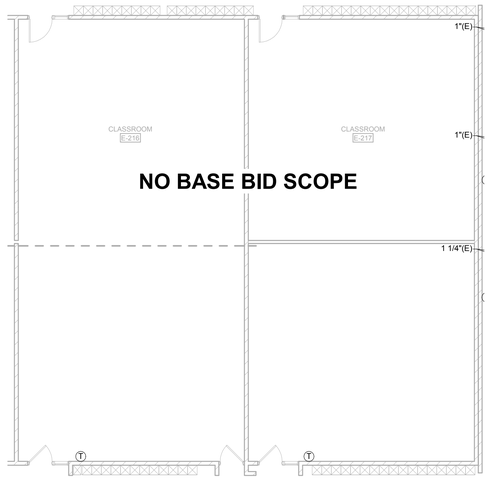
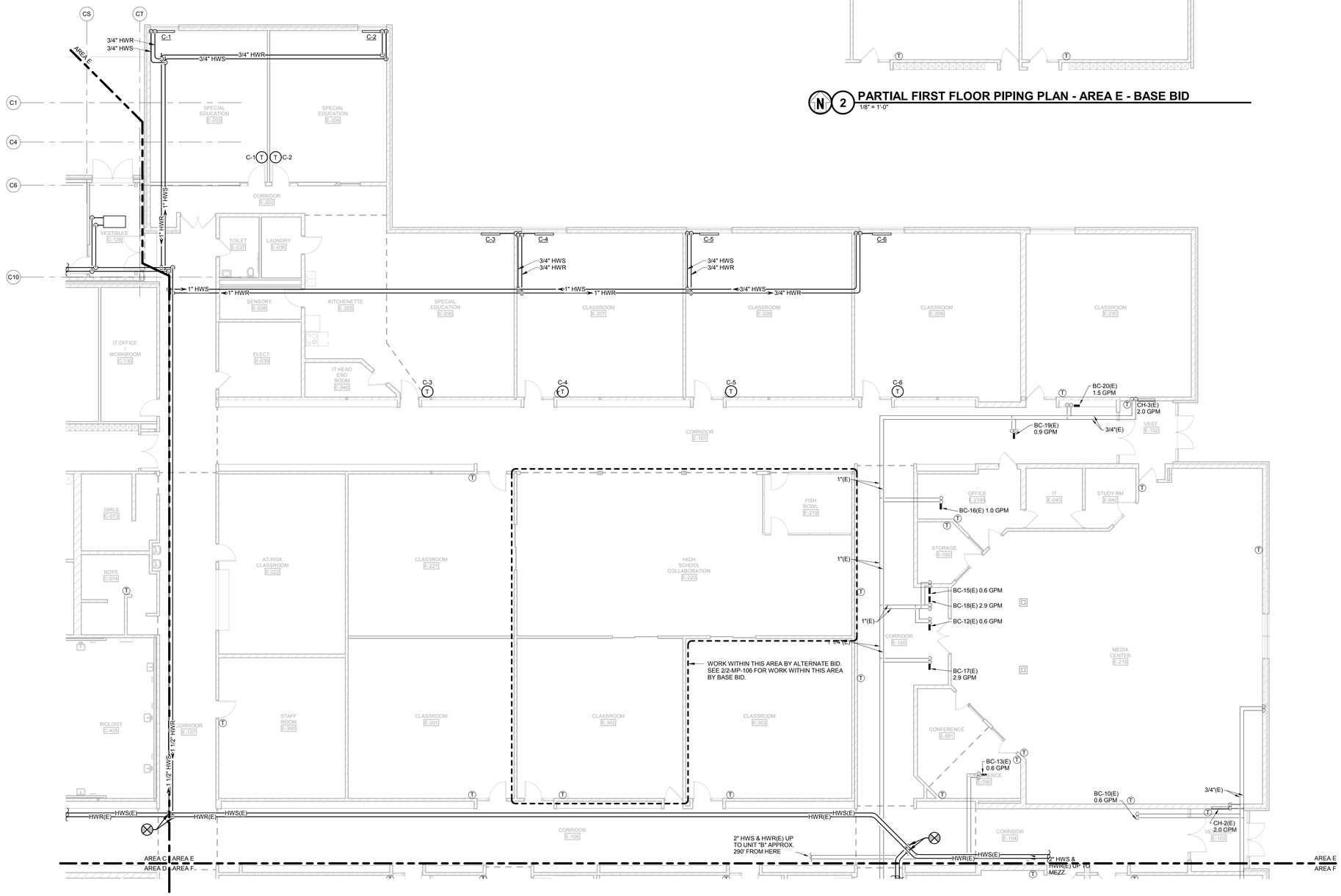
KEYED NOTES



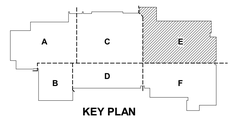
N 2 **PARTIAL FIRST FLOOR PIPING PLAN - AREA E - BASE BID**
1/8" = 1'-0"



N 1 **FIRST FLOOR PIPING PLAN - AREA E**
1/8" = 1'-0"

PRELIMINARY
NOT FOR CONSTRUCTION
2019-06-06

FOR BIDS
NOT FOR CONSTRUCTION



KEY PLAN

Hoffman
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CONSULTANT:
Mead & Hunt, Inc.
4440 Deming Way
Middleton, WI 53562
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CHECKED BY:	DJG

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SHEET TITLE:
FIRST FLOOR PIPING PLAN - AREA E

SHEET NUMBER:
2-MP-106

GENERAL PIPING NOTES:

1. PIPING RUNOUTS TO ALL EQUIPMENT TO BE 3/4" UNLESS NOTED OTHERWISE.
2. WELD-O-LETS AND THREAD-O-LETS MAY BE USED FOR BRANCH TAKE-OFFS UP TO ONE-HALF THE DIAMETER OF THE MAIN.
3. INSTALL DIELECTRIC FITTINGS WHERE PIPING OF DIFFERENT MATERIALS IS JOINED.
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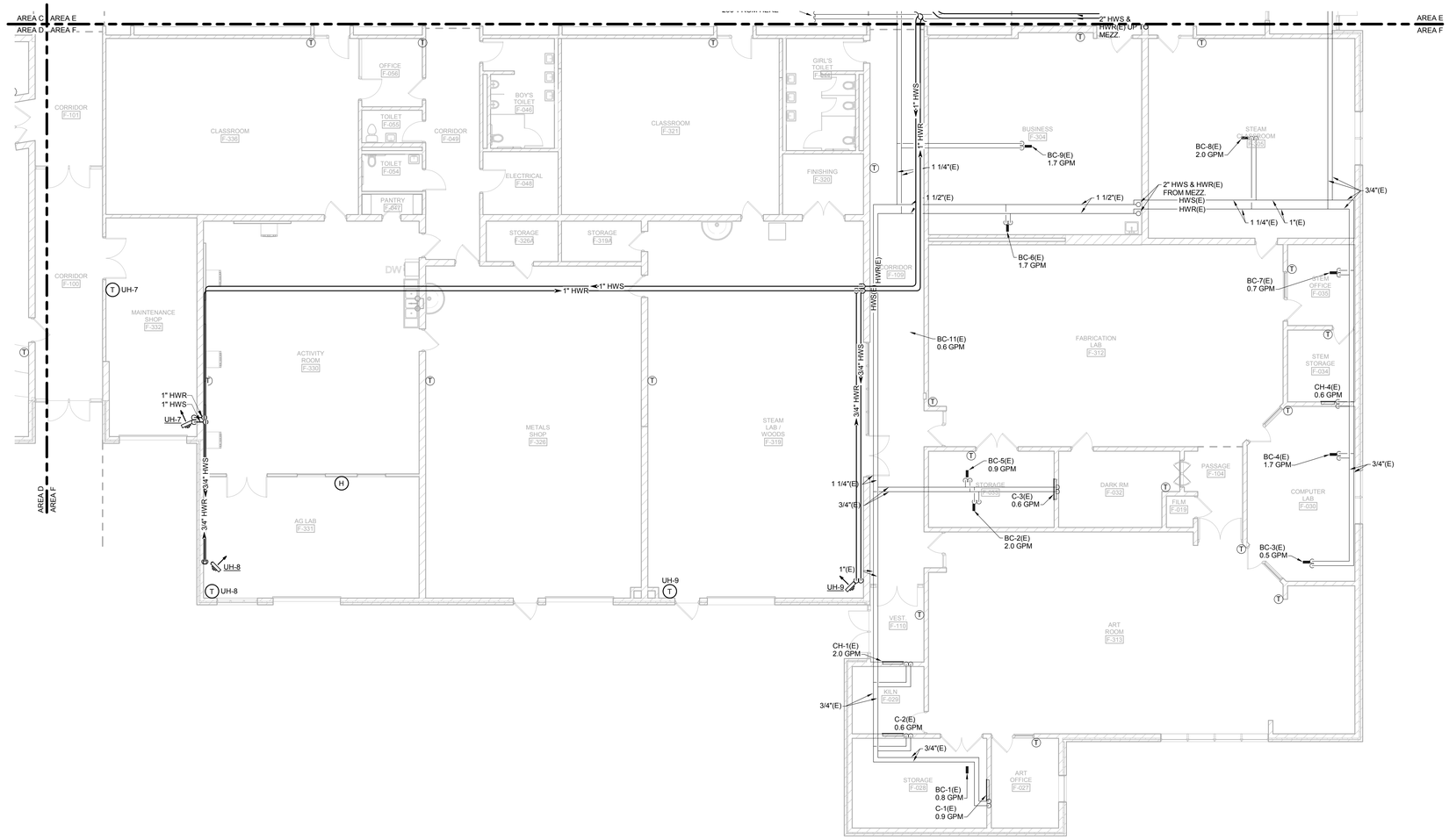
KEYED NOTES

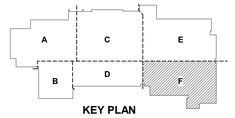


N 1 FIRST FLOOR PIPING PLAN - AREA F

1/8" = 1'-0"

PRELIMINARY
NOT FOR CONSTRUCTION
2019-06-06

FOR BIDS
NOT FOR CONSTRUCTION



KEY PLAN

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ISSUED: June 6, 2019
PROJECT NO: 18268
CAD DWG FILE:
DRAWN BY: RRW
CHECKED BY: DJG

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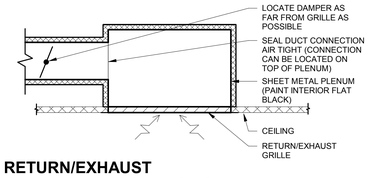
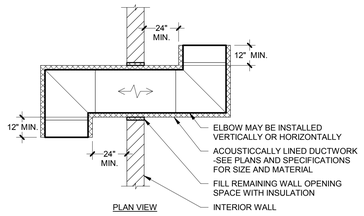
SHEET TITLE:
FIRST FLOOR PIPING PLAN - AREA F

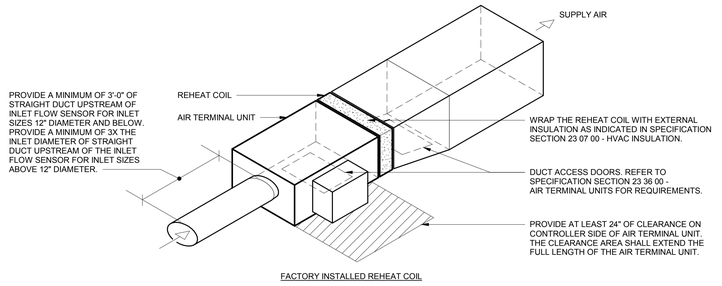
SHEET NUMBER:
2-MP-107



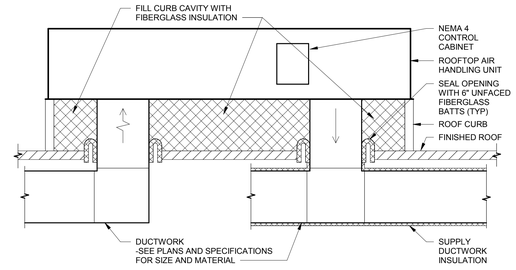
15 RETURN/EXHAUST GRILLE DUCT CONNECTION
NO SCALE



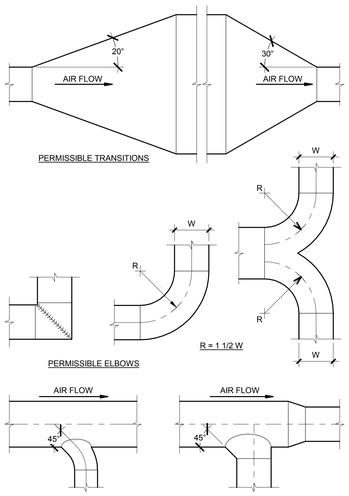
11 TRANSFER DUCT DETAIL
NO SCALE



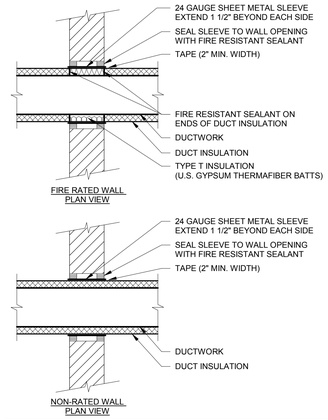
7 SUPPLY AIR TERMINAL UNIT WITH REHEAT COIL
NO SCALE



1 ROOFTOP UNIT (RTU) SECTION
NO SCALE

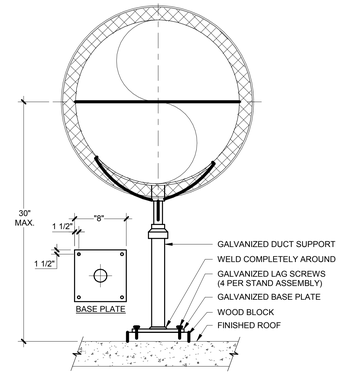


16 TYPICAL DUCT TRANSITIONS
NO SCALE

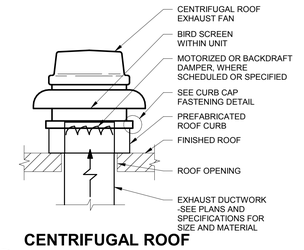


NOTE:
THIS DETAIL APPLIES ONLY FOR INSULATED DUCTS REQUIRING CONTINUOUS INSULATION THROUGH WALL, AND DUCTS NOT REQUIRING FIRE DAMPERS.

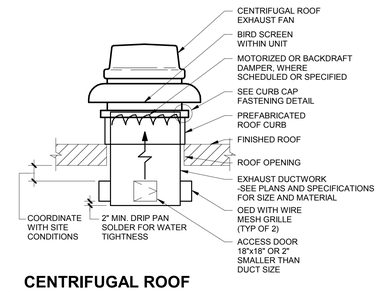
12 DUCT PENETRATION THROUGH INTERIOR WALL
NO SCALE



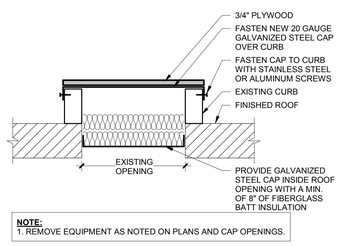
8 ROOF DUCT SUPPORT
NO SCALE



2 CENTRIFUGAL ROOF EXHAUST FAN ON FLAT ROOF
NO SCALE

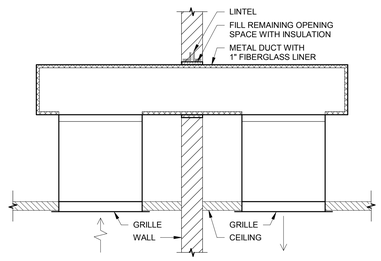


3 CENTRIFUGAL ROOF EXHAUST FAN WITH DRIP PAN
NO SCALE

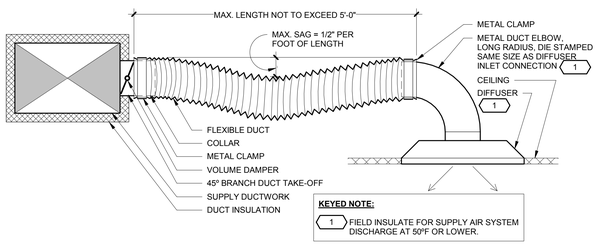


NOTE:
1. REMOVE EQUIPMENT AS NOTED ON PLANS AND CAP OPENINGS.

17 CURB CAP DETAIL
NO SCALE

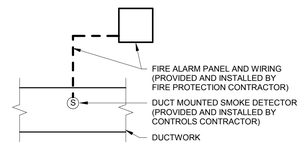


13 TRANSFER DUCT WITH BOTTOM CONNECTION
NO SCALE

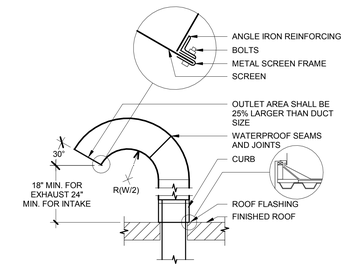


KEYED NOTE:
1 FIELD INSULATE FOR SUPPLY AIR SYSTEM DISCHARGE AT 50°F OR LOWER.

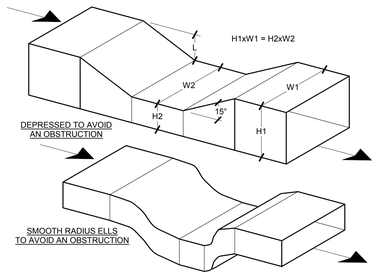
9 FLEXIBLE DUCT TO CEILING DIFFUSER
NO SCALE



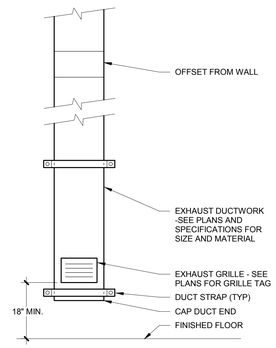
4 DUCT MOUNTED SMOKE DETECTOR CONTROL DIAGRAM
NO SCALE



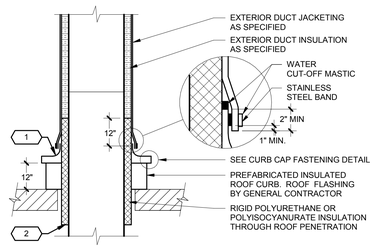
18 GOOSENECK ROOF TERMINATION
NO SCALE



14 TYPICAL DUCT OFFSET
NO SCALE

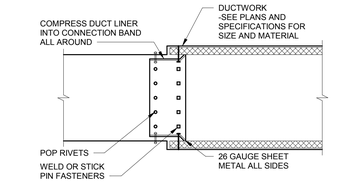


10 RETURN/EXHAUST GRILLE DUCT CONNECTION AT FLOOR
NO SCALE



KEYED NOTES:
1 CURB CAP SIZED TO FIT CURB AND DUCT SHALL BE PROVIDED BY ROOF CURB MANUFACTURER.
2 FOR UNINSULATED DUCTWORK IN INTERIOR SPACES, TERMINATE INSULATION AT ROOF LINE.

6 ROOF DUCT PENETRATION
NO SCALE



5 DUCT SOUND LINING TERMINATION
NO SCALE

FOR BIDS
NOT FOR CONSTRUCTION

PRELIMINARY
NOT FOR CONSTRUCTION
2019-06-06

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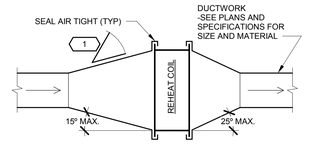
SHEET TITLE:
HVAC DETAILS

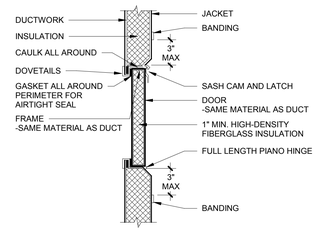
SHEET NUMBER:
2-MS-501



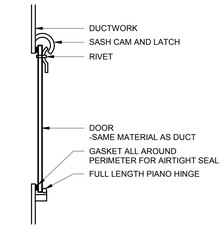
KEYED NOTE:

1 SEE DETAIL AND LOCATE ACCESS DOOR ON SIDE OR BOTTOM WHICHEVER HAS BEST ACCESS FOR MAINTENANCE. DOOR SIZE SHALL BE 18x18 OR 2" LESS THAN DUCT SIZE ON FACE LOCATED.

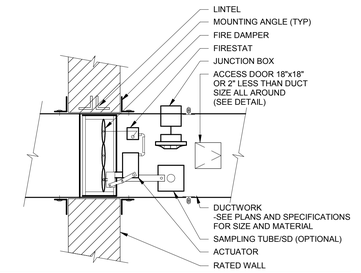
1 REHEAT COIL DUCT CONNECTION
NO SCALE



2 HINGED ACCESS DOOR FOR INSULATED RECTANGULAR DUCT
NO SCALE

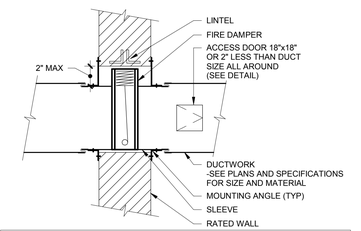


3 HINGED ACCESS DOOR FOR UNINSULATED RECTANGULAR DUCT
NO SCALE



NOTE:
INSTALL FIRE DAMPER ACCORDING TO MANUFACTURERS WRITTEN INSTRUCTIONS.

4 COMBINATION VERTICAL FIRE/SMOKE DAMPER DETAIL
NO SCALE



NOTE:
INSTALL FIRE DAMPER ACCORDING TO MANUFACTURERS WRITTEN INSTRUCTIONS.

5 VERTICAL FIRE DAMPER DETAIL
NO SCALE

FOR BIDS
NOT FOR CONSTRUCTION

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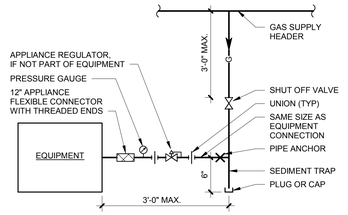
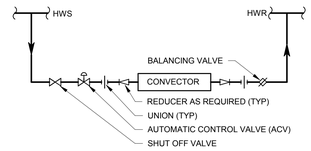
SHEET TITLE:
HVAC DETAILS

SHEET NUMBER:
2-MS-502



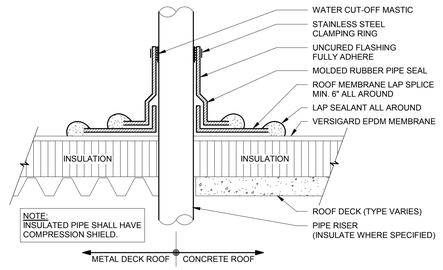
NOTE:
UNLESS OTHERWISE INDICATED, SEE PLANS AND SPECIFICATIONS FOR PIPE SIZE AND MATERIAL.

6 EQUIPMENT GAS CONNECTION (TYP)
NO SCALE



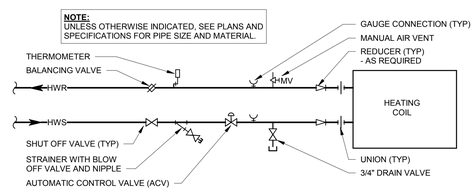
NOTE:
UNLESS OTHERWISE INDICATED, SEE PLANS AND SPECIFICATIONS FOR PIPE SIZE AND MATERIALS.

1 HOT WATER FIN TUBE CONVECTOR PIPING
NO SCALE

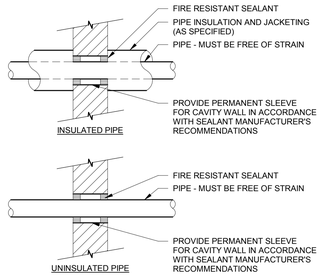


NOTE:
INSULATED PIPE SHALL HAVE COMPRESSION SHIELD.

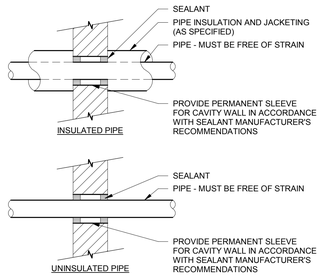
7 ROOF PIPE PENETRATION - RUBBER SEAL (ALT)
NO SCALE



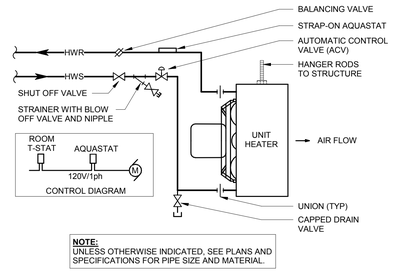
2 HOT WATER REHEAT COIL PIPING
NO SCALE



8 FIRE RATED INTERIOR WALL PIPE PENETRATION
NO SCALE

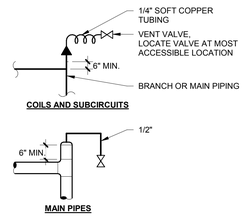


9 NON-RATED INTERIOR WALL PIPE PENETRATION
NO SCALE



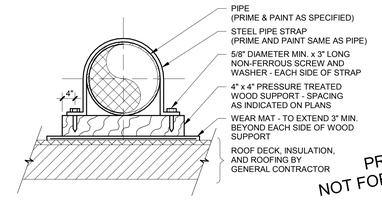
NOTE:
UNLESS OTHERWISE INDICATED, SEE PLANS AND SPECIFICATIONS FOR PIPE SIZE AND MATERIAL.

3 HOT WATER UNIT HEATER PIPING WITH TEMPERATURE CONTROL AND ACV
NO SCALE



NOTE:
UNLESS OTHERWISE INDICATED, SEE PLANS AND SPECIFICATIONS FOR PIPE SIZE AND MATERIAL.

4 AIR VENT PIPING
NO SCALE



5 ROOF WOOD PIPE SUPPORT
NO SCALE

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2019-06-06

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MANAWA

MANAWA ELEMENTARY SCHOOL - ALTERATIONS
MANAWA MIDDLE/HIGH SCHOOL - ADDITIONS & ALTERATIONS
PART 2 - MANAWA MIDDLE / HIGH SCHOOL
515 E. 4th STREET
MANAWA, WI 54949

MARK	DATE
ISSUED:	June 6, 2019
PROJECT NO:	18268
CAD DWG FILE:	
DRAWN BY:	RRW
CHECKED BY:	DJG

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SHEET TITLE:
PIPING DETAILS

SHEET NUMBER:
2-MS-511

FIRE/SMOKE DAMPER (FSD) SCHEDULE

MARK	MANUFACTURER, MODEL NUMBER	TYPE	SIZE (IN) WIDTH	SIZE (IN) DEPTH	AIR FLOW (CFM)	MAX. PD (IN WC)	CONTROL TYPE	ACTUATOR TYPE	CONSTRUCTION MATERIAL	INTERLOCK WITH	SERVING	LOCATION	REMARKS
FSD-1	GREENHECK, FSD-331	M-PB	14	10	685	0.15	TP	EL	GALVANIZED	DETECTOR	LL-106	LL-105	(1) AIR FOIL BLADE
FSD-2	GREENHECK, FSD-331	M-PB	24	10	685	0.15	TP	EL	GALVANIZED	DETECTOR	LL-106	LL-105	(1) AIR FOIL BLADE
FSD-3	GREENHECK, FSD-331	M-PB	14	10	660	0.15	TP	EL	GALVANIZED	DETECTOR	LL-120	LL-102	(1) AIR FOIL BLADE
FSD-4	GREENHECK, FSD-331	M-PB	48	16	3,550	0.15	TP	EL	GALVANIZED	DETECTOR	A-100	A-100	(1) AIR FOIL BLADE
FSD-5	GREENHECK, FSD-331	M-PB	20	20	2200	0.15	TP	EL	GALVANIZED	DETECTOR	A-100	A-100	(1) AIR FOIL BLADE
FSD-6	GREENHECK, FSD-331	M-PB	16	16	1350	0.15	TP	EL	GALVANIZED	DETECTOR	A-100	A-100	(1) AIR FOIL BLADE

TYPE				CONTROL TYPE		ACTUATOR TYPE	
M-PB	MOTOR OPERATED PARALLEL BLADE	G-PB	GRAVITY OPERATED PARALLEL BLADE	MOD	MODULATING	PN	PNEUMATIC
M-OB	MOTOR OPERATED OPPOSED BLADE	M-BF	MOTOR OPERATED BUTTERFLY	TP	TWO POSITION	EL	ELECTRIC

REMARKS:

(1) SEE SPECIFICATION SECTION 230993 - HVAC SEQUENCE OF OPERATIONS.

DESTRATIFICATION FAN (DF) SCHEDULE

MARK	MANUFACTURER, MODEL NUMBER	FAN TYPE	AIRFLOW RATE (CFM)	MOTOR (HP)	MOTOR (W)	MOTOR TYPE	FAN SPEED (RPM)	DRIVE TYPE	ELECTRICAL (VOLTS/PH)	(1) MOUNTING HEIGHT	MAX. SOUND (DB)	WEIGHT (LB)	LOCATION	REMARKS
DF-1	GREENHECK, DS-14 SERIES	CEILING	90,000	0.75	664	IP 54	97	DIRECT	460 / 3	22'-5"	45	170	AREA A	(1)(3)(4)(5)(6)
DF-2	GREENHECK, DS-8 SERIES	CEILING	28,600	0.75	249	IP 40	142	DIRECT	460 / 3	22'-5"	50	167	AREA A	(1)(3)(4)(5)(6)

REMARKS:

(1) PROVIDE MOUNTING HARDWARE AND DROP TUBE.

(2) MOUNTING HEIGHT IS FROM FINISHED FLOOR TO BOTTOM OF FAN IN FEET.

(3) PROVIDE WITH WALL MOUNTED REMOTE CONTROL FOR ON/OFF AND SPEED CONTROL. PROVIDE VARIABLE FREQUENCY DRIVE.

DUST COLLECTOR (DC) SCHEDULE

MARK	MANUFACTURER, MODEL NUMBER	SERVICE	AIR FLOW RATE (CFM)	EXTERNAL SP (IN WC)	VEL. (FPM)	FAN SPEED (RPM)	FILTER PD (IN WG)	MOTOR POWER (HP)	MOTOR VOLT / PH	LOCATION	REMARKS
DC-1	DONALDSON/TORIT, 24	WOOD	3,300	7.0	6,000	3,500	1.0	7.5	460 / 3	ON-GRADE	(1)(2)

REMARKS:

(1) FOR CYCLONE COLLECTOR, REFER TO SPECIFICATION 23 34 00 - DUST COLLECTOR EQUIPMENT.

VARIABLE FREQUENCY DRIVE (VFD) SCHEDULE

MARK	MODEL, MANUFACTURER NUMBER	SERVES	MOTOR (HP)	VOLTS / PHASE	ENCLOSURE	ACCESSORIES INTEGRAL DISCONNECT	ACCESSORIES MANUAL BYPASS	LOCATION	REMARKS
VFD-1	DANFOSS	RTU-17	3	460 /3	NEMA 1	YES	NO	ROOF	
VFD-2	DANFOSS	RTU-18	5	460 /3	NEMA 1	YES	NO	ROOF	
VFD-3	DANFOSS	RTU-19	1	460 /3	NEMA 1	YES	NO	ROOF	
VFD-4	DANFOSS	RTU-20	3	460 /3	NEMA 1	YES	NO	ROOF	
VFD-5	DANFOSS	RTU-21	1	460 /3	NEMA 1	YES	NO	ROOF	
VFD-6	DANFOSS	RTU-22	1	460 /3	NEMA 1	YES	NO	ROOF	
VFD-7	DANFOSS	RTU-23	3	460 /3	NEMA 1	YES	NO	ROOF	

REMARKS:

(1) MANUFACTURER'S VARIABLE FREQUENCY DRIVE WITH ROOFTOP UNIT.

WOOD SHOP EQUIPMENT SCHEDULE

DISCRIPTION	STATUS	CUTTER TYPE & SIZE (IN)	EXHAUST FLOW RATE (CFM)	LOCATION	REMARKS
FLOOR SWEEP	NEW		800	F-319	
PANEL SAW	EXISTING		350	F-319	
WOOD LATHE	EXISTING		350	F-319	
WOOD LATHE	EXISTING		350	F-319	
DADO SAW	NEW	BLADE UP TO 16 IN DIA.	550	F-319	
FLOOR TABLE SAW	NEW	BLADE UP TO 16 IN DIA.	350	F-319	
PLANER	NEW	KNIFE UP TO 20 IN LONG	785	F-319	
JOINTER	NEW	KNIFE UP TO 6IN LONG	350	F-319	
MITER SAW	EXISTING		350	F-319	
BAND SAW	EXISTING	BLADE UP TO 2 IN WIDE.	350	F-319	
SPINDLE SANDER	EXISTING		440	F-319	
BELT SANDER	EXISTING	BELT UP TO 6 IN WIDE	440	F-319	
DRILL PRESS	EXISTING		350	F-319	
PEDESTAL GRINDER	EXISTING		350	F-319	

REMARKS:

(1)

HVAC DUCT SCHEDULE

SYSTEM		DUCT MATERIAL TYPE	DUCT MATERIAL REFERENCE STANDARD	DUCT MATERIAL FINISH	PRESS. CLASS (IN WC)	SEAL CLASS	LEAKAGE CLASS RECT.	LEAKAGE CLASS ROUND	COMMENTS
SUPPLY AIR	DUCT CONNECTED TO TERMINAL UNITS	G90 GALV.	ASTM A 653	MILL PHOSPHATIZED	3	A	12	6	
	DUCT CONNECTED TO CONSTANT VOLUME AIR HANDLING UNITS	G90 GALV.	ASTM A 653	MILL PHOSPHATIZED	3	A	12	6	
	DUCT CONNECTED TO VARIABLE AIR VOLUME AIR HANDLING UNITS	G90 GALV.	ASTM A 653	MILL PHOSPHATIZED	3	A	12	6	
	DUCT CONNECTED TO VARIABLE VOLUME ROOFTOP UNITS	G90 GALV.	ASTM A 653	MILL PHOSPHATIZED	3	A	12	6	
	DUCT CONNECTED TO OTHER FAN POWERED EQUIPMENT	G90 GALV.	ASTM A 653	MILL PHOSPHATIZED	3	A	12	6	
RETURN AIR	DUCT CONNECTED TO CEILING PLENUM	G90 GALV.	ASTM A 653	MILL PHOSPHATIZED	2	A	12	6	
	DUCT CONNECTED TO AIR HANDLING UNITS	G90 GALV.	ASTM A 653	MILL PHOSPHATIZED	3	A	12	6	
	DUCT CONNECTED TO ROOFTOP UNITS	G90 GALV.	ASTM A 653	MILL PHOSPHATIZED	3	A	12	6	
	DUCT CONNECTED TO OTHER FAN POWERED EQUIPMENT	G90 GALV.	ASTM A 653	MILL PHOSPHATIZED	3	A	12	6	
EXHAUST AIR	DUCT CONNECTED TO EXHAUST FANS	G90 GALV.	ASTM A 653	MILL PHOSPHATIZED	3	A	12	6	
	DUCT CONNECTED TO AIR HANDLING UNITS	G90 GALV.	ASTM A 653	MILL PHOSPHATIZED	3	A	12	6	
	DUCT CONNECTED TO FANS EXHAUSTING LABORATORY AIR - EXPOSED TO VIEW	304 SS	ASTM A 480	NO. 4	3	A	12	6	
	DUCT CONNECTED TO FANS EXHAUSTING LABORATORY AIR - CONCEALED	304 SS	ASTM A 480	NO. 2 [NO. 4]	3	A	12	6	
	DUCT CONNECTED TO OTHER FAN POWERED EQUIPMENT	G90 GALV.	ASTM A 653	MILL PHOSPHATIZED	3	A	12	6	
	DUCT CONNECTED TO DUST COLLECTOR FAN	G90 GALV.	ASTM A 653	MILL PHOSPHATIZED	10	A	12	6	
	DRYER EXHAUST	G90 GALV.	ASTM A 653	MILL PHOSPHATIZED	1	B	12	6	
OUTSIDE AIR	DUCT CONNECTED TO TERMINAL UNITS	G90 GALV.	ASTM A 653	MILL PHOSPHATIZED	3	A	12	6	
	DUCT CONNECTED TO AIR HANDLING UNITS	G90 GALV.	ASTM A 653	MILL PHOSPHATIZED	3	A	12	6	
	DUCT CONNECTED TO OTHER FAN POWERED EQUIPMENT	G90 GALV.	ASTM A 653	MILL PHOSPHATIZED	3	A	12	6	
TRANSFER DUCTS		G90 GALV.	ASTM A 653	MILL PHOSPHATIZED	1	B	12	6	1/2" THICK ACOUSTICAL LINER.

FITTINGS

RECTANGULAR DUCT ELBOWS (COMPLY WITH SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE," FIGURE 2-2, "RECTANGULAR ELBOWS.")
- RADIUS TYPE RE 1 WITH MINIMUM 1.5 RADIUS-TO-DIAMETER RATIO.
- RADIUS TYPE RE 3 WITH MINIMUM 1.0 RADIUS-TO-DIAMETER RATIO AND TWO VANES.
- MITERED TYPE RE 2 WITH VANES COMPLYING WITH SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE," FIGURE 2-3, "VANES AND VANE RUNNERS," AND FIGURE 2-4, "VANE SUPPORT IN ELBOWS."

ROUND DUCT ELBOWS (COMPLY WITH SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE," FIGURE 3-3, "ROUND DUCT ELBOWS.")
- RADIUS TO DIAMETER RATIO: 1.5
- ROUND ELBOWS, 12 INCHES AND SMALLER IN DIAMETER: STAMPED OR PLEATED
- ROUND ELBOWS, 14 INCHES AND LARGER IN DIAMETER: WELDED

RECTANGULAR BRANCH DUCT CONFIGURATION (COMPLY WITH SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE," FIGURE 2-6, "BRANCH CONNECTIONS.")
- RECTANGULAR MAIN TO RECTANGULAR BRANCH: 45° ENTRY
- RECTANGULAR MAIN TO ROUND BRANCH: SPIN IN

ROUND BRANCH DUCT CONFIGURATION (COMPLY WITH SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE," FIGURE 3-4, "90 DEGREE TEES AND LATERALS," AND FIGURE 3-5, "CONICAL TEES." SADDLE TAPS ARE PERMITTED IN EXISTING DUCT)
- VELOCITY 1500 FT/MIN AND LOWER: CONICAL TAP
- VELOCITY GREATER THAN 1500 FT/MIN: 45° LATERAL

REMARKS:

(1) PROVIDE PAINT GRIP TYPE DUCT WHERE DUCT IS EXPOSED AND INDICATED TO BE PAINTED.

(2) INSTALL DUCT ACCORDING TO SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE" UNLESS OTHERWISE INDICATED.

(3) INTERMEDIATE REINFORCEMENT MATERIAL SHALL MATCH DUCT MATERIAL.

(4) SUPPLY AIR DUCTS PASSING THROUGH UNCONDITIONED OR OUTDOOR SPACES SHALL BE SEAL CLASS A (ASHRAE 90.1 - 2007).

(5) RETURN AIR DUCTS PASSING THROUGH OUTDOOR SPACES SHALL BE SEAL CLASS A (ASHRAE 90.1 - 2007).

(6) SHEET METAL MATERIALS SHALL BE FREE OF PITTING, SEAM MARKS, ROLLER MARKS, STAINS, DISCOLORATIONS, AND OTHER IMPERFECTIONS.

(7) LINED DUCTWORK MUST STILL BE WRAPPED TO MEET TOTAL INSULATING VALUE PER INSULATION SPECIFICATION AND SCHEDULE.

EXHAUST FAN (EF) AND SUPPLY FAN (SF) SCHEDULE

MARK	MANUFACTURER, MODEL NUMBER	FAN TYPE	AIR FLOW RATE (CFM)	ESP (IN WC)	MOTOR (HP)	MOTOR TYPE	FAN SPEED (RPM)	DRIVE TYPE	ELECTRICAL (VOLTS/PH)	(2) MTG. HEIGHT (IN)	MAXIMUM SOUND (3) (DB)	MAXIMUM SOUND (4) SONES	MAXIMUM SOUND INSTALL. TYPE	(1) INTERLOCK WITH	OPENING (IN) LENGTH	OPENING (IN) WIDTH	ACCESSORIES	WEIGHT (LB)	LOCATION	REMARKS
EF-10	GREENHECK, G-085-VG	6	300	0.50	1/4	ECM	1,626	DIRECT	115 / 1	18	-	8.1	C	RTU-9	12.5	12.5	2, 8, 9, 20, 23	67	ROOF	
EF-11	GREENHECK, G-123-VG	6	1,345	1.50	1/2	ECM	1554	DIRECT	115 / 1	18	-	12.8	C	RTU-21	14.5	14.5	2, 8, 9, 20, 23	75	ROOF	
EF-12	GREENHECK, G-123-VG	6	1,220	1.25	1/2	ECM	1448	DIRECT	115 / 1	18	-	12.1	C	RTU-11	14.5	14.5	2, 8, 9, 20, 23	75	ROOF	
EF-13	GREENHECK, G-085-VG	6	250	0.50	1/4	ECM	1,626	DIRECT	115 / 1	18	-	8.1	C	RTU-13	12.5	12.5	2, 8, 9, 20, 23	67	ROOF	
EF-14	GREENHECK, G-085-VG	6	300	0.50	1/4	ECM	1,626	DIRECT	115 / 1	18	-	8.1	C	RTU-22	12.5	12.5	2, 8, 9, 20, 23	67	ROOF	

FAN TYPE				MOTOR TYPE		INSTALLATION TYPE	
CENTRIFUGAL		AXIAL					
1	SIDEWALL	8	ROOFTOP DOWNBLAST	ODP	OPEN DRIP PROOF	A	FREE INLET, FREE OUTLET
2	INLINE	9	SIDEWALL PROPELLER	TEFC	TOTALLY ENCLOSED FAN COOLED	B	FREE INLET, DUCTED OUTLET
3	UTILITY	10	TUBE AXIAL	XPL	EXPLOSION PROOF	C	DUCTED INLET, FREE OUTLET
4	CABINET	11	VANE AXIAL	INV	INVERTER DUTY	D	DUCTED INLET, DUCTED OUTLET
5	ROOFTOP UPBLAST	12	MIXED FLOW	TEAO	TOTALLY ENCLOSED AIR OVER		
6	ROOFTOP HOODED	13	ROOFTOP FRP UPBLAST	ECM	ELECTRONIC COMMUTATED		
7	ROOFTOP FILTERED SUPPLY						

ACCESSORIES					
1	GRAVITY BACKDRAFT DAMPER	11	OUTLET WIRE GUARD	21	HOODED WALL CAP
2	MOTORIZED BACKDRAFT DAMPER	12	INLET FILTER GUARD	22	HOODED ROOF CAP
3	WEATHERHOOD	13	MOTOR COVER	23	HINGED ROOF CURB
4	WALL COLLAR	14	HOUSING INSULATION	24	INLET GRILLE
5	MOTOR WIRE GUARD	15	BELT (OSHA) WIRE GUARD	25	BASE MOUNTED VIBRATION ISOLATORS
6	MOTOR (OSHA) WIRE GUARD	16	INLET BELL	26	DUCT ADAPTOR
7	SHUTTER GUARD	17	INLET/OUTLET FLANGES	27	HANGING SPRING ISOLATORS
8	FAN SPEED CONTROLLER	18	INLET VANE DAMPER	28	HANGING NEOPRENE ISOLATORS
9	NON-FUSED DISCONNECT SWITCH	19	EXTENDED LUBE LINES	29	FACTORY INSULATED ANGLED FILTER BOX
10	INLET WIRE GUARD	20	MFR. ROOF CURB		

REMARKS:

(1) SEE SPECIFICATION SECTION 230993 - HVAC SEQUENCE OF OPERATION.

(2) MOUNTING HEIGHT IS FROM FINISHED FLOOR LEVEL OF INDICATED ROOM, TO TOP OF FAN OR WALL OPENING.

(3) SOUND POWER LEVEL RATING PER AMCA 301.

(4) LOUDNESS VALUES AT 5 FT IN A HEMISPHERICAL FREE FIELD PER AMCA 301.

ROOF EXHAUST FAN (REF) SCHEDULE

MARK	MANUFACTURER, MODEL NUMBER	FAN TYPE	AIR FLOW RATE (CFM)	ESP (IN WC)	MOTOR (HP)	MOTOR TYPE	FAN SPEED (RPM)	DRIVE TYPE	ELECTRICAL (VOLTS/PH)	MTG. HEIGHT (FT)	MAXIMUM SOUND (DB)	MAXIMUM SOUND SONE	MAXIMUM SOUND INSTALL. TYPE	INTERLOCK WITH	OPENING (IN) LENGTH	OPENING (IN) WIDTH	ACCESSORIES	WEIGHT (LB)	LOCATION	REMARKS
REF-2	GREENHECK, CSW-13BI	3	700	2.0	1	ODP	1857	DIRECT	460 / 3	1'-6"	-	22.0	B	W. SWITCH	-	-	1, 9,13,20,25	1,000	ROOF	(1)

FAN TYPE				MOTOR TYPE		INSTALLATION TYPE	
CENTRIFUGAL		AXIAL					
1	SIDEWALL	8	ROOFTOP DOWNBLAST	ODP	OPEN DRIP PROOF	A	FREE INLET, FREE OUTLET
2	INLINE	9	SIDEWALL PROPELLER	TEFC	TOTALLY ENCLOSED FAN COOLED	B	FREE INLET, DUCTED OUTLET
3	UTILITY - FUME EXHAUST	10	TUBE AXIAL	XPL	EXPLOSION PROOF	C	DUCTED INLET, FREE OUTLET
4	CABINET	11	VANE AXIAL	INV	INVERTER DUTY	D	DUCTED INLET, DUCTED OUTLET
5	ROOFTOP UPBLAST	12	MIXED FLOW	TEAO	TOTALLY ENCLOSED AIR OVER		
6	ROOFTOP HOODED	13	ROOFTOP FRP UPBLAST				
7	ROOFTOP FILTERED SUPPLY						

ACCESSORIES					
1	GRAVITY BACKDRAFT DAMPER	11	OUTLET WIRE GUARD	21	HOODED WALL CAP
2	MOTORIZED BACKDRAFT DAMPER	12	INLET FILTER GUARD	22	HOODED ROOF CAP
3	WEATHERHOOD	13	MOTOR COVER	23	HINGED ROOF CURB
4	WALL COLLAR	14	HOUSING INSULATION	24	INLET GRILLE
5	MOTOR WIRE GUARD	15	BELT (OSHA) WIRE GUARD	25	BASE MOUNTED VIBRATION ISOLATORS
6	MOTOR (OSHA) WIRE GUARD	16	INLET BELL	26	DUCT ADAPTOR
7	SHUTTER GUARD	17	INLET/OUTLET FLANGES	27	HANGING SPRING ISOLATORS
8	FAN SPEED CONTROLLER	18	INLET VANE DAMPER	28	HANGING NEOPRENE ISOLATORS
9	NON-FUSED DISCONNECT SWITCH	19	EXTENDED LUBE LINES	29	FACTORY INSULATED ANGLED FILTER BOX
10	INLET WIRE GUARD	20	MFR. ROOF CURB		

REMARKS:

(1) FUME EXHAUST ULTITY SET FAN WITH EXHAUST STACK.

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PRELIMINARY
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2019-06-06

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MANAWA

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PART 2 - MANAWA MIDDLE / HIGH SCHOOL
515 E. 4th STREET
MANAWA, WI 54949

MARK	DATE

ISSUED: June 6, 2019
PROJECT NO: 18268
CAD DWG FILE:
DRAWN BY: RRW
CHECKED BY: DJG

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SHEET TITLE:
HVAC SCHEDULES

SHEET NUMBER:
2-MS-601

AIR TERMINAL (VAV) SCHEDULE

MARK	MANUFACTURER, MODEL NUMBER	TYPE	AIR FLOW (CFM) MAX.	AIR FLOW (CFM) MIN.	AIR FLOW (CFM) HEATING	(1) MAX. PD (IN. WC)	(2) (3) HOT WATER REHEAT COIL CAP. (MBH)	EAT (°F)	LAT (°F)	EWT (°F)	LWT (°F)	FLOW (GPM)	PD (FT)	NO. OF ROWS	INLET SIZE (IN)	OUTLET WIDTH (IN)	OUTLET DEPTH (IN)	OUTLET QTY.	WEIGHT (LB)	ACCESSORIES	LOCATION	REMARKS
VAV-18A	TRANE, VCWF	1 / 3	620	120	310	1.0	21.9	55	120	180	150	1.5	5.0	3	8			-	-	3, 7	C-106	
VAV-18B	TRANE, VCWF	1 / 3	300	60	150	1.0	10.6	55	120	180	150	0.7	5.0	2	6			-	-	3, 7	C-103	
VAV-18C	TRANE, VCWF	1 / 3	210	40	110	1.0	7.8	55	120	180	150	0.5	5.0	2	5			-	-	3, 7	C-113	
VAV-18D	TRANE, VCWF	1 / 3	240	50	120	1.0	7.2	55	110	180	150	0.5	5.0	2	6			-	-	3, 7	C-120	
VAV-18E	TRANE, VCWF	1 / 3	205	40	160	1.0	11.3	55	120	180	150	0.8	5.0	2	6			-	-	3, 7	C-125	
VAV-18F	TRANE, VCWF	1 / 3	130	30	65	1.0	3.9	55	110	180	150	0.3	5.0	2	4			-	-	3, 7	C-126	
VAV-18G	TRANE, VCWF	1 / 3	400	80	200	1.0	14.1	55	120	180	150	0.9	5.0	3	7			-	-	3, 7	C-126	
VAV-18H	TRANE, VCWF	1 / 3	160	30	30	1.0	1.0	55	85	180	150	0.1	5.0	2	4			-	-	3, 7	C-109	
VAV-18I	TRANE, VCWF	1 / 3	250	50	50	1.0	1.6	55	85	180	150	0.1	5.0	2	5			-	-	3, 7	C-106	
VAV-21A	TRANE, VCWF	1 / 3	4,655	930	2,370	1.0	167.1	55	120	180	140	8.4	5.0	3	24X16			-	-	3, 7	LL-104	RETROIT SQ. (5)
VAV-21B	TRANE, VCWF	1 / 3	685	140	140	1.0	4.6	55	85	180	150	0.3	5.0	2	9			-	-	3, 7	LL-106	
VAV-21C	TRANE, VCWF	1 / 3	660	130	130	1.0	4.2	55	85	180	150	0.3	5.0	2	9			-	-	3, 7	LL-102	
VAV-8F	TRANE, VRRF	1 / 3	960	190	-	0.50	-	-	-	-	-	-	-	-	10			-	-	3, 7	C-132	(4)
VAV-10H	TRANE, VRRF	1 / 3	250	50	-	0.50	-	-	-	-	-	-	-	-	6			-	-	3, 7	E-219	(4)
VAV-17A	TRANE, VRRF	1 / 3	1,000	200	-	0.50	-	-	-	-	-	-	-	-	14			-	-	3, 7	C-138	(4)
VAV-17B	TRANE, VRRF	1 / 3	1,500	300	-	0.50	-	-	-	-	-	-	-	-	16			-	-	3, 7	C-133	(4)
VAV-17C	TRANE, VRRF	1 / 3	440	90	-	0.50	-	-	-	-	-	-	-	-	7			-	-	3, 7	C-138	(4)

TYPE				ACCESSORIES					
1	PRESSURE...	5	SERIES FAN POWERED	1	ELECTRIC HEAT	5	2-WAY TWO-POSITION VALVE	9	FACTORY MOUNTED TRANSFORMER
2	PRESSURE DEPENDENT	6	PARALLEL FAN POWERED	2	FUSE	6	3-WAY TWO-POSITION VALVE	10	FACTORY MOUNTED DISCONNECT SWITCH
3	SINGLE DUCT	7	BYPASS	3	DDC CONTROLS	7	2-WAY PROPORTIONAL VALVE		
4	DUAL DUCT			4	PNEUMATIC CONTROLS	8	3-WAY PROPORTIONAL VALVE		

REMARKS:

(1) MAXIMUM STATIC PRESSURE DROP BASED ON MAXIMUM RATED AIR FLOW.

(2) HEATING CAPACITY OF REHEAT COIL BASED ON MINIMUM RATED AIR FLOW, UNLESS OTHERWISE NOTED. PROVIDE A MINIMUM 2 ROWS.

(3) EXISTING HYDRONCIS IS 35% ETHYLENE GLYCOL FOR HEATING SYSTEM.

(4) PROVIDE BUTTERFLY SUPPLY AIR TERMINAL BASED ON THE TRANE VARITRANE MODEL VRRF WITH BELIMO ACTUATOR. PROVIDE TRANE "AIR-FI"WIRELESS CONTROLS WITH ADJUSTABLE THERMOSTAT FOR ROOM E-2019

(5) PROVIDE RETROFIT SLIDE-IN AIR TERMINAL BOX FOR VARIABLE VOLUME SERVING LARGE VARIABLE VOLUME SUPPLY AIRFLOW.

HVAC DUCT INSULATION SCHEDULE

INDOOR OR OUTDOOR	CONCEALED OR EXPOSED	DUCT SHAPE	DUCT SERVICE	INSULATION TYPE	INSULATION THICKNESS (IN)	INSULATION JACKETING TYPE	REMARKS
INDOOR	CONCEALED	SQUARE	SUPPLY AIR	D1, D2	1 1/2	J1	-
			RETURN AIR	D1, D2	1 1/2	J1	-
			OUTSIDE AIR	D1, D2	3	J1	-
			EXHAUST AIR	D1, D2	1	J1	(1)
		ROUND	SUPPLY AIR	D1	1 1/2	J1	-
			RETURN AIR	D1	1 1/2	J1	-
			OUTSIDE AIR	D1	3	J1	-
			EXHAUST AIR	D1	1	J1	(1)
	EXPOSED	SQUARE	SUPPLY AIR	D1, D2	1 1/2	J1	-
			RETURN AIR	D1, D2	1 1/2	J1	-
			OUTSIDE AIR	D1, D2	3	J1	-
			EXHAUST AIR	D1, D2	1	J1	(1)
		ROUND	SUPPLY AIR	D1	1 1/2	J1	-
			RETURN AIR	D1	1 1/2	J1	-
			OUTSIDE AIR	D1	3	J1	-
			EXHAUST AIR	D1	1	J1	(1)
OUTDOOR	CONCEALED	SQUARE	SUPPLY AIR	D1, D2	3	J1	-
			RETURN AIR	D1, D2	3	J1	-
			OUTSIDE AIR	D1, D2	3	J1	-
		ROUND	SUPPLY AIR	D1	3	J1	-
			RETURN AIR	D1	3	J1	-
			OUTSIDE AIR	D1	3	J1	-
	EXPOSED	SQUARE	SUPPLY AIR	D1, D2	3	J9	-
			RETURN AIR	D1, D2	3	J9	-
			OUTSIDE AIR	D1, D2	3	J9	-
		ROUND	SUPPLY AIR	D1	3	J9	-
			RETURN AIR	D1	3	J9	-
			OUTSIDE AIR	D1	3	J9	-

INSULATION TYPE		JACKETING TYPE	
D1	MINERAL FIBER BLANKET (ASTM C 553 TYPE II) (ASTM C 1290 TYPE III) AVAIL. MFR'S: CERTAINTEED CORP; DUCT WRAP JOHNS MANVILLE; MICROLITE. KNAUF INSULATION; DUCT WRAP OWENS CORNING; ALL-SERVICE DUCT WRAP	J1	FACTORY APPLIED FSK
		J2	FACTORY APPLIED FSP
		J3	FACTORY APPLIED VINYL
		J4	FACTORY APPLIED ASJ-SSL
D2	MINERAL FIBER BOARD (ASTM C 612 TYPE 1A OR 1B) AVAIL. MFR'S: CERTAINTEED CORP.; COMMERCIAL BOARD. JOHNS MANVILLE; 800 SERIES SPIN-GLAS KNAUF INSULATION; INSULATION BOARD. OWENS CORNING; FIBERGLAS 700 SERIES.	J5	PVC, 30 MIL THICK, WHITE, UVC RESISTANT, ASTM D 1784 CLASS 16354-C, AVAIL. MFR'S: JOHNS MANVILLE; ZESTON P.I.C. PLASTICS, INC.; FG SERIES PROTO PVC CORP; LOSMOKE SPEEDLINE CORPORATION; SMOKESAFE
D3	RIGID POLYISOCYANURATE (ASTM C 591) AVAIL. MFR'S: DOW CHEMICAL COMPANY (THE); TRYMER. APACHE PRODUCTS COMPANY; ISO-25. DUNA USA INC.; CORAFOAM. ELLIOTT COMPANY; ELFOAM.	J6	ALUMINUM, 0.016" THICK, EMBOSSED, ASTM B 209, ALLOY 3003, 3005, 3105, OR 5005, TEMPER H-14, FACTORY FABRICATED FITTING COVERS AVAIL. MFR'S: CHILDERS PRODUCTS, DIV OF ITW PABCO METALS CORP.; SUREFIT. RPR PRODUCTS, INC.; INSUL-MATE
D4	HIGH TEMPERATURE MINERAL FIBER BLANKET (ASTM C 553 TYPE V) AVAIL. MFR'S: JOHNS MANVILLE, HTB 23 SPIN-GLAS OWNES CORNING; HIGH TEMP FLEXIBLE BATT	J7	STAINLESS STEEL, 304 [316] , 0.016" THICK, SMOOTH, 2B OR 4 FINISH, ASTM A 167 OR ASTM A 240 FACTORY FABRICATED FITTING COVERS AVAIL. MFR'S: CHILDERS PRODUCTS, DIV OF ITW PABCO METALS CORP.; SUREFIT. RPR PRODUCTS, INC.; INSUL-MATE
D5	HIGH TEMPERATURE MINERAL FIBER BOARD (ASTM C 612 TYPE III) AVAIL. MFR'S: JOHNS MANVILLE, HTB 23 SPIN-GLAS OWNES CORNING; HIGH TEMP FLEXIBLE BATT	J8	PVDC (DOW CHEMICAL; SARAN 540 OR 560) (USDA & FDA COMPLIANT)
D6	[1] [2] HR FIRE RATED BLANKET (ASTM C 591) AVAIL. MFR'S: CERTAINTEED CORP.; FLAMECHEK JOHNS MANVILLE; FIRETEMP WRAP 3M; FIRE BARRIER WRAP PRODUCTS. THERMAL CERAMICS; FIREMASTER DUCT WRAP	J9	VENTURETAPE; VENTURECLAD 1577CW-E (NATURAL ALUMINUM EMBOSSED FINISH)

REMARKS:

(1) EXHAUST DUCT ONLY NEEDS TO BE INSULATED FROM THE DAMPER TO THE OUTSIDE WALL OR ROOF.

AIR FILTER (AF) SCHEDULE

MARK	MANUFACTURER, MODEL NUMBER	TYPE	AIR FLOW RATE (CFM)	PRESSURE DROP (IN WG) INITIAL	PRESSURE DROP (IN WG) FINAL	FAN TSP & AIR BALANCE PD (IN WG)	(1) MIN. EFF. (%)	MERV RATING	MEDIA LENGTH (IN)	MIN. FACE AREA (FT2)	SERVES	LOCATION	REMARKS
AF-17	AAF INTERNATIONAL, PREpleat M13	PRE	3,550	0.3	1.0	0.65	80-90	13	2		RTU-17	ROOF	
AF-18	AAF INTERNATIONAL, PREpleat M13	PRE	6,000	0.3	1.0	0.65	80-90	13	2		RTU-18	ROOF	
AF-19	AAF INTERNATIONAL, PREpleat M13	PRE	1,650	0.3	1.0	0.65	80-90	13	2		RTU-19	ROOF	
AF-20	AAF INTERNATIONAL, PREpleat M13	PRE	3,550	0.2	1.0	0.65	80-90	13	2		RTU-20	ROOF	
AF-21	AAF INTERNATIONAL, PREpleat M13	PRE	6,000	0.2	1.0	0.65	80-90	13	2		RTU-21	ROOF	
AF-22	AAF INTERNATIONAL, PREpleat M13	PRE	1,650	0.2	1.0	0.65	80-90	13	2		RTU-22	ROOF	
AF-23	AAF INTERNATIONAL, PREpleat M13	PRE	1,650	0.2	1.0	0.65	80-90	13	2		RTU-23	ROOF	

REMARKS:

(1) DUST SPOT EFFICIENCY MINIMUM FOR MERV 13 FILTERS.

AIR OUTLET AND INLET SCHEDULE

MARK	MANUFACTURER, MODEL NUMBER	APPLICATION	(1) MAX AIRFLOW (CFM)	OUTLET / INLET	TYPE	MOUNTING SYSTEM	(2) DAMPER	(3) FACE SIZE (IN)	NECK SIZE (IN)	(4) MAX NOISE LEVEL (NC)	PATTERN	MAX SP (IN WG)	FINISH	MATERIAL	(5) MOUNTING HEIGHT (IN)	ACCESSORIES	LOCATION	REMARKS
CD-1	TITUS, OMNI	SUPPLY	110	1	7	1	NONE	24x24	6	24	4-WAY	0.1	W	STEEL	CEILING	24x24 LAY-IN PANEL		(12)
CD-2	TITUS, OMNI	SUPPLY	225	1	7	1	NONE	24x24	8	24	4-WAY	0.1	W	STEEL	CEILING	24x24 LAY-IN PANEL		(12)
CD-3	TITUS, OMNI	SUPPLY	400	1	7	1	NONE	24x24	10	24	4-WAY	0.1	W	STEEL	CEILING	24x24 LAY-IN PANEL		(12)
CD-4	TITUS, OMNI	SUPPLY	575	1	7	1	NONE	24x24	12	24	4-WAY	0.1	W	STEEL	CEILING	24x24 LAY-IN PANEL		(12)
CD-5	TITUS, OMNI	SUPPLY	750	1	7	1	NONE	24x24	14	24	4-WAY	0.1	W	STEEL	CEILING	24x24 LAY-IN PANEL		(12)
SG-1	TITUS, 272RS	SUPPLY	155	3	2		NONE	9x9	6x6	20	-	0.1	W	STEEL				(6)
SG-2	TITUS, 272RS	SUPPLY	255	3	2		NONE	13x9	10x6	20	-	0.1	W	STEEL				(6)
SG-3	TITUS, 272RS	SUPPLY	305	3	2		NONE	15x9	12x6	20	-	0.1	W	STEEL				(6)
SG-4	TITUS, 272RS	SUPPLY	400	3	2		NONE	15x11	12x8	20	-	0.1	W	STEEL				(6)
SG-5	TITUS, 272RS	SUPPLY	415	3	2		NONE	13x13	10x10	20	-	0.1	W	STEEL				(6)
SG-6	TITUS, 272RS	SUPPLY	440	3	2		NONE	21x9	18x6	20	-	0.1	W	STEEL				(6)
SG-7	TITUS, 272RS	SUPPLY	500	3	2		NONE	15x13	12x10	20	-	0.1	W	STEEL				(6)
SG-8	TITUS, 272RS	SUPPLY	580	3	2		NONE	15x15	12x12	20	-	0.1	W	STEEL				(6)
SG-9	TITUS, 272RS	SUPPLY	710	3	2		NONE	21x13	18x10	20	-	0.1	W	STEEL				(6)
SG-10	TITUS, 272RS	SUPPLY	780	3	2		NONE	17x17	14x14	20	-	0.1	W	STEEL				(6)
SG-11	TITUS, 272RS	SUPPLY	845	3	2		NONE	21x15	18x12	20	-	0.1	W	STEEL				(6)
RG/EG-1	TITUS, 350RL	RETURN/EXHAUST	95	3	3		NONE	8x8	6x6	20	-	0.1	W	STEEL				(10)
RG/EG-2	TITUS, 350RL	RETURN/EXHAUST	125	3	3		NONE	12x8	10x6	20	-	0.1	W	STEEL				(10)
RG/EG-3	TITUS, 350RL	RETURN/EXHAUST	140	3	3		NONE	14x8	12x6	20	-	0.1	W	STEEL				(10)
RG/EG-4	TITUS, 350RL	RETURN/EXHAUST	160	3	3		NONE	14x10	12x8	20	-	0.1	W	STEEL				(10)
RG/EG-5	TITUS, 350RL	RETURN/EXHAUST	175	3	3		NONE	12x12	10x10	20	-	0.1	W	STEEL				(10)
RG/EG-6	TITUS, 350RL	RETURN/EXHAUST	190	3	3		NONE	20x8	18x6	20	-	0.1	W	STEEL				(10)
RG/EG-7	TITUS, 350RL	RETURN/EXHAUST	200	3	3		NONE	14x12	12x10	20	-	0.1	W	STEEL				(10)
RG/EG-8	TITUS, 350RL	RETURN/EXHAUST	275	3	3		NONE	16x16	14x14	20	-	0.1	W	STEEL				(10)
RG/EG-9	TITUS, 350RL	RETURN/EXHAUST	275	3	3		NONE	24x12	22x10	20	-	0.1	W	STEEL				(10)
RG/EG-10	TITUS, 350RL	RETURN/EXHAUST	300	3	3		NONE	20x16	18x14	20	-	0.1	W	STEEL				(10)
RG/EG-11	TITUS, 350RL	RETURN/EXHAUST	375	3	3		NONE	20x20	18x18	20	-	0.1	W	STEEL				(10)
RG/EG-12	TITUS, 350RL	RETURN/EXHAUST	410	3	3		NONE	26x18	24x16	20	-	0.1	W	STEEL				(10)
RG/EG-13	TITUS, 350RL	RETURN/EXHAUST	470	3	3		NONE	26x22	24x20	20	-	0.1	W	STEEL				(10)
RG/EG-14	TITUS, 50F	RETURN/EXHAUST	575	3	8	1	NONE	15x15	12x12	20	-	0.1	W	ALUMINUM	CEILING	24x24 LAY-IN PANEL		
RG/EG-15	TITUS, 50F	RETURN/EXHAUST	975	3	8	1	NONE	19x19	16x16	20	-	0.1	W	ALUMINUM	CEILING	24x24 LAY-IN PANEL		
RG/EG-16	TITUS, 50F	RETURN/EXHAUST	1725	3	8	1	NONE	24x24	22x22	20	-	0.1	W	ALUMINUM	CEILING	24x24 LAY-IN PANEL		
TG-1	TITUS, 350RL	TRANSFER	115	3	3		NONE	12x12	10x10	15	-	0.05	W	STEEL				(10)
TG-2	TITUS, 350RL	TRANSFER	140	3	3		NONE	14x12	12x10	15	-	0.05	W	STEEL				(10)
TG-3	TITUS, 350RL	TRANSFER	160	3	3		NONE	20x16	18x14	15	-	0.05	W	STEEL				(10)
TG-4	TITUS, 350RL	TRANSFER	200	3	3		NONE	26x14	24x12	15	-	0.05	W	STEEL				(10)
TG-5	TITUS, 350RL	TRANSFER	255	3	3		NONE	22x22	20x20	15	-	0.05	W	STEEL				(10)
TG-6	TITUS, 50F	RETURN/EXHAUST	575	3	8	1	NONE	15x15	12x12	20	-	0.1	W	ALUMINUM	CEILING	24x24 LAY-IN PANEL		
TG-7	TITUS, 50F	RETURN/EXHAUST	975	3	8	1	NONE	19x19	16x16	20	-	0.1	W	ALUMINUM	CEILING	24x24 LAY-IN PANEL		
TG-8	TITUS, 50F	RETURN/EXHAUST	1725	3	8	1	NONE	24x24	22x22	20	-	0.1	W	ALUMINUM	CEILING	24x24 LAY-IN PANEL		

OUTLET/INLET		TYPE				MOUNTING SYSTEM		DAMPER		FINISH	
1	DIFFUSER	1	SINGLE DEFLECTION	9	LOUVERED	1	T-BAR CEILING	N	NONE	M	MILL
2	REGISTER	2	DOUBLE DEFLECTION	10	HOODED	2	PLASTER/CONCRETE CEILING	BF	BUTTERFLY	W	MFR. STANDARD WHITE
3	GRILLE	3	FIXED BLADE	11	DOOR TRANSFER	3	PLASTER/MASONRY WALL	G	GRAVITY	S	MFR. SPECIAL COLOR
4	LOUVER	4	PERFORATED	12	BRICK	4	EXPOSED DUCTWORK	MP	MOTORIZED PNEUMATIC	A	ANODIZED ALUMINUM
5	PENTHOUSE	5	LINEAR	13	PUNKAH	5	METAL PANEL WALL	ME	MOTORIZED ELECTRIC	P	PRIME COAT (FINAL COAT BY GC)
6	VENT	6	PLENUM SLOT	14	LAMINAR	6	FLOOR	OB	OPPOSED BLADE	O	OTHER (SEE SPECIFICATIONS)
		7	PLAQUE	15	DRUM	7	ROOF	PB	PARALLEL BLADE		
		8	EGGCRATE			8	EXTERIOR STUD WALL	LL	LOW LEAKAGE, INSUL.		

REMARKS:

(1) SEE PLANS FOR ACTUAL INDIVIDUAL AIR QUANTITIES OF EACH DEVICE.

(2) IF DAMPER IS SCHEDULED 'NONE', EACH SUPPLY, RETURN, AND EXHAUST DEVICE TO HAVE A BALANCE DAMPER IN THE DUCT BRANCH TAKE-OFF UNLESS AN ASSOCIATED VAV BOX SERVES A SINGLE DEVICE.

(3) BORDER TYPES SHALL BE COMPATIBLE WITH CEILING OR WALL TYPES WHERE AIR DEVICE IS LOCATED. REFER TO ARCHITECTURAL PLANS AND ALL OTHER TRADES.

(4) ALL GRILLES AND DIFFUSERS SHALL NOT EXCEED NOISE CRITERIA LISTED (BASED ON 10 DB ROOM ATTENUATION) AND AT THE SCHEDULED MAXIMUM STATIC PRESSURE DROP.

(5) MOUNTING HEIGHT SHALL BE FROM FINISHED FLOOR TO BOTTOM OF OPENING.

(6) INDIVIDUALLY ADJUSTABLE AIRFOIL BLADE WITH 3/4" SPACING. FRONT BLADES PARALLEL TO THE SHORT DIMENSION. INITIALLY SET BLADES FOR APPROXIMATELY 30 DEGREE THROW.

(7) EXTERNALLY INSULATE PLENUM SLOT DIFFUSERS.

(8) PENCIL-PROOF GRILLE DESIGN, 7/32" BARS WITH 7/16" SPACING.

(9) 1/8" BARS WITH 1/4" SPACING.

(10) BLADES PARALLEL TO THE LONG DIMENSION WITH FIXED 30 DEGREE DEFLECTION AND 3/4" SPACING.

(11) AIRFOIL BLADES PARALLEL TO THE LONG DIMENSION WITH FIXED 45 DEGREE DEFLECTION AND 3/4" SPACING.

(12) INSULATE THE TOP OF THE DIFFUSER WHEN THE SUPPLY AIR TEMPERATURE IS 50 DEGREES OR LESS.

(13) RE-BALANCE EXISTING OUTLET/INLET TO INDICATED AIR FLOW.

PACKAGED ROOFTOP UNIT (RTU) SCHEDULE

MARK	MANUFACTURER, MODEL NUMBER	NOM. CAP. (TON)	SUPPLY FAN AIR FLOW (CFM)	SUPPLY FAN ESP (IN WC)	SUPPLY FAN TSP (IN WC)	MIN. OUTDOOR AIR FLOW (CFM)	COOLING COIL EAT (°F) DB	EAT (°F) WB	LAT (°F) DB	LAT (°F) WB	NO. OF STAGES	TOTAL CAP. (MBH)	SENS. CAP. (MBH)	GAS HEATER - NAT. GAS (1) EAT (°F)	LAT (°F)	NO. OF STAGES	CAPACITY (MBH) INPUT	CAPACITY (MBH) OUTPUT	GAS PRESS. (IN WC)	MIN. AFUE (%)
RTU-17	TRANE YHC	10	2,940	1.25	1.5	TBD	80.0	67.0	58.0	57.0	2	116.0	90.0	70	122	2	250	200	7	80
RTU-18	TRANE YHC	10	2,515	1.25	1.5	TBD	80.0	67.0	58.0	57.0	2	116.0	90.0	70	122	2	250	200	7	80
RTU-19	TRANE YHC	5	1,650	1.00	1.5	TBD	80.0	67.0	57.0	56.0	2	57.3	33.7	70	105	1	130	104	7	80
RTU-20	TRANE YHC	7.5	3,550	1.25	1.5	TBD	80.0	67.0	58.0	57.0	2	93.0	58.0	70	122	2	250	200	7	80
RTU-21	TRANE YHD	15	6,000	1.50	2.0	TBD	80.0	67.0	60.0	58.0	2	181.0	138.0	70	115	MOD	350	284	7	80
RTU-22	TRANE YHC	5	1,650	1.00	1.5	TBD	80.0	67.0	57.0	56.0	2	57.3	33.6	70	105	1	120	96	7	80
RTU-23	TRANE YHC	7.5	1,650	0.75	1.5	TBD	80.0	67.0	57.0	56.0	2	81.3	44.6	70	105	2	150	120	7	80

MARK	ELECTRIC... CAP. (KW)	ELECTRIC... NO. OF STAGES	FILTER TAG	REFRIG. TYPE	CONDENSER AMB. TEMP. (°F) MIN.	CONDENSER AMB. TEMP. (°F) MAX.	CONDENSER MIN. EER	RETURN/EXHAUST FAN AIR FLOW (CFM)	RETURN/EXHAUST FAN ESP (IN WC)	ELECTRICAL TSP (IN WC)	ELECTRICAL VOLTS	ELECTRICAL PHASE	ELECTRICAL MCA	ELECTRICAL MOCP	ACCESSORIES	WEIGHT WITH CURB (LB)	LOCATION	REMARKS
RTU-17	-	-	AF-17	R-410A	40	95	10.9	2,940	0.5	1.0	460	3	24.9	30	1,3,5,6,7,11	1,800	ROOF	MIDDLE SCHOOL
RTU-18	-	-	AF-18	R-410A	40	95	10.9	2,940	0.5	1.0	460	3	24.9	30	1,3,5,6,7,11	1,800	ROOF	ADMINISTRATION
RTU-19	-	-	AF-19	R-410A	40	95	10.9	1,650	0.5	1.0	460	3	11.3	15	1,3,5,6,7,11	800	ROOF	VESTIBULE
RTU-20	-	-	AF-20	R-410A	40	95	10.9	1,650	0.5	1.0	460	3	24.9	30	1,3,5,6,7,11	1,800	ROOF	VESTIBULE
RTU-21	-	-	AF-21	R-410A	40	95	10.9	6,000	0.5	1.0	460	3	39.0	50	1,3,5,6,7,11	2,800	ROOF	FITNESS
RTU-22	-	-	AF-22	R-410A	40	95	10.9	1,650	0.5	1.0	460	3	11.3	15	1,5,6,7,11	800	ROOF	MAINTENANCE
RTU-23	-	-	AF-23	R-410A	40	95	10.9	1,650	0.5	1.0	460	3	19.9	30	1,3,5,6,7,11	1,200	ROOF	AG LAB

ACCESSORIES			
1	DRY BULB ECONOMIZER CONTROL	7	STANDARD ROOF CURB
2	ENTHALPY ECONOMIZER CONTROL	8	VIBRATION ISOLATION ROOF CURB
3	POWER EXHAUST KIT (2)	9	SEISMIC ROOF CURB
4	DISCONNECT SWITCH	10	SUPPLY AIR SMOKE DETECTOR
5	CONDENSER COIL GUARDS	11	RETURN AIR SMOKE DETECTOR
6	15A GFI CONVENIENCE OUTLET		

REMARKS:

(1) PROVIDE GAS PRESSURE REGULATOR FOR GAS HEATER. EXISTING GAS PRESSURE AT UTILITY METER IS 5 PSIG.

(2) CONTRACTOR TO PROVIDE POWER EXHAUST KIT (CONSTANT VOLUME) FOR ECONOMIZER MODE. COORDINATE WITH EC FOR WIRING.

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PRELIMINARY
NOT FOR CONSTRUCTION
2019-06-06

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MANAWA

MANAWA ELEMENTARY SCHOOL - ALTERATIONS
MANAWA MIDDLE/HIGH SCHOOL - ADDITIONS & ALTERATIONS
PART 2 - MANAWA MIDDLE / HIGH SCHOOL
515 E. 4th STREET
MANAWA, WI 54949

MARK	DATE

ISSUED: June 6, 2019
PROJECT NO: 18268
CAD DWG FILE:
DRAWN BY: RRW
CHECKED BY: DJG

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SHEET TITLE:
HVAC SCHEDULES

SHEET NUMBER:
2-MS-602

EXISTING EXHAUST FAN (EF) SCHEDULE

MARK	MANUFACTURER, MODEL NUMBER	FAN TYPE	AIR FLOW RATE (CFM)	ESP (IN WC)	MOTOR (HP)	MOTOR TYPE	FAN SPEED (RPM)	DRIVE TYPE	ELECTRICAL (VOLTS/PH)	MTG. HEIGHT (FT)	MAXIMUM SOUND (DB)	MAXIMUM SOUND SONE	INSTALL. TYPE	INTERLOCK WITH	OPENING (IN) LENGTH	OPENING (IN) WIDTH	ACCESSORIES	WEIGHT (LB)	LOCATION	REMARKS
SEF-1	EXISTING CARNES	-	1,925	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SEF-2	EXISTING CARNES	-	1,925	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SEF-3	EXISTING CARNES	-	500	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SEF-4	EXISTING CARNES	-	300	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SEF-5	EXISTING CARNES	-	260	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
RE-1	EXISTING CARNES	-	530	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
RE-2	EXISTING CARNES	-	400	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
RE-3	EXISTING CARNES	-	420	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
RE-4	EXISTING CARNES	-	410	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
RE-5	EXISTING CARNES	-	800	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
RE-6	EXISTING CARNES	-	110	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
RE-7	EXISTING CARNES	-	930	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
RE-8	EXISTING CARNES	-	400	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
RE-9	EXISTING CARNES	-	200	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
CEF-1	EXISTING CARNES	-	60	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

EXISTING AIR TERMINAL (VAV) SCHEDULE

MARK	MANUFACTURER, MODEL NUMBER	TYPE	AIR FLOW (CFM) MAX.	AIR FLOW (CFM) MIN.	AIR FLOW (CFM) HEATING	(1) HOT WATER REHEAT COIL MAX. PD (IN. WC)	CAP. (MBH)	EAT (°F)	LAT (°F)	EWT (°F)	LWT (°F)	FLOW (GPM)	PD (FT)	NO. OF ROWS	INLET SIZE (IN)	OUTLET WIDTH (IN)	OUTLET DEPTH (IN)	QTY.	WEIGHT (LB)	ACCESSORIES	LOCATION	REMARKS
VAV-1	EXISTING TRANE, VRRF	-			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	QTY 5
VAV-2	EXISTING TRANE, VRRF	-			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	QTY 5
VAV-3	EXISTING TRANE, VRRF	-			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	QTY 6
VAV-4	EXISTING TRANE, VRRF	-			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	QTY 3
VAV-5	EXISTING TRANE, VRRF	-			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	QTY 5
VAV-6	EXISTING TRANE, VRRF	-			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	QTY 4
VAV-7	EXISTING TRANE, VRRF	-			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	QTY 6
VAV-8	EXISTING TRANE, VRRF	-			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	QTY 8
VAV-9	EXISTING TRANE, VRRF	-			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	QTY 7
VAV-10	EXISTING TRANE, VRRF	-			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	QTY 7
VAV-11	EXISTING TRANE, VRRF	-			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	QTY 6
VAV-12	EXISTING TRANE, VRRF	-			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	QTY 6
VAV-16	EXISTING TRANE, VRRF	-			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	QTY. 6

REMARKS:

(1) EXISTING UNIT(S) SHALL BE RE-BALANCED TO SCHEDULED CAPACITIES.

(1) EXISTING AIR HANDLING UNIT (AHU) SCHEDULE

MARK	MANUFACTURER, MODEL NUMBER	TYPE	AIR FLOW (CFM) SUPPLY	AIR FLOW (CFM) OUTDOOR	AIR FLOW (CFM) MINIMUM	SUPPLY FAN TYPE	SUPPLY FAN ESP (IN WC)	SUPPLY FAN POWER (HP)	SUPPLY FAN SPEED (RPM)	RETURN FAN TYPE	RETURN FAN AIR FLOW (CFM)	RETURN FAN ESP (IN WC)	RETURN FAN POWER (HP)	RETURN FAN SPEED (RPM)	ELECTRICAL (VOLTS/PH)	ELECTRICAL MCA	ELECTRICAL MOCP (A)	REMARKS
AHU-1	EXISTING TRANE, CLIMATE CHANGER	CS	9,500	1,100	-	-	-	-	-	-	-	-	-	-	-	-	-	
AHU-2	EXISTING TRANE, CLIMATE CHANGER	CS	9,500	1,100	-	-	-	-	-	-	-	-	-	-	-	-	-	
AHU-3	EXISTING TRANE, CLIMATE CHANGER	CS	5,400	5,400	-	-	-	-	-	-	-	-	-	-	-	-	-	

REMARKS:

(1) EXISTING UNIT(S) SHALL BE RE-BALANCED TO SCHEDULED CAPACITIES.

EXISTING PACKAGED ROOFTOP UNIT (RTU) SCHEDULE

MARK	MANUFACTURER, MODEL NUMBER	NOM. CAP. (TON)	SUPPLY FAN AIR FLOW (CFM)	SUPPLY FAN ESP (IN WC)	SUPPLY FAN TSP (IN WC)	MIN. OUTDOOR AIR FLOW (CFM)	COOLING COIL EAT (°F) DB	COOLING COIL EAT (°F) WB	COOLING COIL LAT (°F) DB	COOLING COIL LAT (°F) WB	COOLING COIL NO. OF STAGES	COOLING COIL TOTAL CAP. (MBH)	COOLING COIL SENS. CAP. (MBH)	GAS HEATER EAT (°F)	GAS HEATER LAT (°F)	GAS HEATER NO. OF STAGES	GAS HEATER CAPACITY (MBH) INPUT	GAS HEATER CAPACITY (MBH) OUTPUT	GAS PRESS. (IN WC)	MIN. AFUE (%)	REMARKS
RTU-1	EXISTING TRANE YHD	21.5	8,000	-	-	3,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
RTU-2	EXISTING TRANE YHD	21.5	8,000	-	-	3,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
RTU-3	EXISTING TRANE YHD	21.5	8,000	-	-	1,650	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
RTU-4	EXISTING TRANE YHC	9.7	3,500	-	-	550	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
RTU-5	EXISTING TRANE YHD	21.5	8,000	-	-	2,650	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
RTU-6	EXISTING TRANE YHD	9.7	3,550	-	-	650	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
RTU-7	EXISTING TRANE YHC	15.1	6,000	-	-	1,250	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
RTU-8	EXISTING TRANE YHD	12.5	5,100	-	-	1,750	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
RTU-9	EXISTING TRANE YHD	12.5	5,000	-	-	850	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
RTU-10	EXISTING TRANE YHD	15.1	6,000	-	-	950	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
RTU-11	EXISTING TRANE YHD	12.5	4,800	-	-	950	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
RTU-12	EXISTING TRANE YHC	9.7	4,150	-	-	850	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
RTU-13	EXISTING TRANE YHC	9.7	4,000	-	-	600	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
RTU-14	EXISTING TRANE YHC	9.7	4,000	-	-	600	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
RTU-15	EXISTING TRANE YHD	12.5	4,800	-	-	750	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
RTU-16	EXISTING TRANE YHC	4.1	1,650	-	-	150	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

REMARKS:

(1) EXISTING UNIT(S) SHALL BE RE-BALANCED TO SCHEDULED CAPACITIES.

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MARK	DATE

ISSUED: June 6, 2019
PROJECT NO: 18268
CAD DWG FILE:
DRAWN BY: RRW
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SHEET TITLE:
HVAC SCHEDULES

SHEET NUMBER:
2-MS-603

MECHANICAL PIPING & VALVE SCHEDULE

SYSTEM MARK	SERVICE	ROOM TYPE	PIPING SIZE (IN)	PIPING: MATERIAL TYPE	WALL THICKNESS	ASME PIPING: STD	GRADE	TYPE	PRESS. CLASS	FITTING TYPE	ENDS	JOINT TYPE	VALVE: TYPE	CHECK VALVES	PRESS. CLASS	CONNECTION TYPE	BODY MATERIAL	TRIM MATERIAL	VALVE EQUAL TO: [MANUFACTURER, MODEL]	REMARKS
G	NATURAL GAS	OUTDOORS	1/2 TO 2	BS	SCH 40	A 53	B	E or S	150#	MI	PLAIN	TH	2BV	-	125#	THREADED	BRONZE	BRONZE	APOLLO, 77-100	PAINT PIPE
-	- LOW PRESSURE (2 PSIG OR <)	-	2 1/2 OR MORE	BS	SCH 40	A 53	B	E or S	150#	WS	BEVELED	BW, FL	PV	-	125#	FLANGED	IRON	IRON	XOMOX TUFFLINE	PAINT PIPE
-	-	INDOORS	1/2 TO 2	BS	SCH 40	A 53	B	E or S	150#	MI	PLAIN	TH	2BV	-	125#	THREADED	BRONZE	BRONZE	APOLLO, 77-100	PAINT PIPE
-	-	-	2 1/2 OR MORE	BS	SCH 40	A 53	B	E or S	150#	WS	BEVELED	BW, FL	PV	-	125#	FLANGED	IRON	IRON	XOMOX TUFFLINE	PAINT PIPE
-	NATURAL GAS	OUTDOORS	1/2 TO 2	BS	SCH 40	A 53	B	E or S	150#	WS	PLAIN	SW	2BV	-	125#	THREADED	BRONZE	BRONZE	APOLLO, 77-100	PAINT PIPE
-	- HIGH PRESSURE (> 2 PSIG)	-	2 1/2 OR MORE	BS	SCH 40	A 53	B	E or S	150#	WS	BEVELED	BW, FL	PV	-	125#	FLANGED	IRON	IRON	XOMOX TUFFLINE	PAINT PIPE
-	-	INDOORS	1/2 TO 2	BS	SCH 40	A 53	B	E or S	150#	WS	PLAIN	SW	2BV	-	125#	THREADED	BRONZE	BRONZE	APOLLO, 77-100	PAINT PIPE
-	-	-	2 1/2 OR MORE	BS	SCH 40	A 53	B	E or S	150#	WS	BEVELED	BW, FL	PV	-	125#	FLANGED	IRON	IRON	XOMOX TUFFLINE	PAINT PIPE
HWS/R	HEATING WATER SUPPLY/RETURN	ALL AREAS	3/4 TO 2	Cu	L	B 88	-	-	-	WCu	PLAIN	SD	2BV	SWING	125#	THREADED	BRONZE	SS	APOLLO 70-100/200 SERIES	-
-	- (HVAC)		2 1/2 OR MORE	BS	SCH 40	A 53	A or B	E or S	150#	WS,WC,FS	BEVELED	BW	1BV	SWING	125#	FLANGED	DUCTILE	SS	AMERICAN VALVE BALL VALVE	-
CD	HVAC CONDENSATE DRAIN	INDOORS	3/4 TO 2	BS	SCH 40	A 53	B	-	-	WW	PLAIN	BW	-	-	-	-	-	-	-	-
RL/RS	REFRIGERANT	ALL AREAS	ALL SIZES	Cu	ACR	B 280	-	-	-	WCu	PLAIN	BZ	-	-	-	-	-	-	-	-

MATERIAL TYPE		JOINT TYPE		FITTING TYPE		ASME PIPING TYPE		VALVE TYPE	
BS	BLACK STEEL	BW	BUTT WELD	CI	CAST IRON (THREADED) (ASME B16.4 FOR IRON, ASME A 351 FOR SS) (FLANGED) (ASME B16.1)	S	SEAMLESS	1BV	ONE PIECE FULL PORT BALL VALVE
SS	STAINLESS STEEL	SW	SOCKET WELD	MI	MALLEABLE IRON (THREADED) (ASME B16.3)	E	ELECTRIC RESISTANCE WELDED	2BV	TWO PIECE FULL PORT BALL VALVE
GS	GALVANIZED STEEL	TH	THREADED	WS	WROUGHT STEEL (ASTM A 234 FOR STEEL, ASTM A 403 FOR SS)	F	FURNACE BUTT WELDED	3BV	THREE PIECE FULL PORT BALL VALVE
PE	POLYETHYLENE	FL	FLANGED	PE	POLYETHYLENE (ASTM D 2683 (SOCKET) OR ASTM D 3261 (BUTT))			SBV	STEEL BODY BALL VALVE
CU	COPPER	SF	SOCKET FUSION	WW	WELDED WROUGHT STEEL (ASTM A 774 FOR SS)			NGV	NON-RISING STEM GATE VALVE
PVC	PVC	BF	BUTT FUSION	WC	WROUGHT CAST (FLANGES, ASME B16.5)			RGV	RISING STEM GATE VALVE
		SD	SOLDERED	FS	FORGED STEEL (FLANGES, ASME B16.5)			OGV	OSY GATE VALVE
		BZ	BRAZED	PS	PVC SOCKET			BFV	BUTTERFLY VALVE
		SV	SOLVENT WELD	WCu	WROUGHT COPPER (ASME B 16.22)			PV	PLUG VALVE

PIPING SYSTEM JOINING MATERIALS

1. PIPE-FLANGE GASKET MATERIALS: SUITABLE FOR CHEMICAL AND THERMAL CONDITIONS OF PIPING SYSTEM CONTENTS.
2. PIPE FLANGE GASKETS: ASME B16.21, NONMETALLIC, FLAT, ASBESTOS-FREE, 1/8IN MAXIMUM THICKNESS UNLESS SPECIFIED OTHERWISE.
   A. FULL-FACE TYPE: FOR FLAT-FACE, CLASS 125, CAST-IRON AND CAST-BRONZE FLANGES.
   B. NARROW-FACE TYPE: FOR RAISED-FACE, CLASS 250, CAST-IRON AND STEEL FLANGES.
3. FLANGE BOLTS AND NUTS: ASME B18.2.1, CARBON STEEL, UNLESS OTHERWISE INDICATED.
4. SOLDER FILLER METALS: ASTM B 32, LEAD-FREE ALLOYS. INCLUDE WATER-FLUSHABLE FLUX ACCORDING TO ASTM B 813.
5. GENERAL DUTY BRAZING FILLER METALS: AWS A5.8, BCUP SERIES, COPPER-PHOSPHORUS ALLOYS UNLESS OTHERWISE INDICATED.
6. REFRIGERANT PIPING BRAZING FILLER METALS: AWS A5.8, BAG1, SILVER ALLOY UNLESS OTHERWISE INDICATED.
7. WELDING FILLER METALS: AWS D10.12 FOR WELDING MATERIALS APPROPRIATE FOR WALL THICKNESS AND CHEMICAL ANALYSIS OF STEEL PIPE.

REMARKS:

(1) FITTING MATERIAL SHALL MATCH PIPING MATERIAL (EXCEPTION: MI FITTINGS SHALL BE USED FOR BS PIPING WHERE INDICATED).
(2) PRESS. CLASS LISTED IS MIN. REQUIRED. PROVIDE GREATER PRESS. CLASS VALVE AND PIPE SYSTEM IF PRESS. CLASS INDICATED IS NOT AVAILABLE FOR GIVEN VALVE AND PIPE TYPE.
(3) FLANGES SHALL BE RAISED FACE WITH SPOT FACED BOLT HOLES.
(4) AIR VENT AND VACUUM BREAKER SHALL BE THE SAME AS THE CONNECTED SERVICE PIPING.

DUCTLESS SPLIT SYSTEM (AC) SCHEDULE

MARK	MANUFACTURER, MODEL NUMBER	UNIT TYPE	AIR FLOW (CFM): SUPPLY	OUTDOOR	AMBIENT TEMP. (°F): MINIMUM	MAXIMUM	COOLING: TYPE	EAT (°F): DB	WB	CAPACITY (MBH): TOTAL	SENS.	HEATING: TYPE	EAT (°F)	CAP. (MBH)	STAGES	ELECTRICAL: VOLTS/PH	MCA	MOCP (A)	HEATER (KW)	UNIT DIMENSIONS (IN): LENGTH	WIDTH	HEIGHT	ACCESSORIES	MTG. HEIGHT (FT)	ASSOCIATED CONDENSING UNIT	WEIGHT (LB)	LOCATION	REMARKS
ACU-1	MITSUBISHI PKA-A-18HAL	W	425	0	-	95	DX	80	67	18	8	-	-	-	-	208/1	13	20	-	35	10	12	2, 8, 14	8	ACCU-1	20	103	(1)

UNIT TYPE		ACCESSORIES									
R	RECESSED	1	POWERED OA VENT & DAMPER	6	WALL SLEEVE	11	LEVELING LEGS	16	FUSE HOLDER		
SR	SEMI-RECESSED	2	REMOTE/WALL THERMOSTAT	7	ARCHITECTURAL OUTDOOR GRILLE	12	ADJOINING ROOM DUCT TRANSITION	17	HYDRONIC HEAT		
W	WALL SURFACE	3	REMOTE TEMPERATURE SENSOR	8	CONDENSER BAFFLES (WIND BAFFLES)	13	HARD WIRE JUNCTION BOX	18	HYDRONIC CONTROL VALVE		
C	CEILING	4	CONDENSATE REMOVAL PUMP	9	CONDENSATE DRAIN	14	DISCONNECT SWITCH	19	FILTER		
SU	SUSPENDED	5	SUB-BASE	10	KEY LOCK CONTROL COVER	15	CIRCUIT BREAKER				

REMARKS:

(1) SINGLE POINT ELECTRICAL CONNECTION AT OUTDOOR UNIT.

CONVECTOR (C) SCHEDULE

MARK	MANUFACTURER, MODEL NUMBER	TOTAL CAP. (MBH)	EAT (°F)	MEDIA TYPE	EWT (°F)	LWT (°F)	MEDIA FLOW RATE (GPM)	(FT HD)	CABINET SIZE (IN): D	L	H	TOP STYPE	MTG. TYPE	(1) MTG. HEIGHT (IN)	FINISH	LOCATION	REMARKS
C-1	MESTEK MODEL SF-A	8.1	60	35% EG	180	160	0.8	5	6	40	32	S	W	4	W	SEE DWGS	
C-2	MESTEK MODEL SF-A	8.1	60	35% EG	180	160	0.8	5	6	40	32	S	W	4	W	SEE DWGS	
C-3	MESTEK MODEL SF-A	8.1	60	35% EG	180	160	0.8	5	6	40	32	S	W	4	W	SEE DWGS	
C-4	MESTEK MODEL SF-A	8.1	60	35% EG	180	160	0.8	5	6	40	32	S	W	4	W	SEE DWGS	
C-5	MESTEK MODEL SF-A	8.1	60	35% EG	180	160	0.8	5	6	40	32	S	W	4	W	SEE DWGS	
C-6	MESTEK MODEL SF-A	8.1	60	35% EG	180	160	0.8	5	6	40	32	S	W	4	W	SEE DWGS	

MOUNTING TYPE		TOP STYLE		FINISH		MEDIA TYPE	
W	WALL	F	FLAT	W	MFR. STANDARD COLOR	WTR	WATER
F	FLOOR	S	SLOPED	P	PRIME COAT (PAINT BY GC)	35% EG	35% ETHYLENE GLYCOL
		R	RECESSED UNIT	S	MFR SPECIAL COLOR	XX% PG	XX% PROPYLENE GLYCOL

REMARKS:

(1) MOUNTING HEIGHT IS TO BOTTOM OF CONVECTOR CABINET.
(2) SUBMIT MANUFACTURER'S STANDARD COLOR CHART TO ARCHITECT FOR COLOR SELECTION.

UNIT HEATER (UH) SCHEDULE

MARK	MANUFACTURER, MODEL NUMBER	TYPE	CAPACITY (MBH)	AIR FLOW (CFM)	AIR FLOW HOR. or VER.	AIR THROW (FT)	MOTOR (HP)	ELECTRICAL (VOLTS/PH)	EAT (°F)	LAT (°F)	STEAM: PRESS. (PSI)	COND. (LB/H)	GLYCOL WATER (2): FLOW (GPM)	PD (FT)	EWT (°F)	LWT (°F)	FUEL FIRED: FUEL TYPE	INPUT (MBH)	OUTPUT (MBH)	VENT TYPE	ACCESSORIES	(1) MTG. HEIGHT (FT)	WEIGHT (LB)	LOCATION	REMARKS
UH-7	TRANE, UHS-96	HYD	51.7	1,400	HOR.	30	1/12	115/1	50		-	-	4.1	5	180	150	-	-	-	-	2,7,8	12	150	SHOPS	
UH-8	TRANE, UHS-96	HYD	51.7	1,400	HOR.	30	1/12	115/1	50		-	-	4.1	5	180	150	-	-	-	-	2,7,8	12	150	SHOPS	
UH-9	TRANE, UHS-96	HYD	51.7	1,400	HOR.	30	1/12	115/1	50		-	-	4.1	5	180	150	-	-	-	-	2,7,8	12	150	SHOPS	

TYPE				VENT TYPE		ACCESSORIES	
HYD	HYDRONIC	XPL	EXPLOSION PROOF	GV	GRAVITY VENT	1	CONCENTRIC VENT ASSEMBLY
STM	STEAM	WD	WASH DOWN	PV	POWER VENT	2	DOWN TURN AIR NOZZLE
GF	GAS-FIRED			SC	SEPARATED COMBUSTION	3	STAINLESS STEEL HEAT EXCHANGER
EL	ELECTRIC					4	STAINLESS STEEL BURNER
						5	MANUFACTURER SUPPLIED MOUNTING HARDWARE
						6	INTEGRAL THERMOSTAT
						7	REMOTE THERMOSTAT
						8	DISCONNECT SWITCH

REMARKS:

(1) MOUNTING HEIGHT SHALL BE FROM FINISHED FLOOR TO BOTTOM OF UNIT.
(2) EXISTING HYDRONCIS IS 35% ETHYLENE GLYCOL FOR HEATING SYSTEM.

MECHANICAL PIPE & EQUIPMENT INSULATION SCHEDULE

MARK	SERVICE	PIPE SIZES (IN)	All EXCEPT, INSULATION TYPE	THICKNESS (IN)	JACKETING TYPE	OUTDOORS, INSULATION TYPE	THICKNESS (IN)	JACKETING TYPE	PIPE/EQUIP LABEL (Y/N)	HEAT TRACE	REMARKS
HWS/R	HEATING HOT WATER SUPPLY & RETURN	3/4 TO 1 1/4	I2	1 1/2	-	I2	2	J3	Y	NONE	-
	(141°F - 200°F)	1 1/2 OR MORE	I2	2	-	I2	3	J3	Y	NONE	-
RS / RL	REFRIGERANT SUCTION & LIQUID	ALL SIZES	I5	1		I2	1	J3	N	NONE	-
CD	COOLING COIL CONDENSATE DRAIN	ALL SIZES	I2	1	-	-	-	-	-	NONE	-

INSULATION TYPE	
I1	RIGID MOLDED HYDROUS CALCIUM SILICATE (ASTM C 533, TYPE I) FABRICATE SHAPES ACCORDING TO ASTM C 450 AND ASTM C 585 AVAIL. MFR'S: JOHNS MANVILLE: THERMO-12 GOLD
I2	MINERAL FIBER, PRE-FORMED PIPE (ASTM C 547, Type I, Grade A) INCLUDING SSL-ASJ WITH PREFORMED FITTING JACKETS AVAIL. MFR'S: JOHNS MANVILLE: MICRO-LOK KNAUF INSULATION: 1000 PIPE INSULATION OWENS CORNING: FIBERGLAS PIPE INSULATION
I3	EXTRUDED POLYSTYRENE (ASTM C 578, TYPE IV or TYPE XIII) FABRICATE SHAPES ACCORDING TO ASTM C 450 AND ASTM C 585 AVAIL. MFR'S: DOW CHEMICAL COMPANY; STYROFOAM. KNAUF INSULATION; KNAUF POLYSTYRENE
I4	RIGID POLYISOCYANURATE (ASTM C 591, TYPE I OR TYPE IV) FABRICATE SHAPES ACCORDING TO ASTM C 450 AND ASTM C 585 INCLUDING SSL-ASJ WITH PREFORMED FITTING JACKETS AVAIL. MFR'S: DOW CHEMICAL COMPANY (THE); TRYMER APACHE PRODUCTS COMPANY; ISO-25
I5	FLEXIBLE ELASTOMERIC (COMPLY WITH ASTM C 534, TYPE I FOR TUBE AND TYPE II FOR SHEET) AVAIL. MFR'S: AEROFLEX USA INC.; AEROCEL ARMACELL LLC; AP ARMAFLEX
I6	MINERAL FIBER PIPE & TANK (ASTM C 1393, TYPE II OR TYPE IIIA CATEGORY 2) INCLUDING ASJ AVAIL. MFR'S: CERTAINTEED CORP.; CRIMPWRAP JOHNS MANVILLE; MICROFLEX KNAUF INSULATION; PIPE AND TANK INSULATION OWENS CORNING; FIBERGLAS PIPE AND TANK INSULATION

JACKETING TYPE (FIELD APPLIED)	
J1	PVC, 30 MIL THICK, WHITE,... ASTM D 1784 CLASS 16354-C, AVAIL. MFR'S: JOHNS MANVILLE; ZESTON P.I.C. PLASTICS, INC.; FG SERIES PROTO PVC CORP; LOSMOKE SPEEDLINE CORPORATION; SMOKESAFE
J2	PVC, 30 MIL THICK, COLORED
J3	ALUMINUM, 0.016" THICK, EMBOSSED, ASTM B 209, ALLOY 3003, 3005, 3105, OR 5005, TEMPER H-14, FACTORY FABRICATED FITTING COVERS AVAIL. MFR'S: CHILDERS PRODUCTS, DIV OF ITW PABCO METALS CORP.; SUREFIT. RPR PRODUCTS, INC.; INSUL-MATE
J4	STAINLESS STEEL, 304, 0.016" THICK, SMOOTH, 2B OR 4 FINISH, ASTM A 167 OR ASTM A 240 FACTORY FABRICATED FITTING COVERS AVAIL. MFR'S: CHILDERS PRODUCTS, DIV OF ITW PABCO METALS CORP.; SUREFIT. RPR PRODUCTS, INC.; INSUL-MATE

REMARKS:

CABINET UNIT HEATER (CUH) SCHEDULE

MARK	MANUFACTURER, MODEL NUMBER	AIR FLOW (CFM)	EAT (°F)	LAT (°F)	HEATING: MEDIA TYPE	CAPACITY (MBH)	CAPACITY (KW)	FLOW RATE (GPM)	FLOW RATE (LB/HR)	EWT (°F)	LWT (°F)	ELECTRICAL (VOLTS/PH)	FAN MOTOR (HP)	FAN MOTOR (RPM)	CABINET SIZE (IN): D	L	H	(1) MOUNTING: HEIGHT (FT)	ORIENT.	TYPE	INLET LOCATION	OUTLET LOCATION	LOCATION	REMARKS
CUH-10	TRANE, FFBB-060	400	55	-	30%EG	32	-	2.3	-	180	150	115 / 1	0.22	846	9.875	47.75	25.188	*-	VERT.	F	FRONT	FRONT	AREA A	WALL PLATE
CUH-11	TRANE, FFEB-060	418	55	-	30%EG	33	-	2.4	-	180	150	115 / 1	0.22	817	11	47	30	9'-6"	HORIZ.	C, R	FRONT	FRONT	AREA A	WALL PLATE
CUH-12	TRANE, FFEB-060	418	55	-	30%EG	33	-	2.4	-	180	150	115 / 1	0.22	817	11	47	30	9'-6"	HORIZ.	C, R	FRONT	FRONT	AREA A	WALL PLATE
CUH-13	TRANE, FFEB-060	418	55	-	30%EG	33	-	2.4	-	180	150	115 / 1	0.22	817	11	47	30	9'-0"	HORIZ.	C, R	FRONT	FRONT	AREA C	WALL PLATE

MOUNTING TYPE	
C	CEILING
SR	SEMI-RECESSED
R	RECESSED
FS	FLOOR STANDING
W	WALL

REMARKS:

(1) MOUNTING HEIGHT IS FROM BOTTOM OF UNIT TO FINISHED FLOOR.

AIR COOLED CONDENSING UNIT (ACCU) SCHEDULE

MARK	MANUFACTURER, MODEL NUMBER	NOM. CAP. (TON)	MIN. EER	MIN. IEER	REF. TYPE	SST (°F)	HOT GAS BYPASS	NO. OF STAGES (4)	AMB. AIR TEMP. (°F): MINIMUM	MAXIMUM	COMPRESSORS: QTY.	TYPE	ELECTRICAL (3): VOLTS	PHASE	MCA	MOCP	(2) MAX. SOUND (DB)	MATCHING EQUIPMENT COOLING COIL	WEIGHT (LB)	LOCATION	REMARKS
ACCU-7	TRANE TWE07244BAA	6	12.7	12.2	R410A	-	NO	2	0	95	2	SCR	460	3	3.0	15.0	46	AHU-7	360	ROOF	

COMPRESSOR TYPE	
RCP	RECIPROCATING
SCR	SCROLL
SCW	SCREW

REMARKS:

(1) MANUFACTURER SHALL SIZE REFRIGERANT PIPING, VALVES, AND ACCESSORIES FOR PROPER OPERATION OF SYSTEM.
(2) PER ARI STANDARD 320 "SOUND RATING OF LARGE OUTDOOR REFRIGERATING AND AIR-CONDITIONING EQUIPMENT".
(3) REFER TO ELECTRICAL PANEL "PP1" FOR CONDENING UNIT ACCU-2 BREAKER LOCATION IN MEZZANINE C201 ABOVE THE KITCHEN. COORDINATE WITH EC.
(4) PROVIDE 2-STAGE COMPRESSORS (2) AT 2.6 TON EACH WITH DIRECT DRIVE CONDENSER FANS.

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MANAWA

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PART 2 - MANAWA MIDDLE / HIGH SCHOOL
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MANAWA, WI 54949

MARK	DATE
ISSUED:	June 6, 2019
PROJECT NO:	18268
CAD DWG FILE:	
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SHEET TITLE:
PIPING SCHEDULES

SHEET NUMBER:
2-MS-611

EXISTING BOOSTER COIL (BC) SCHEDULE

MARK	MANUFACTURER, MODEL NUMBER	TYPE	AIR FLOW (CFM)	PD (IN WC)	COIL				CAPACITY (MBH)		EAT (°F)		LAT (°F)		MEDIA									
					FACE VEL. (FPM)	FACE AREA (FT²)	ROWS	FINS PER INCH	TOTAL	SENS.	DB	WB	DB	WB	TYPE	FLOW RATE			PRESSURE		EWT (°F)	LWT (°F)	EQUIPMENT SERVED	LOCATION	REMARKS
																(LB/H)	(GPM)	(TON)	ENTER (PSI)	DROP (FT)				
BC-1	EXISTING TRANE	HEATING	350	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-
BC-2	EXISTING TRANE	HEATING	2,060	-	-	-	-	-	-	-	-	-	-	-	-	-	2.5	-	-	-	-	-	-	-
BC-3	EXISTING TRANE	HEATING	285	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-
BC-4	EXISTING TRANE	HEATING	1,440	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-
BC-5	EXISTING TRANE	HEATING	180	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-
BC-6	EXISTING TRANE	HEATING	1,455	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-
BC-7	EXISTING TRANE	HEATING	150	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-
BC-8	EXISTING TRANE	HEATING	1,320	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-
BC-9	EXISTING TRANE	HEATING	1,860	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-
BC-10	EXISTING TRANE	HEATING	320	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-
BC-11	EXISTING TRANE	HEATING	350	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-
BC-12	EXISTING TRANE	HEATING	400	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-
BC-13	EXISTING TRANE	HEATING	985	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-
BC-14	EXISTING TRANE	HEATING	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BC-15	EXISTING TRANE	HEATING	95	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-
BC-16	EXISTING TRANE	HEATING	230	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-
BC-17	EXISTING TRANE	HEATING	2,500	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-
BC-18	EXISTING TRANE	HEATING	2,500	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-
BC-19	EXISTING TRANE	HEATING	270	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-
BC-20	EXISTING TRANE	HEATING	1,020	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-
BC-21	EXISTING TRANE	HEATING	360	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-
BC-22	EXISTING TRANE	HEATING	1,930	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-
BC-23	EXISTING TRANE	HEATING	1,930	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-
BC-24	EXISTING TRANE	HEATING	800	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-
BC-25	EXISTING TRANE	HEATING	175	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-
BC-26	EXISTING TRANE	HEATING	260	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-

REMARKS:

(1) EXISTING UNIT(S) SHALL BE RE-BALANCED TO SCHEDULED CAPACITIES.

EXISTING HOT WATER BOILER (HWB) SCHEDULE

MARK	MANUFACTURER, MODEL NUMBER	TYPE	INPUT (MBH)		OUTPUT (MBH)		MIN. EFF. (%)	FUEL	FLUID	FLUID FLOW (GPM)			(2) FLUID TEMP. (°F)		PD (FT)	ELECTRICAL			ACCESSORIES	WEIGHT (LB)		LOCATION	REMARKS
			MAX.	MIN.	MAX.	MIN.				MIN.	DESIGN	MAX.	IN	OUT		(VOLTS / PH)	(FLA)	(MCOP)		EMPTY	OPER.		
HWB-1	EXISTING PK BOILER MACH SERIES	-	1,000	-	930	-	-	NG	35% EG	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HWB-2	EXISTING PK BOILER MACH SERIES	-	1,000	-	930	-	-	NG	35% EG	-	-	-	-	-	-	-	-	-	-	-	-	-	-

REMARKS:

(1) EXISTING UNIT(S) SHALL BE RE-BALANCED TO SCHEDULED CAPACITIES.

EXISTING HYDRONIC PUMP (P) SCHEDULE

MARK	MANUFACTURER, MODEL NUMBER	TYPE	SYSTEM SERVED	MEDIA	FLOW RATE (GPM)	TDH (FT)	MOTOR			IMPELLER DIA. (IN)	PUMP EFF. (%)	FLUID TEMP. (°F)		SIZE (IN)		NPSHA (FT)	SUCTION DIFFUSER (IN)	TRIPLE DUTY VALVE (IN)	MTG. HEIGHT (IN)	WEIGHT (LB)	LOCATION	REMARKS
							POWER (HP)	SPEED (RPM)	(VOLTS/ PH)			MAX.	MIN.	SUCT.	DISCH.							
P-1	EXISTING TACO	INLINE	HEATING	EG%35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
P-2	EXISTING TACO	INLINE	HEATING	EG%35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
P-3	EXISTING TACO	INLINE	HEATING	EG%35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
P-4	EXISTING TACO	INLINE	HEATING	EG%35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

REMARKS:

(1) EXISTING UNIT(S) SHALL BE RE-BALANCED TO SCHEDULED CAPACITIES.

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MANAWA MIDDLE/HIGH SCHOOL - ADDITIONS & ALTERATIONS
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MARK	DATE

ISSUED: June 6, 2019
PROJECT NO: 18268
CAD DWG FILE:
DRAWN BY: RRW
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SHEET TITLE:
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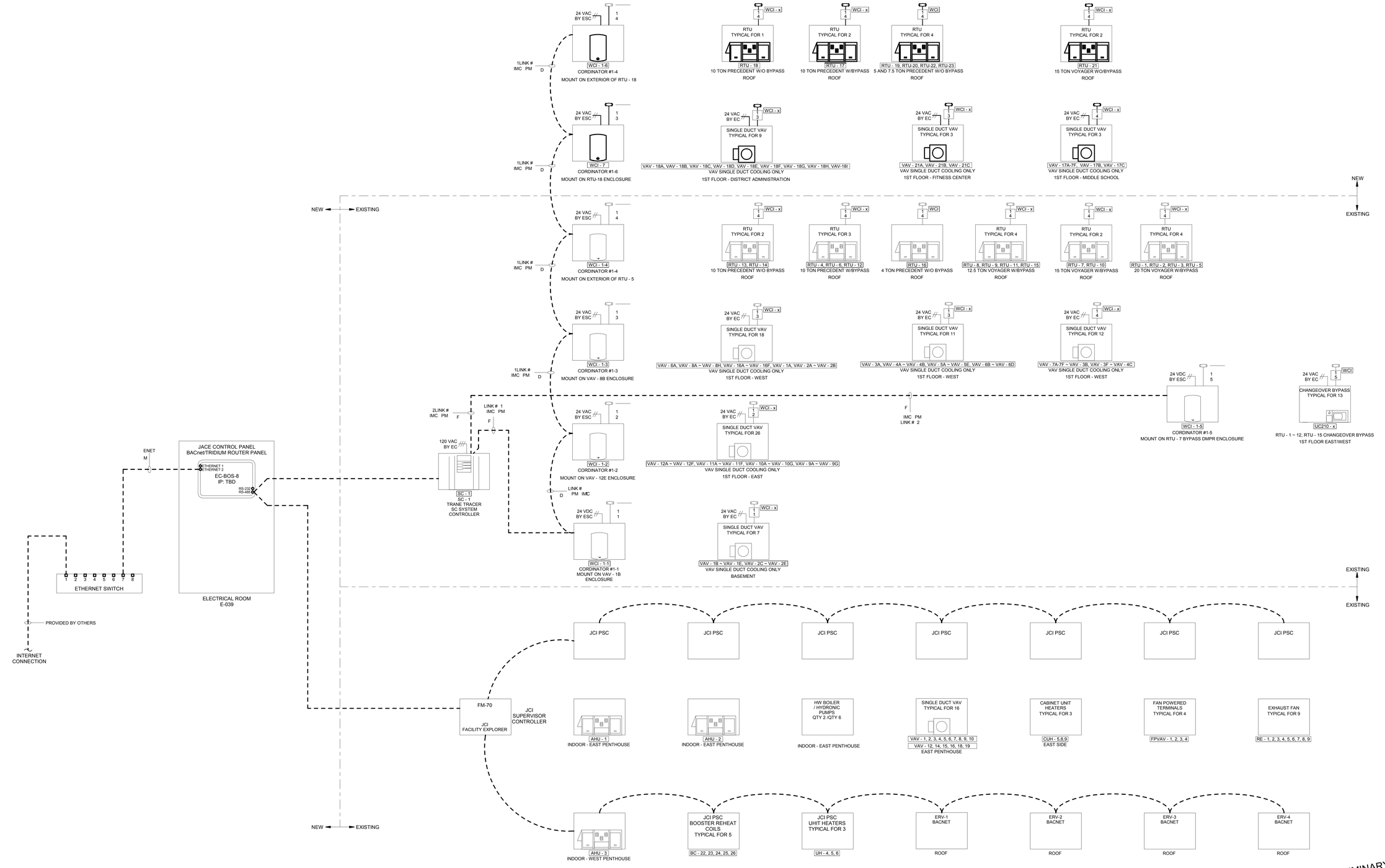

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SHEET TITLE:
CONTROL SCHEMATICS

SHEET NUMBER:
2-MS-901

LUMINAIRE SYMBOLS

- RECESSED LUMINAIRE
- RECESSED TROFFER
- RECESSED LINEAR
- SURFACE ROUND LUMINAIRE
- SURFACE SQUARE LUMINAIRE
- SURFACE LINEAR
- SURFACE INDUSTRIAL
- SURFACE COVE STRIP
- PENDANT ROUND LUMINAIRE
- PENDANT SQUARE LUMINAIRE
- PENDANT LINEAR
- PENDANT INDUSTRIAL
- (#) TRACK (# INDICATES NUMBER TRACK HEADS)
- WALL SURFACE BRACKET
- WALL RECESSED BRACKET
- WALL SURFACE LINEAR
- WALL RECESSED LINEAR
- CEILING MOUNTED EXIT SIGN
- WALL MOUNTED EXIT SIGN
- WALL MOUNTED COMBINATION EXIT SIGN/EBU
- ARROW DENOTES EXIT SIGN CHEVRON
- EMERGENCY BATTERY UNIT
- RECESSED EMERGENCY BATTERY UNIT
- WALL WASH MODIFIER
- EMERGENCY SHADING MODIFIER

LUMINAIRE CIRCUITRY & CONTROL KEY:

- A1 — LUMINAIRE TYPE
- 1Ra — LOWER CASE LETTER INDICATES SWITCHLEG CONTROL; "R" INDICATES LIGHTING CONTROL PANEL REFER TO LIGHTING CONTROL PANEL SCHEDULE; NUMBER INDICATES BRANCH PANEL CIRCUIT NUMBER

LUMINAIRE CONTROL SYMBOLS

- (XS) OCCUPANCY SENSOR CEILING MOUNT (X REPRESENTS OCCUPANCY/PHOTO SENSOR SCHEDULE DESIGNATION)
- (XS) DAYLIGHT SENSOR (X REPRESENTS OCCUPANCY/PHOTO SENSOR SCHEDULE DESIGNATION)
- (XS) DAYLIGHT SENSOR CEILING MOUNT (X REPRESENTS OCCUPANCY/PHOTO SENSOR SCHEDULE DESIGNATION)
- TC ELECTRONIC TIME CLOCK
- PE PHOTO ELECTRIC CONTROL (X REPRESENTS OCCUPANCY/PHOTO SENSOR SCHEDULE DESIGNATION)
- LC LIGHTING CONTACTOR
- LCP X LIGHTING CONTROL PANEL (X REPRESENTS PANEL DESIGNATION)
- PT UL 924 LISTED EMERGENCY LIGHTING BYPASS CONTROL UNIT
- PP POWER PACK USED IN CONJUNCTION WITH OCCUPANCY SENSORS OR DAYLIGHT SENSORS
- PS REMOTE POWER SUPPLY OR DRIVER
- DR DIMMER RACK
- D DIMMER CONTROL STATION MULTI-PRESET MODULAR DIMMING SYSTEM

DIMMER NOTATIONS:

MCS DENOTES MASTER CONTROL STATION
RS DENOTES REMOTE STATION
ES ENTRY STATION
PS PARTITION STATION

- S SINGLE POLE SWITCH

SWITCH NOTATIONS:

3 DENOTES 3-WAY SWITCH
4 DENOTES 4-WAY SWITCH
C MAINTAINED CONTACT, THREE POSITION, CENTER OFF
D DENOTES WALL BOX DIMMER SWITCH
K DENOTES KEY SWITCH
OSX DENOTES OCCUPANCY SENSOR (X REPRESENTS SCHEDULE DESIGNATION)
P DENOTES PILOT SWITCH
T DENOTES TIMER SWITCH
VSX DENOTES VACANCY SENSOR (X REPRESENTS SCHEDULE DESIGNATION)
WL DENOTES WET LOCATION SWITCH

SERVICE & DISTRIBUTION SYMBOLS

- EPO EMERGENCY POWER OFF
- EGB EQUIPMENT GROUND BUS
- PANELBOARD
- C CONTACTOR
- P PUSH BUTTON
- J JUNCTION BOX

RECEPTACLE SYMBOLS

- 60" DUPLEX RECEPTACLE TEXT INDICATES MOUNTING HEIGHT
- DOUBLE DUPLEX RECEPTACLE
- ABOVE COUNTER DUPLEX RECEPTACLE
- SIMPLEX RECEPTACLE
- SPLIT WIRED DUPLEX RECEPTACLE
- SPECIFIC USE RECEPTACLE. NEMA CONFIGURATIONAS NOTED ON DRAWINGS AND/OR SCHEDULE.
- F FLOOR BOX
- P POKE THRU
- C CEILING MOUNTED DUPLEX RECEPTACLE
- C CEILING MOUNTED DOUBLE DUPLEX RECEPTACLE
- C CEILING MOUNTED SPECIFIC USE RECEPTACLE. NEMA CONFIGURATIONAS NOTED ON DRAWINGS AND/OR SCHEDULE.
- E CORD REEL
- SURFACE METAL RACEWAY - REFER TO DRAWINGS AND/OR SPECIFICATIONS, MOUNTED 6" ABOVE COUNTER OR AT HEIGHT AS INDICATED.
- A MULTI-OUTLET RACEWAY - OUTLETS ON CENTER AS INDICATED ON DRAWINGS AND IN THE SPECIFICATIONS, MOUNTED 6" ABOVE COUNTER OR AT HEIGHT AS INDICATED.

MULTI-OUTLET RACEWAY NOTATIONS:

A DENOTES 2'-0" LENGTH, RECEPTACLES 6" O.C.
B DENOTES 3'-0" LENGTH, RECEPTACLES 6" O.C.
C DENOTES 5'-0" LENGTH, RECEPTACLES 6" OR 12" O.C.
D DENOTES 6'-0" LENGTH, RECEPTACLES 6", 12", 18" OR 24" O.C.
F DENOTES X'-X" LENGTH, RECEPTACLES X" O.C.

- P DATA/POWER POLE

RECEPTACLE NOTATIONS:

EWC DENOTES ELECTRIC WATER COOLER OUTLETS
GFCI DENOTES GROUND FAULT INTERRUPTER OUTLETS
H DENOTES HORIZONTALLY MOUNTED OUTLETS
TR DENOTES TAMPER RESISTANT SAFETY OUTLETS
USB DENOTES COMBINATION DUPLEX/USB OUTLETS
WP DENOTES WEATHER PROOF OUTLETS

RACEWAY SYMBOLS

- CABLE TRAY, SIZE AND TYPE AS INDICATED ON DRAWINGS
- J JUNCTION BOX - CEILING MOUNTED
- J JUNCTION BOX - WALL MOUNTED
- H HANDHOLE

MOTOR & EQUIPMENT CONNECTION SYMBOLS

- ELECTRICAL CONNECTION TO EQUIPMENT AND MOTORS, SIZED PER NEC. COORDINATE REQUIREMENTS WITH CONTRACTOR FURNISHING MOTOR OR EQUIPMENT. REFER TO SPECIFICATIONS AND EQUIPMENT WIRING SCHEDULE FOR ADDITIONALWORK ASSOCIATED WITH MOTOR OR EQUIPMENT.
- COMBINATION MAGNETIC CONTROLLER
- VFD VARIABLE FREQUENCY MOTOR CONTROLLER
- NON-FUSIBLE DISCONNECT SWITCH
- FUSIBLE DISCONNECT SWITCH
- S_{MS} MOTOR STARTING SWITCH WITH OVERLOADS
- S_{MX} MOTOR STARTING SWITCH WITHOUT OVERLOADS
- ENCLOSED CIRCUIT BREAKER

FIRE ALARM SYMBOLS

- FMCP FIRE AND MASS NOTIFICATION CONTROL PANEL
- FAAP FIRE ALARM ANNUNCIATOR PANEL
- KNOX CABINET FOR HOLDING FIRE DEPARTMENT DOCUMENTS & KEYS WITH INTEGRAL TAMPER SWITCH. KNOX BRAND # 4400 OR APPROVED EQUAL. SEE DRAWING ##.
- FIRE ALARM PULL STATION
- H FIRE ALARM HORN
- S FIRE ALARM SPEAKER
- H## FIRE ALARM HORN/STROBE, (##) IS CANDELA RATING
- S## FIRE ALARM SPEAKER/STROBE, (##) IS CANDELA RATING
- S SUPERVISED FIRE ALARM HORN LOUDSPEAKER
- ## FIRE ALARM STROBE, (##) IS CANDELA RATING
- B FIRE ALARM BELL
- INTELLIGENT PHOTOELECTRIC SMOKE DETECTOR
- ER INTELLIGENT PHOTOELECTRIC SMOKE DETECTOR FOR ELEVATOR RECALL
- H INTELLIGENT 135ºF FIXED & RATE OF RISE HEAT DETECTOR (15ºF/M), (20ºF/M), UNLESS NOTED ON DRAWINGS
- DS INTELLIGENT PHOTOELECTRIC DUCT SMOKE DETECTOR
- CO CARBON MONOXIDE DETECTOR
- ## CEILING MOUNTED FIRE ALARM STROBE, (##) IS CANDELA RATING
- ## CEILING MOUNTED FIRE ALARM SPEAKER/STROBE, (##) IS CANDELA RATING
- CEILING MOUNTED FIRE ALARM SPEAKER
- ## CEILING MOUNTED FIRE ALARM HORN/STROBE, (##) IS CANDELA RATING
- CEILING MOUNTED FIRE ALARM HORN
- MM MONITOR MODULE
- CM CONTROL MODULE
- DH MAGNETIC DOOR HOLDER
- RTS/I REMOTE TEST SWITCH WITH INDICATOR

GENERAL SYMBOLS

- #/E-### DETAIL NUMBER / SHEET NUMBER
- 9.### KEYED NOTE, USED TO DESCRIBE ADDITIONAL INFORMATION OF WORK REQUIRED, SPECIFIC TO THE SHEET AND/OR DETAIL IT IS SHOWN WITH.

LINE TYPE KEY

- NEW WORK BY THIS CONTRACTOR (DARK SOLID LINE)
- EXISTING TO BE REMOVED BY THIS CONTRACTOR (DARK DASHED LINE)
- EXISTING TO REMAIN WORK (THIN SOLID LINE)
- NEW WORK UNDER FLOOR BY THIS CONTRACTOR
- ONE-LINE EQUIPMENT ENCLOSURE
- PANEL DIVISION LINES

ELECTRICAL ABBREVIATIONS

3R	NEMA 3R RATING
4X	NEMA 4X RATING
A	AMPERES
A/E	ARCHITECT / ENGINEER
AAC	ABOVE ACCESSIBLE CEILING
ACCU	AIR COOLED CONDENSING UNIT
AFF	ABOVE FINISHED FLOOR
AFG	ABOVE FINISHED GRADE
AHU	AIR HANDLING UNIT
ALT	ALTERNATE
APE	AIRCRAFT PROCESS EQUIPMENT
ATS	AUTOMATIC TRANSFER SWITCH
BLDG	BUILDING
BRKR	BREAKER
C	CONDUIT
CB	CIRCUIT BREAKER
CEB	CONCRETE EQUIPMENT BASE
CF	CIRCULATION FAN
CH	CHILLER
CHWP	CHILLED WATER PUMP
CKT	CIRCUIT
CP	CIRCULATION PUMP
CRAC	COMPUTER ROOM AIR CONDITIONER
CRP	CONDENSATION RETURN
CT	COOLING TOWER
CUH	CABINET UNIT HEATER
DC	DROP CLOTH
DDC	DIGITAL CONTROL PANEL
DH	DUCT HEATER
DISC	DISCONNECT
DO	DOOR OPERATOR
DWG	DRAWING
E/O	ELECTRICAL-TO-OPTICAL CONVERTER
EC	ELECTRICAL CONTRACTOR
ECB	ENCLOSED CIRCUIT BREAKER
EF	EXHAUST FAN
EM	EMERGENCY
EMT	ELECTRICAL METALLIC TUBING
ERL	EXISTING TO BE RELOCATED
ERLD	EXISTING - RELOCATED LOCATION
ES	EQUIPMENT SUPPLIER
ETR	EXISTING TO REMAIN
EWC	ELECTRICAL WATER COOLER
EWH	ELECTRICAL WATER HEATER
F	FUSED
FA	FIRE ALARM
FAF	FORCED AIR FURNACE
FCU	FAN COIL UNIT
GC	GENERAL CONTRACTOR
GD	GARBAGE DISPOSAL
GFI	GROUND FAULT INTERRUPTER
GND	GROUND
GWH	GAS WATER HEATER
HD	HAND DRYER
HP	HORSEPOWER
HVAC	HEATING, VENTILATION, AIR CONDITIONING
HWB	HOT WATER BOILER
HWP	HOT WATER PUMP
IEWH	INSTANTANEOUS ELECTRIC WATER HEATER
IH	INFRARED HEATER
IMC	INTERMEDIATE METALLIC CONDUIT
IWH	INSTANTANEOUS WATER HEATER
J-BOX	JUNCTION BOX
LBS	POUNDS
LFS	LIGHTING FIXTURE SCHEDULE
MAU	MAKE-UP AIR UNIT
MAX	MAXIMUM
MC	MECHANICAL CONTRACTOR
MCC	MOTOR CONTROL CENTER
MDF	MAIN DISTRIBUTION FRAME
MDP	MAIN DISTRIBUTION PANEL
MIN.	MINIMUM
MNS	MASS NOTIFICATION SYSTEM
MTD	MOUNTED
MTG	MOUNTING
MTS	MANUAL TRANSFER SWITCH
NIC	NOT IN CONTRACT
NL	NIGHT LIGHT
NL/EL	NIGHT LIGHT AND EMERGENCY LIGHT
NTS	NOT TO SCALE
OC	ON CENTER
OFCI	OWNER FURNISHED, CONTRACTOR INSTALLED
OFOI	OWNER FURNISHED, OWNER INSTALLED
PH	PHASE
PNL	PANEL
PVC	POLYVINYL CHLORIDE
RCP	RADIANT CEILING PANEL
RECPT	RECEPTACLE
REF	REFRIGERATOR
REQ'D	REQUIRED
RF	RETURN FAN
RGS	RIGID GALVANIZED STEEL CONDUIT MAY ALSO BE REFERENCED AS RMC OR GRC
RMC	RIGID METAL CONDUIT
RTU	ROOF TOP UNIT
S/N	SOLID NEUTRAL
SE	SERVICE ENTRANCE
SEC-P	SECURITY PANEL
SF	SUPPLY FAN
SP	SUMP PUMP
SS	STAINLESS STEEL
SW	SWITCH
SWBK	SWITCH BANK
TBR	TO BE REMOVED
TCP	TEMPERATURE CONTROL PANEL
TFA	TO FLOOR ABOVE
TFB	TO FLOOR BELOW
TYP	TYPICAL
UC	UNIT COOLER
UG	UNDERGROUND
UH	UNIT HEATER
UNO	UNLESS NOTED OTHERWISE
UV	UNIT VENTILATER
V	VOLTS
VER	VEHICLE EXHAUST REEL
VFD	VARIABLE FREQUENCY DRIVE
VS	VERSUS
W	WATTS
WCC	WATER COOLED CONDENSER
WFE	WELDING FUME EXTRACTOR
WH	WATER HEATER
WL	WET LOCATION LISTED
WP	WEATHERPROOF
XFMR	TRANSFORMER
XP	EXPLOSION PROOF

GENERAL NOTES:

1. REFER TO THE G SERIES DRAWINGS FOR CODE ANALYSIS PLANS, INFORMATION AND NOTES.
2. THE CONTRACTOR SHALL BECOME FAMILIAR WITH THE DETAILS OF WORK, VERIFY DIMENSIONS IN THE FIELD, AND ADVISE THE [ARCHITECT/ENGINEER] [CONTRACTING OFFICER] OF ANY DISCREPANCY BEFORE PERFORMING ANY WORK.
3. THE COMPLETE INSTALLATION SHALL BE IN ACCORDANCE WITH THE ADAAG (AMERICANS WITH DISABILITIES ACT ACCESSIBILITY GUIDELINES) AND ABA (ARCHITECTURAL BARRIERS ACT).
4. REFER TO ARCHITECTURAL DRAWINGS FOR FIRE RATED WALLS AND FLOORS. MAKE RATED PENETRATIONS AS REQUIRED. SEAL ALL RATED PENETRATIONS AS IDENTIFIED IN DIVISION 1 REQUIREMENTS.
5. FLUSH MOUNT ALL TOGGLE SWITCHES, RECEPTACLE , FIRE ALARM PULL STATIONS AND FIRE ALARM NOTIFICATION DEVICES AT HEIGHTS ABOVE FINISHED FLOOR AS SHOWN IN THE DEVICE MOUNTING HEIGHT DETAIL, EXCEPT WHERE OTHERWISE NOTED. DEVICES MAY BE SURFACE MOUNTED WHEN CONDUIT IS SPECIFIED EXPOSED.
6. CIRCUIT NUMBERS ARE SHOWN FOR CIRCUIT IDENTIFICATION. CIRCUITING SHALL AGREE WITH NUMBERING ON THE PANEL SCHEDULES PROVIDED. BALANCE THE LOAD ON PANELS AS EVENLY AS POSSIBLE BETWEEN EACH PHASE. COMMON NEUTRALS MAY **[NOT]** BE USED FOR BRANCH CIRCUITS. BALANCE THE LOAD ON PANEL AS EVENLY AS POSSIBLE BETWEEN EACH PHASE.
7. CIRCUITS SERVING EMERGENCY AND EXIT LUMINAIRES SHALL BE RUN IN SEPARATE RACEWAY FROM ALL OTHER CIRCUITS.
8. A #12 GREEN INSULATED GROUND CONDUCTOR SHALL BE INSTALLED WITH CIRCUIT CONDUCTORS TO ALL RECEPTACLES.
9. CONCEAL ALL CONDUIT IN WALLS, PARTITIONS, ABOVE CEILING, ETC. UNLESS OTHERWISE INDICATED ON THE PLANS OR IN THE SPECIFICATIONS. CONDUIT IN MECHANICAL ROOMS, AND STORAGE ROOMS WITHOUT CEILINGS MAY BE EXPOSED ON BUILDING STRUCTURE. WHERE RACEWAY IS REQUIRED ON EXISTING CONCRETE AND MASONRY WALLS, SURFACE RACEWAY MAY BE USED IN LIEU OF CHANNELING WALLS TO ALLOW CONCEALED ROUTING. THE RACEWAY SHALL BE SINGLE CHANNEL STYLE TYPE WITH IVORY FINISH. THIS APPLIES FOR BRANCH CIRCUIT CONDUITS UP TO 3/4" SIZE. CONDUITS LARGER THAN 3/4" MAY BE ROUTED EXPOSED, BUT INSTALLED PARALLEL AND/OR PERPENDICULAR TO BUILDING LINES AND RUN AS UNOBTRUSIVELY AS POSSIBLE.
10. BOXES LOCATED ON OPPOSITE SIDES OF NON-RATED WALLS SHALL BE OFFSET A MINIMUM OF 6" HORIZONTALLY. "THRU-THE-WALL" BOXES SHALL NOT BE ALLOWED WITHOUT PRIOR WRITTEN APPROVAL OF THE ARCHITECT/ENGINEER.
11. COORDINATE AND CO-LOCATE WALL MOUNTED RECEPTACLE LOCATIONS WITH TECHNOLOGY (VOICE/DATA,CATV, FIDS, ETC) OUTLETS SHOWN ON THE T-SERIES DRAWINGS UNLESS OTHERWISE NOTED, EACH TECHNOLOGY OUTLET SHALL BE LOCATED WITHIN 24"OF ITS ASSOCIATED RECEPTACLE. ASSOCIATED RECEPTACLE SHALL BE DEFINED AS THE RECEPTACLE NEAREST THE LOCATION OF, AND AT THE SAME HEIGHT AS,THE TECHNOLOGY OUTLET WHEN MULTIPLE RECEPTACLES ARE SHOWN ON A WALL.
12. DUPLEX RECEPTACLES FOR ELECTRIC WATER COOLERS (EWC) SHALL BE CONCEALED BEHIND WATER COOLER ACCESS PLATE OR BE DIRECTLY BELOW AND CENTERED ON EWC. CONTRACTOR SHALL VERIFY TYPE OF EWC TO BE INSTALLED.
13. CONTRACTOR SHALL COORDINATE THE LOCATION OF ALL DETECTORS WITH LUMINAIRES, SPRINKLER, AND CEILING DIFFUSERS. CENTER ALL DEVICES IN CEILING TILE PATTERN. SMOKE DETECTORS SHALL BE LOCATED NO CLOSER THAN 3 FEET TO AN AIR SUPPLY DIFFUSER OR RETURN GRILLE.
14. CONTRACTOR SHALL VERIFY ALL FURNITURE, MODULAR FURNITURE AND EQUIPMENT LOCATIONS WITH ARCHITECTURAL PLANS, ELEVATIONS AND REVIEWED SHOP DRAWINGS. PRIOR TO ELECTRICAL INSTALLATION THIS CONTRACTOR SHALL ADJUST RECEPTACLES, OUTLETS OR CONNECTION LOCATIONS TO ACCOMMODATE FURNITURE AND/OR EQUIPMENT.
15. ELECTRICAL AND TELECOMMUNICATIONS EQUIPMENT SHALL BE MOUNTED TO AVOID IMPEDANCE OF, OPERATION OF, AND/OR ACCESS TO ELECTRICAL AND MECHANICAL EQUIPMENT. ALL MOUNTING OF ELECTRICAL AND TELECOMMUNICATIONS EQUIPMENT, ON EQUIPMENT SUPPLIED BY ANOTHER CONTRACTOR, SHALL BE APPROVED IN ADVANCE BY THE OTHER CONTRACTOR.
16. CONTRACTOR TO PROVIDE SUITABLE MECHANICAL PROTECTION AROUND ALL CONDUITS STUBBED OUT FROM FLOORS, WALLS OR CEILINGS DURING CONSTRUCTION TO PREVENT BENDING OR DAMAGING OF STUB OUTS DUE TO CARELESSNESS WITH CONSTRUCTION EQUIPMENT.
17. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL OPENINGS REQUIRED IN WALLS. ALL OPENINGS SHALL BE REPAIRED TO MATCH EXISTING BY A QUALIFIED CONTRACTOR AT THE EXPENSE OF THIS CONTRACTOR. ALL CONDUITS THROUGH WALLS SHALL BE GROUTED OR SEALED INTO OPENINGS.
18. DRAWINGS INDICATE THE EXTENT OF HAZARDOUS OR WET LOCATIONS. INSTALLATION MEANS AND METHODS SHALL BE SUITABLY RATED FOR THE ENVIRONMENT INDICATED ON THE DRAWINGS.
19. CONTRACTOR SHALL REMOVE AND REINSTALL ALL CEILING TILES AS REQUIRED FOR THE EXECUTION OF ELECTRICAL WORK THAT IS OUTSIDE THE CONTRACT LIMITS OF CONSTRUCTION. CONTRACTOR SHALL REPLACE CEILING TILES WITH IDENTICAL MATERIAL WHERE DAMAGED BY THIS CONTRACTOR.
20. ALL INTERLOCKING REQUIRED BY THE DRIVE MANUFACTURER BETWEEN THE VARIABLE FREQUENCY DRIVE AND THE DISCONNECT SWITCHES SHALL BE THE RESPONSIBILITY OF THE ELECTRICAL CONTRACTOR.
21. SCCR RATINGS LISTED FOR EQUIPMENT ARE MINIMUM REQUIREMENTS FOR BUS BRACING AND DEVICE RATING. ALL EQUIPMENT SHALL BE FULLY RATED UNLESS SPECIFICALLY NOTED AS SERIES RATED.
22. ALL INTERIOR AND EXTERIOR EMERGENCY BATTERY UNITS (EBU) SHALL BE ON THE SAME BRANCH CIRCUIT AS THAT SERVING THE NORMAL OR EMERGENCY LIGHTING IN THE AREA CONNECTED AHEAD OF ANY LOCAL SWITCH OR CONTROLS, PER NEC. 700.12(F).

DEMOLITION GENERAL NOTES:

1. THE INFORMATION SHOWN IS BASED ON EXISTING DRAWINGS AND SITE OBSERVATIONS TO ASSIST CONTRACTOR IN BIDDING. THE ELECTRICAL DRAWINGS INDICATE EXISTING ELECTRICAL ITEMS TO BE REMOVED. THE DRAWINGS ARE INTENDED TO INDICATE THE SCOPE OF WORK REQUIRED AND DO NOT INDICATE EVERY BOX, CONDUIT, OR WIRE THAT MUST BE REMOVED. THE CONTRACTOR SHALL VISIT THE SITE PRIOR TO SUBMITTING A BID AND VERIFY EXISTING CONDITIONS. REFER TO SPECIFICATION SECTION 26 05 02 FOR ADDITIONAL REQUIREMENTS.
2. DASHED WALLS ON THE FLOOR PLANS INDICATE EXISTING WALLS BEING DEMOLISHED. REFER TO THE ARCHITECTURAL DEMOLITION PLANS FOR THE EXACT EXTENT OF WORK REQUIRED BY THIS PROJECT. REMOVE ALL DEVICES ON DASHED WALLS NOT SHOWN ON THE CONTRACT DRAWINGS. REFER TO DEMOLITION DRAWINGS OF OTHER TRADES. WHERE MOTORS CONTROL PANELS, AND OTHER LOADS OR APPARATUS THAT HAVE ELECTRICAL CONNECTION ARE BEING REMOVED, INCLUDE DISCONNECTION AND REMOVAL OF ALL ASSOCIATED CONDUIT, WIRING, ETC.
3. ELECTRICAL ITEMS (i.e., LIGHTING FIXTURES, PANELBOARDS, DISCONNECTS, MOTOR CONTROLLERS , ETC.) REMOVED AND NOT RELOCATED REMAIN THE PROPERTY OF THE OWNER AND SHALL BE TURNED OVER TO THE OWNER, IN A STORAGE AREA TO BE DESIGNATED BY THE OWNER. EQUIPMENT BEING REMOVED SHALL BE HANDLED SO AS NOT TO FURTHER REDUCE ITS VALUE TO THE OWNER. THE CONTRACTOR SHALL DISPOSE OF MATERIAL THE OWNER DOES NOT WANT TO REUSE OR RETAIN FOR MAINTENANCE PURPOSES.
4. WHERE LIGHTS, SWITCHES, RECEPTACLES, ETC., ARE BEING REMOVED ALL ASSOCIATED CONDUIT AND WIRE BACK TO THE PANELBOARD OR FEEDER JUNCTION BOX SERVING THE DEVICE SHALL ALSO BE REMOVED, UNLESS THE CONDUIT CAN BE REUSED FOR NEW CONDUCTORS. THE CONTRACTOR SHALL DISPOSE OF MATERIAL THE OWNER DOES NOT WANT TO REUSE OR RETAIN FOR MAINTENANCE PURPOSES.
5. ALL BOXES THAT REMAIN IN PLACE IN EXISTING MASONRY WALLS THAT ARE TO REMAIN SHALL BE PROVIDED WITH A BLANK COVERPLATE. REFER TO SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS ASSOCIATED WITH TYPE AND ATTACHMENT.
6. ALL CONDUIT SHALL BE REMOVED WHERE WALLS ARE BEING REMOVED. WHERE CONDUIT IS IN THE CONCRETE SLAB, CUT OFF FLUSH, PULL OUT WIRE, AND PLUG. WHERE CONDUIT IS RUN EXPOSED, ALL ASSOCIATED CLAMPS, SUPPORTS, HANGERS, ETC., SHALL ALSO BE REMOVED. CONDUIT CONCEALED IN WALL CONSTRUCTION MAY BE ABANDONED IN PLACE IF NOT AFFECTED BY OTHER CONSTRUCTION.
7. THIS CONTRACTOR SHALL COORDINATE ALL HIS WORK, INCLUDING PHASING WITH OTHER CONTRACTORS AT THE JOB SITE BEFORE REMOVING EXISTING ELECTRICAL AND INSTALLING NEW ITEMS.
8. EXISTING CONDUIT IN GOOD CONDITION, MAY BE REUSED IN PLACE. RELOCATED EXISTING CONDUIT SHALL NOT BE ALLOWED. BONDING CONDUCTORS SHALL BE INSTALLED IN ALL REUSED CONDUIT TO ASSURE PROPER GROUND PATH.
9. MAINTAIN CIRCUIT CONTINUITY OF DEVICES LOCATED OUTSIDE OF CONSTRUCTION AREA. DEVICE AND EQUIPMENT REMOVAL IN CERTAIN LOCATIONS MAY REQUIRE THE INSTALLATION OF A JUNCTION BOX TO RECONNECT CIRCUITS THAT REMAIN IN OPERATION. EXTEND CONDUIT AND WIRING AS REQUIRED TO MAINTAIN POWER TO REMAINING EQUIPMENT.
10. BALLASTS MANUFACTURED PRIOR TO 1980 CONTAIN PCBs AND SHALL BE DISPOSED OF IN ACCORDANCE WITH SPECIFICATIONS.
11. HID AND FLUORESCENT LAMPS CONTAIN MERCURY AND SHALL BE DISPOSED OF IN ACCORDANCE WITH SPECIFICATIONS.
12. CONTRACTOR SHALL REMOVE AND INSTALL ALL CEILING TILES AS REQUIRED FOR THE EXECUTION OF ELECTRICAL WORK THAT IS OUTSIDE THE CONTRACT LIMITS OF CONSTRUCTION. CONTRACTOR SHALL REPLACE CEILING TILES WITH IDENTICAL MATERIAL WHERE DAMAGED BY THIS CONTRACTOR.
13. PROVIDE REVISED TYPED CIRCUIT DIRECTORY IN PANELBOARDS THAT HAVE CIRCUITS REMOVED OR ADDED CIRCUITS.
14. REMOVE EXPOSED ABANDONED CONDUIT, INCLUDING ABANDONED CONDUIT ABOVE ACCESSIBLE CEILING FINISHES. CUT RACEWAY FLUSH WITH WALLS AND FLOORS, PATCH SURFACES TO MATCH EXISTING. REMOVE ALL ASSOCIATED CLAMPS, HANGERS, SUPPORTS, ETC. ASSOCIATED WITH RACEWAY REMOVAL.
15. DISCONNECT AND REMOVE ABANDONED LUMINAIRES, INCLUDING BRACKETS, STEMS, HANGERS, AND OTHER ACCESSORIES.
16. DISCONNECT AND REMOVED ELECTRICAL DEVICES AND EQUIPMENT SERVING UTILIZATION EQUIPMENT THAT HAS BEEN REMOVED.
17. EC SHALL PROVIDE ALL REQUIRED LABOR AND MATERIALS ASSOCIATED WITH DISCONNECTION AND TEMPORARY REMOVAL OF LIGHT FIXTURES, OCCUPANCY SENSORS, SPEAKERS, TELECOMMUNICATION OUTLETS AND ETC AS DEEMED NECESSARY TO ACCOMODATE THE INSTALLATION OF THE NEW DUCTWORK AND PIPING OF ALL OTHER TRADES IN THE AREAS OUTSIDE OF THIS PROJECT CONSTRUCTION SCOPE/BOUNDARIES. REFER TO THE RESPECTIVE ARCHITECTURAL DEMOLITION PLANS FOR COORDINATION AND ADDITIONAL INFORMATION. NOTE, THAT THESE DOCUMENTS ONLY ADDRESS DEMOLITION SCOPE WITHIN PROJECT BOUNDARY. EC SHALL ALSO INCLUDE COST ASSOCIATED WITH RE-INSTALLATION AND RE-CONNECTION OF THE ABOVE MENTIONED FIXTURES AND DEVICES BACK IN THEIR SPACES UPON WORK OF OTHER TRADES IS COMPLETED AND ASSURE PROPER OPERATION OF ALL DEVICES.

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2019-06-06

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MANAWA

MANAWA ELEMENTARY SCHOOL - ALTERATIONS
MANAWA MIDDLE/HIGH SCHOOL - ADDITIONS & ALTERATIONS
PART 2 - MANAWA MIDDLE / HIGH SCHOOL
515 E. 4th STREET
MANAWA, WI 54949

MARK	DATE

ISSUED: June 6, 2019
PROJECT NO: 18268
CAD DWG FILE:
DRAWN BY: MRF
CHECKED BY: IMR

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SHEET TITLE:
NOTES, SYMBOLS & ABBREVIATIONS

SHEET NUMBER:
2-EE-001

DEMOLITION GENERAL NOTES:

1. EXISTING RACEWAYS AND DEVICES INSTALLED WITH PLENUM SPACES ABOVE THE ACCESSIBLE CEILING ARE SUPPORTED BY WOODEN SUPPORTS. PROVIDE NEW SUPPORTS OF EXISTING RACEWAY AND DEVICES AS NEEDED TO ACCOMODATE DEMOLITION OF EXISTING WOODEN SUPPORTS. WOODEN SUPPORTS TO BE DEMOLISHED BY DEMOLITION CONTRACTOR. NEW SUPPORTS SHALL BE IN ACCORDANCE WITH SPECIFICATIONS 26 05 29 AND 26 05 33. FIELD VERIFY LOCATIONS OF WOODEN SUPPORTS. NEW SUPPORTS SHALL BE INSTALLED PRIOR TO THE DEMOLITION OF THE EXISTING WOODEN SUPPORTS.

KEYED NOTES

TRUE NORTH PLAN NORTH

1 OVERALL FIRST FLOOR POWER & FA DEMOLITION PLAN

1/16" = 1'-0"

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2019-06-06

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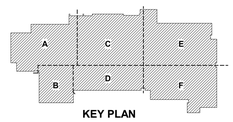

KEY PLAN

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DRAWN BY:	MRF
CHECKED BY:	IMR

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SHEET TITLE:
OVERALL FIRST FLOOR POWER & FA DEMOLITION PLAN

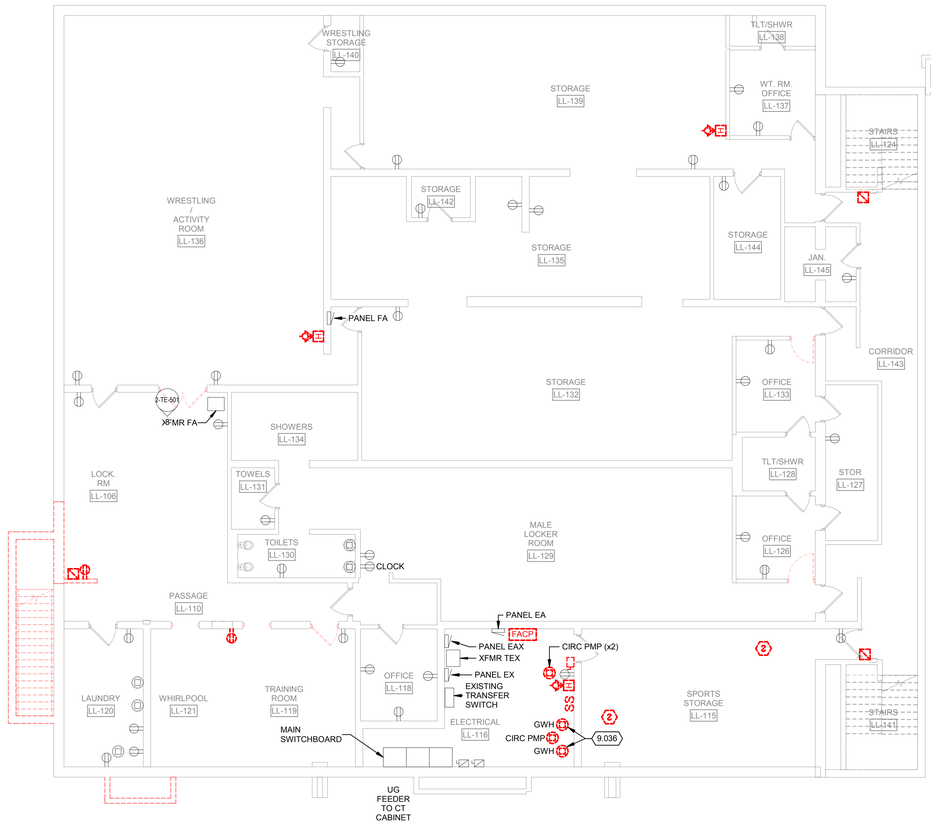
SHEET NUMBER:
2-EPD-100

DEMOLITION GENERAL NOTES:

1. EXISTING RACEWAYS AND DEVICES INSTALLED WITH PLENUM SPACES ABOVE THE ACCESSIBLE CEILING ARE SUPPORTED BY WOODEN SUPPORTS. PROVIDE NEW SUPPORTS OF EXISTING RACEWAY AND DEVICES AS NEEDED TO ACCOMODATE DEMOLITION OF EXISTING WOODEN SUPPORTS. WOODEN SUPPORTS TO BE DEMOLISHED BY DEMOLITION CONTRACTOR. NEW SUPPORTS SHALL BE IN ACCORDANCE WITH SPECIFICATIONS 26 05 29 AND 26 05 33. FIELD VERIFY LOCATIONS OF WOODEN SUPPORTS. NEW SUPPORTS SHALL BE INSTALLED PRIOR TO THE DEMOLITION OF THE EXISTING WOODEN SUPPORTS.

KEYED NOTES

9.036 DEMOLISH EXISTING GAS WATER HEATER CONNECT, CIRCULATION PUMP CONNECTIONS, DISCONNECTS, STARTERS AND ALL GAS WATER HEATER ASSOCIATED WIRING AND DEVICES. DEMOLISH CIRCUITS BACK TO NEAREST JUNCTION BOX FOR EXTENSION TO NEW GAS WATER HEATER EQUIPMENT LOCATIONS IN SPORTS STORAGE LL-115 AS SHOWN ON SHEET 2-EP-101.



TRUE NORTH PLAN NORTH

LOWER LEVEL POWER & FA DEMOLITION PLAN

1/8" = 1'-0"

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2019-06-06

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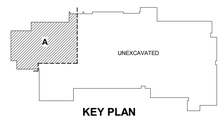

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MANAWA, WI 54949

MARK	DATE

ISSUED: June 6, 2019
PROJECT NO: 18268
CAD DWG FILE:
DRAWN BY: MRF
CHECKED BY: IMR

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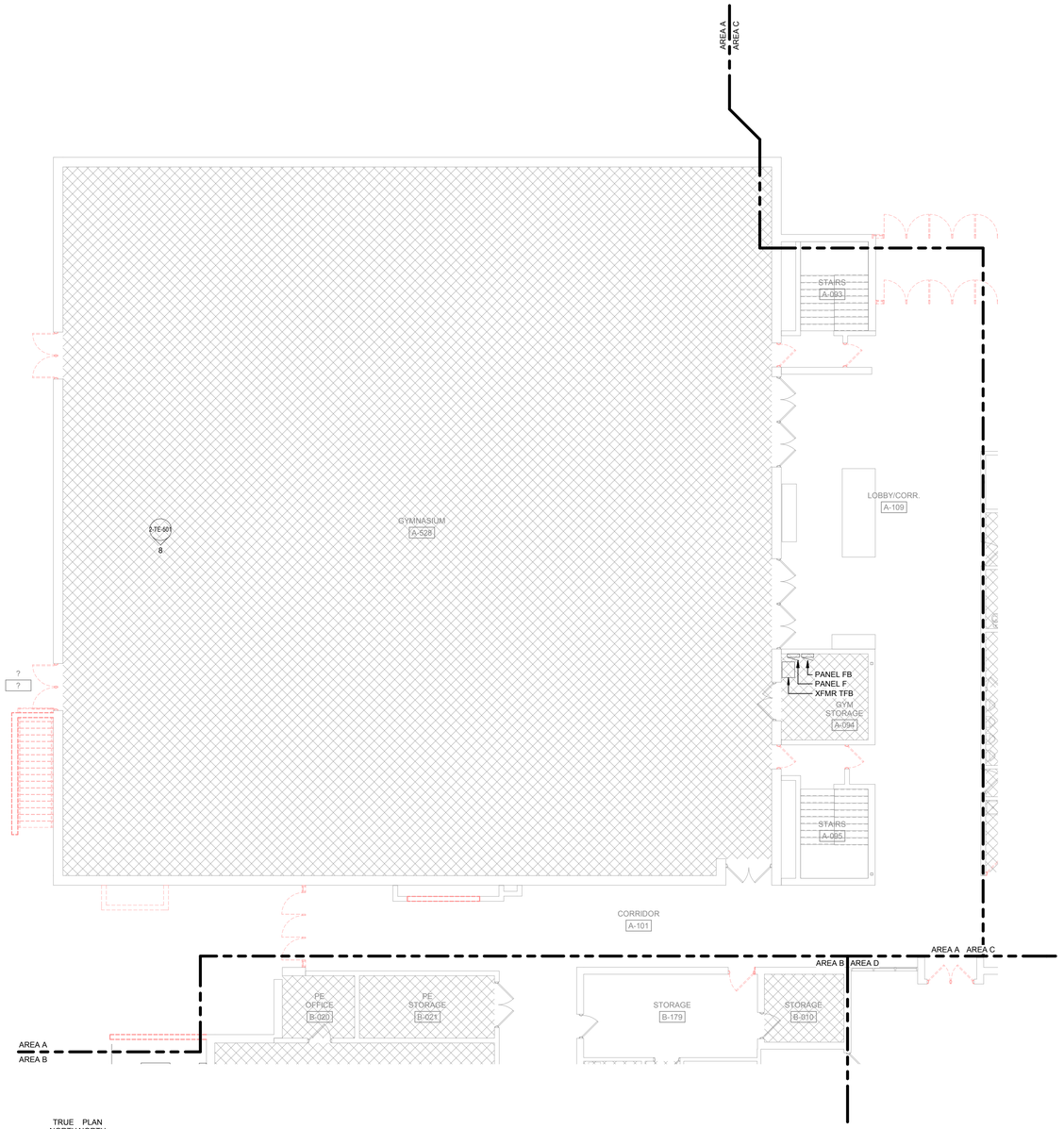
SHEET TITLE:
LOWER LEVEL POWER & FA DEMOLITION PLAN

SHEET NUMBER:
2-EPD-101

DEMOLITION GENERAL NOTES:

1. EXISTING RACEWAYS AND DEVICES INSTALLED WITH PLENUM SPACES ABOVE THE ACCESSIBLE CEILING ARE SUPPORTED BY WOODEN SUPPORTS. PROVIDE NEW SUPPORTS OF EXISTING RACEWAY AND DEVICES AS NEEDED TO ACCOMODATE DEMOLITION OF EXISTING WOODEN SUPPORTS. WOODEN SUPPORTS TO BE DEMOLISHED BY DEMOLITION CONTRACTOR. NEW SUPPORTS SHALL BE IN ACCORDANCE WITH SPECIFICATIONS 26 05 29 AND 26 05 33. FIELD VERIFY LOCATIONS OF WOODEN SUPPORTS. NEW SUPPORTS SHALL BE INSTALLED PRIOR TO THE DEMOLITION OF THE EXISTING WOODEN SUPPORTS.

KEYED NOTES



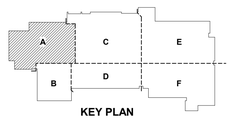
TRUE NORTH PLAN NORTH

FIRST FLOOR POWER & FA DEMOLITION PLAN - AREA A

1/8" = 1'-0"

PRELIMINARY
NOT FOR CONSTRUCTION
2019-06-06

FOR BIDS
NOT FOR CONSTRUCTION



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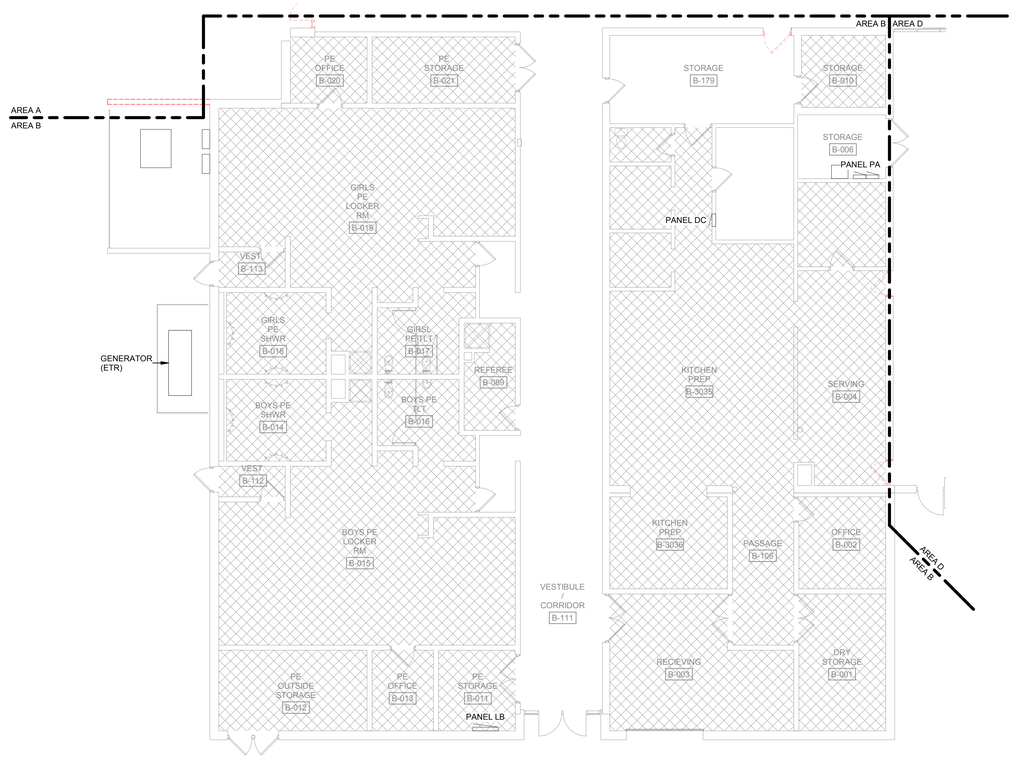
SHEET TITLE:
FIRST FLOOR POWER & FA DEMOLITION PLAN - AREA A

SHEET NUMBER:
2-EPD-102

DEMOLITION GENERAL NOTES:

1. EXISTING RACEWAYS AND DEVICES INSTALLED WITH PLENUM SPACES ABOVE THE ACCESSIBLE CEILING ARE SUPPORTED BY WOODEN SUPPORTS. PROVIDE NEW SUPPORTS OF EXISTING RACEWAY AND DEVICES AS NEEDED TO ACCOMODATE DEMOLITION OF EXISTING WOODEN SUPPORTS. WOODEN SUPPORTS TO BE DEMOLISHED BY DEMOLITION CONTRACTOR. NEW SUPPORTS SHALL BE IN ACCORDANCE WITH SPECIFICATIONS 26 05 29 AND 26 05 33. FIELD VERIFY LOCATIONS OF WOODEN SUPPORTS. NEW SUPPORTS SHALL BE INSTALLED PRIOR TO THE DEMOLITION OF THE EXISTING WOODEN SUPPORTS.

KEYED NOTES



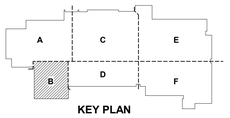
TRUE NORTH PLAN NORTH

N N 1 **FIRST FLOOR POWER & FA DEMOLITION PLAN - AREA B**

1/8" = 1'-0"

PRELIMINARY
NOT FOR CONSTRUCTION
2019-06-06

FOR BIDS
NOT FOR CONSTRUCTION



KEY PLAN

Hoffman
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800.236.2370 | hoffman.net

CONSULTANT:
Mead & Hunt, Inc.
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meadhunt.com

MANAWA

MANAWA ELEMENTARY SCHOOL - ALTERATIONS
MANAWA MIDDLE/HIGH SCHOOL - ADDITIONS & ALTERATIONS
PART 2 - MANAWA MIDDLE / HIGH SCHOOL
515 E. 4th STREET
MANAWA, WI 54949

MARK	DATE
ISSUED:	June 6, 2019
PROJECT NO:	18268
CAD DWG FILE:	
DRAWN BY:	MRF
CHECKED BY:	IMR

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SHEET TITLE:
FIRST FLOOR POWER & FA DEMOLITION PLAN - AREA B

SHEET NUMBER:
2-EPD-103

DEMOLITION GENERAL NOTES:

1. EXISTING RACEWAYS AND DEVICES INSTALLED WITH PLENUM SPACES ABOVE THE ACCESSIBLE CEILING ARE SUPPORTED BY WOODEN SUPPORTS. PROVIDE NEW SUPPORTS OF EXISTING RACEWAY AND DEVICES AS NEEDED TO ACCOMODATE DEMOLITION OF EXISTING WOODEN SUPPORTS. WOODEN SUPPORTS TO BE DEMOLISHED BY DEMOLITION CONTRACTOR. NEW SUPPORTS SHALL BE IN ACCORDANCE WITH SPECIFICATIONS 26 05 29 AND 26 05 33. FIELD VERIFY LOCATIONS OF WOODEN SUPPORTS. NEW SUPPORTS SHALL BE INSTALLED PRIOR TO THE DEMOLITION OF THE EXISTING WOODEN SUPPORTS.

KEYED NOTES

9.024 REMOVE EXISTING RECEPTACLE AND WIRING BACK TO NEAREST JUNCTION BOX. EXISTING CONDUIT IN FLOOR SHALL REMAIN FOR RE-USE.

9.026 DE-ENERGIZE AND DISCONNECT POWER TO EXISTING FUME HOOD FOR FUME HOOD RELOCATION. EXISTING BRANCH CIRCUIT SHALL REMAIN FOR RE-USE.

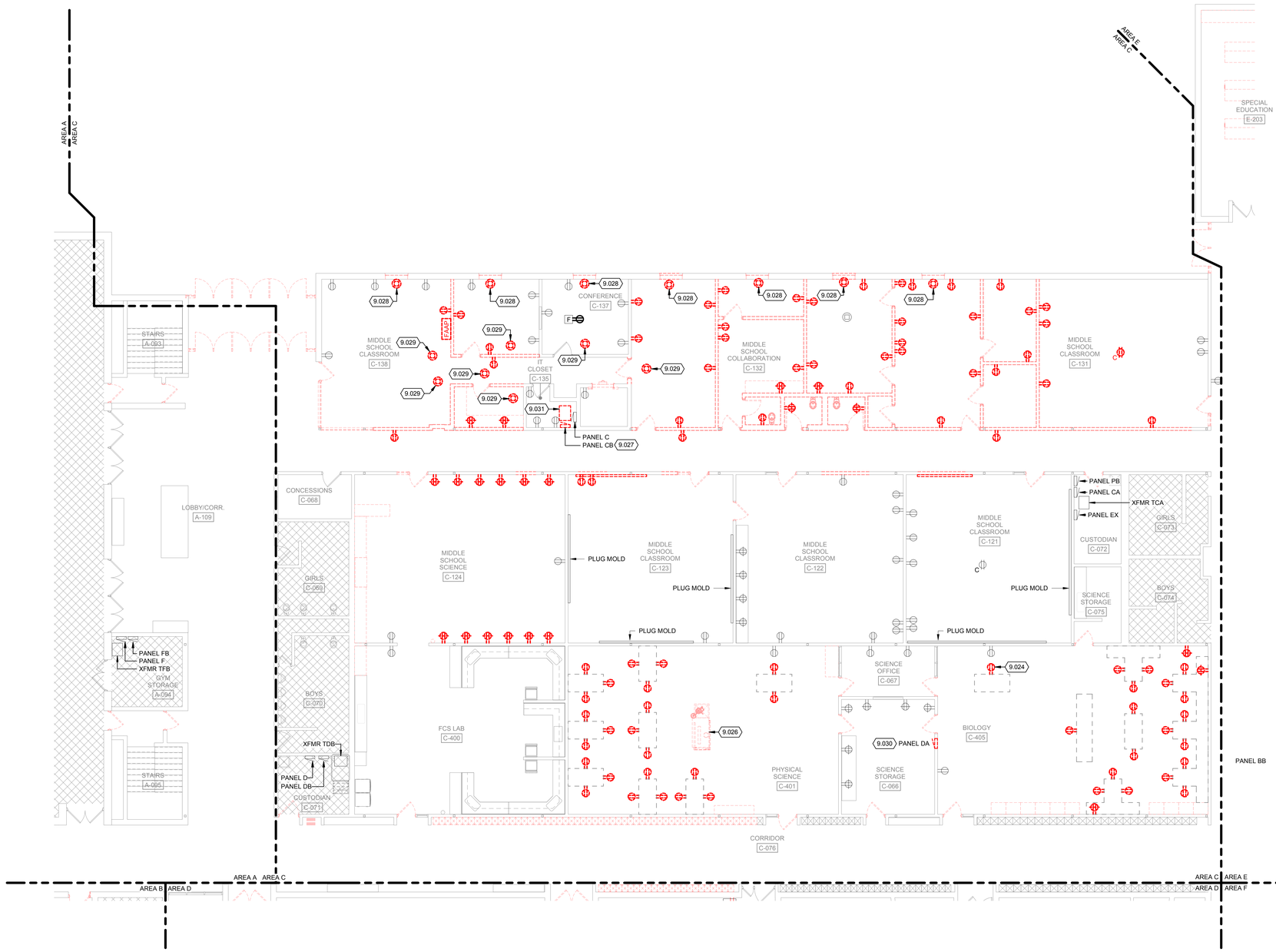
9.027 DE-ENERGIZE AND DISCONNECT EXISTING PANELBOARD CB. EXISTING BRANCH CIRCUITS SHALL REMAIN FOR RE-TERMINATION ON NEW PANELBOARD UNLESS NOTED OTHERWISE. FOR BIDDING PURPOSES ASSUME THE DISCONNECTION AND RE-TERMINATION OF TWENTY (20) - 20A/1P CIRCUITS, (1) - 30A/1P CIRCUIT, (2) - 30A/2P CIRCUITS, AND (4) - 20A/2P CIRCUITS.

9.028 REMOVE EXISTING ELECTRIC BASEBOARD HEATER AND CONTROLS, INCLUDING ALL WIRING AND CONDUIT BACK TO SOURCE.

9.029 DISCONNECT AND REMOVE EXISTING BRANCH CIRCUIT ASSOCIATED WITH HVAC EQUIPMENT BACK TO SOURCE. REFER TO M-SERIES SHEETS FOR EXACT EQUIPMENT LOCATIONS.

9.030 DE-ENERGIZE AND DISCONNECT EXISTING PANELBOARD DA. REMOVE INTERNAL COMPONENTS OF PANELBOARD. FLUSH MOUNTED PANELBOARD BACKBOX SHALL REMAIN AS SPLICE BOX FOR EXISTING TO REMAIN BRANCH CIRCUITS. EXISTING BRANCH CIRCUITS REMAINING SHALL BE INTERCEPTED, EXTENDED AND RE-TERMINATED ON NEW PANELBOARD UNLESS NOTED OTHERWISE. FOR BIDDING PURPOSES ASSUME THE DISCONNECTION, EXTENSION, AND RE-TERMINATION OF THIRTY (30) - 20A/1P CIRCUITS. EXISTING BRANCH CIRCUITS SHARE COMMON NEUTRAL. COMMON NEUTRAL BRANCH CIRCUITS SHALL BE TERMINATED ON MULTI-POLE CIRCUIT BREAKERS. FIELD VERIFY EXACT QUANTITY OF MULTI-POLE CIRCUIT BREAKERS REQUIRED PRIOR TO FINAL CIRCUIT BREAKER INSTALLATION. MULTI-POLE CIRCUIT BREAKERS LISTED FOR EXISTING CIRCUITS IN PANEL SCHEDULE DA ARE FOR BIDDING PURPOSES ONLY.

9.031 DE-ENERGIZE AND DISCONNECT EXISTING WALL MOUNTED TRANSFORMER FOR RELOCATION. REMOVE PRIMARY AND SECONDARY FEEDERS BACK TO SOURCE. REFER TO SHEET 2-EP-104 FOR RELOCATED TRANSFORMER LOCATION.



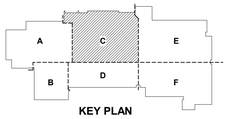
TRUE NORTH PLAN NORTH

FIRST FLOOR POWER & FA DEMOLITION PLAN - AREA C

1/8" = 1'-0"

PRELIMINARY
NOT FOR CONSTRUCTION
2019-06-06

FOR BIDS
NOT FOR CONSTRUCTION



KEY PLAN

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PART 2 - MANAWA MIDDLE / HIGH SCHOOL
515 E. 4th STREET
MANAWA, WI 54949

MARK	DATE

ISSUED: June 6, 2019
PROJECT NO: 18268
CAD DWG FILE:
DRAWN BY: MRF
CHECKED BY: IMR

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SHEET TITLE:
FIRST FLOOR POWER & FA DEMOLITION PLAN - AREA C

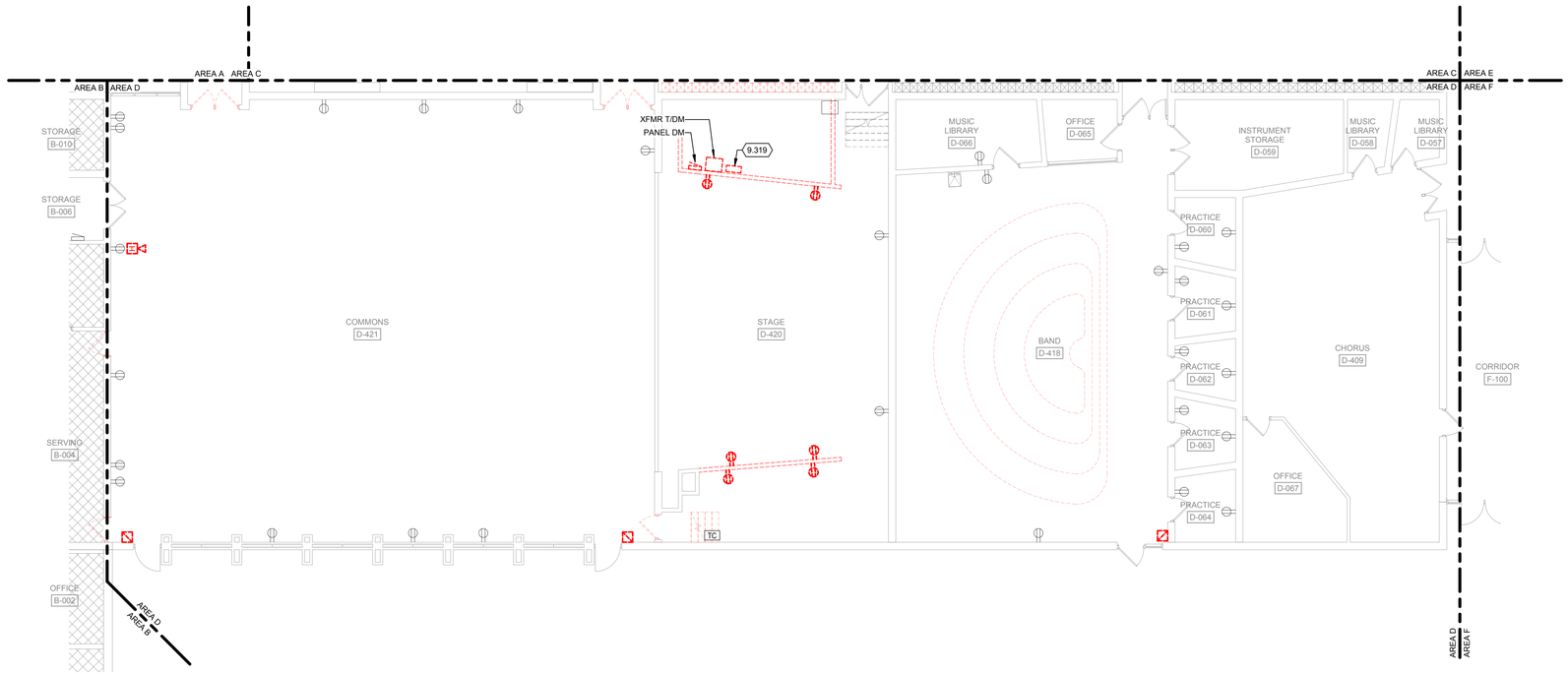
SHEET NUMBER:
2-EPD-104

DEMOLITION GENERAL NOTES:

1. EXISTING RACEWAYS AND DEVICES INSTALLED WITH PLENUM SPACES ABOVE THE ACCESSIBLE CEILING ARE SUPPORTED BY WOODEN SUPPORTS. PROVIDE NEW SUPPORTS OF EXISTING RACEWAY AND DEVICES AS NEEDED TO ACCOMODATE DEMOLITION OF EXISTING WOODEN SUPPORTS. WOODEN SUPPORTS TO BE DEMOLISHED BY DEMOLITION CONTRACTOR. NEW SUPPORTS SHALL BE IN ACCORDANCE WITH SPECIFICATIONS 26 05 29 AND 26 05 33. FIELD VERIFY LOCATIONS OF WOODEN SUPPORTS. NEW SUPPORTS SHALL BE INSTALLED PRIOR TO THE DEMOLITION OF THE EXISTING WOODEN SUPPORTS.

KEYED NOTES

9.319 REMOVE EXISTING DIMMER EQUIPMENT AND ASSOCIATED BACKBOX.



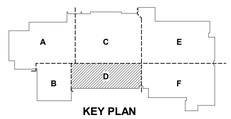
TRUE NORTH PLAN NORTH

1 **FIRST FLOOR POWER & FA DEMOLITION PLAN - AREA D**

1/8" = 1'-0"

PRELIMINARY
NOT FOR CONSTRUCTION
2019-06-06

FOR BIDS
NOT FOR CONSTRUCTION



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MANAWA, WI 54949

MARK	DATE

ISSUED: June 6, 2019
PROJECT NO: 18268
CAD DWG FILE:
DRAWN BY: MRF
CHECKED BY: IMR

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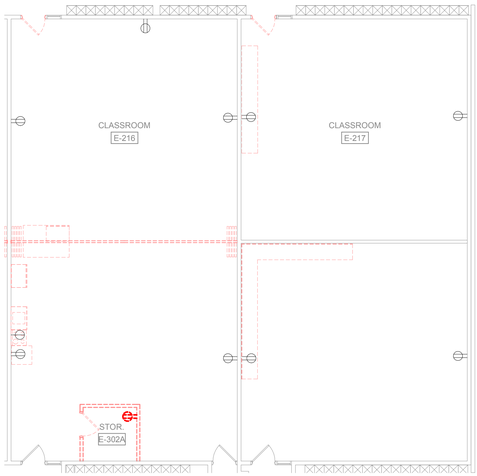
SHEET TITLE:
FIRST FLOOR POWER & FA DEMOLITION PLAN - AREA D

SHEET NUMBER:
2-EPD-105

DEMOLITION GENERAL NOTES:

1. EXISTING RACEWAYS AND DEVICES INSTALLED WITH PLENUM SPACES ABOVE THE ACCESSIBLE CEILING ARE SUPPORTED BY WOODEN SUPPORTS. PROVIDE NEW SUPPORTS OF EXISTING RACEWAY AND DEVICES AS NEEDED TO ACCOMODATE DEMOLITION OF EXISTING WOODEN SUPPORTS. WOODEN SUPPORTS TO BE DEMOLISHED BY DEMOLITION CONTRACTOR. NEW SUPPORTS SHALL BE IN ACCORDANCE WITH SPECIFICATIONS 26 05 29 AND 26 05 33. FIELD VERIFY LOCATIONS OF WOODEN SUPPORTS. NEW SUPPORTS SHALL BE INSTALLED PRIOR TO THE DEMOLITION OF THE EXISTING WOODEN SUPPORTS.

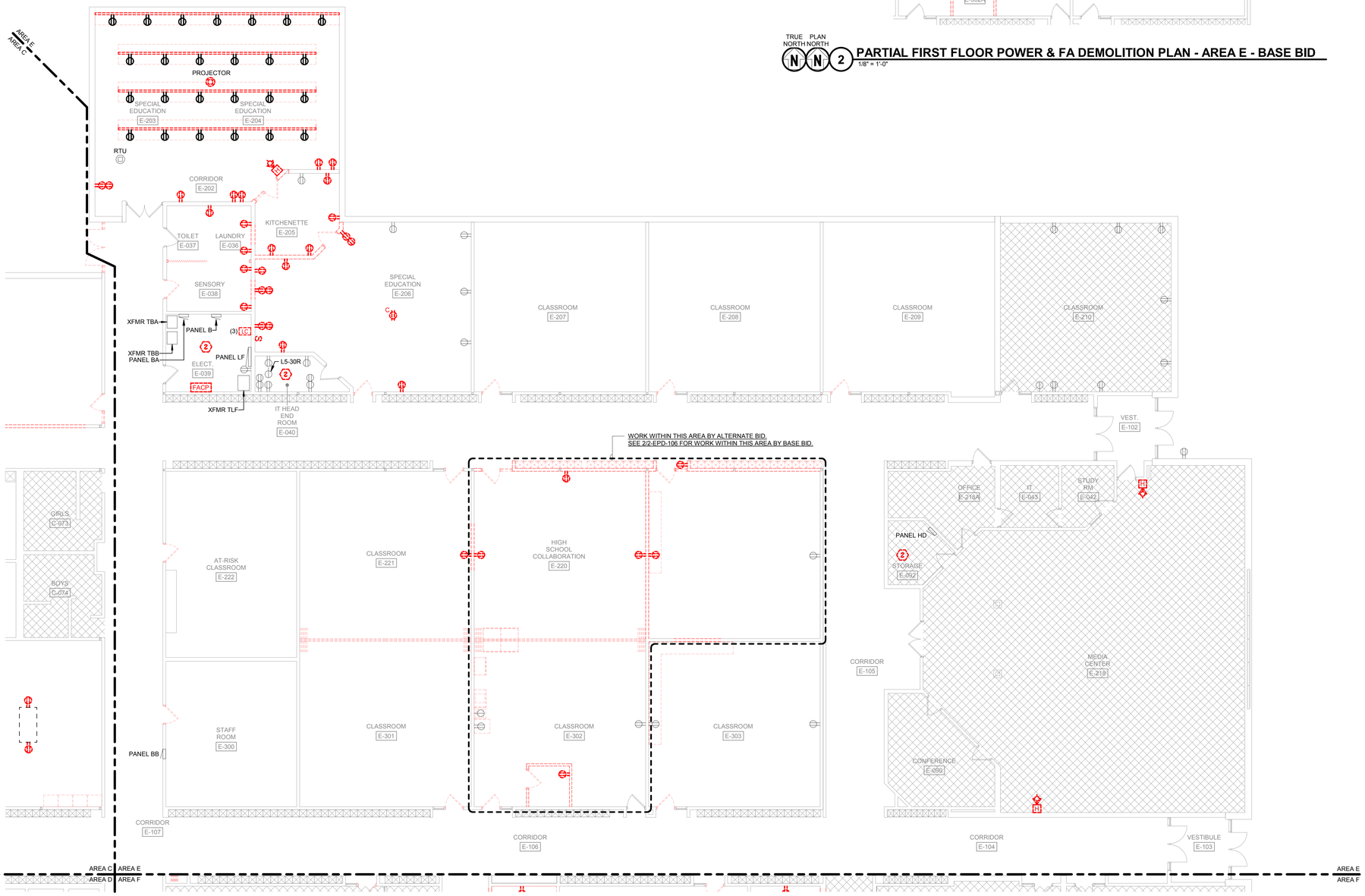
KEYED NOTES



TRUE NORTH PLAN NORTH

2 PARTIAL FIRST FLOOR POWER & FA DEMOLITION PLAN - AREA E - BASE BID

1/8" = 1'-0"



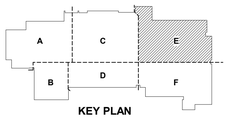
TRUE NORTH PLAN NORTH

1 FIRST FLOOR POWER & FA DEMOLITION PLAN - AREA E

1/8" = 1'-0"

FOR BIDS
NOT FOR CONSTRUCTION

PRELIMINARY
NOT FOR CONSTRUCTION
2019-06-06



KEY PLAN

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PROJECT NO:	18268
CAD DWG FILE:	
DRAWN BY:	MRF
CHECKED BY:	IMR

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SHEET TITLE:
FIRST FLOOR POWER & FA DEMOLITION PLAN - AREA E

SHEET NUMBER:
2-EPD-106

DEMOLITION GENERAL NOTES:

1. EXISTING RACEWAYS AND DEVICES INSTALLED WITH PLENUM SPACES ABOVE THE ACCESSIBLE CEILING ARE SUPPORTED BY WOODEN SUPPORTS. PROVIDE NEW SUPPORTS OF EXISTING RACEWAY AND DEVICES AS NEEDED TO ACCOMODATE DEMOLITION OF EXISTING WOODEN SUPPORTS. WOODEN SUPPORTS TO BE DEMOLISHED BY DEMOLITION CONTRACTOR. NEW SUPPORTS SHALL BE IN ACCORDANCE WITH SPECIFICATIONS 26 05 29 AND 26 05 33. FIELD VERIFY LOCATIONS OF WOODEN SUPPORTS. NEW SUPPORTS SHALL BE INSTALLED PRIOR TO THE DEMOLITION OF THE EXISTING WOODEN SUPPORTS.

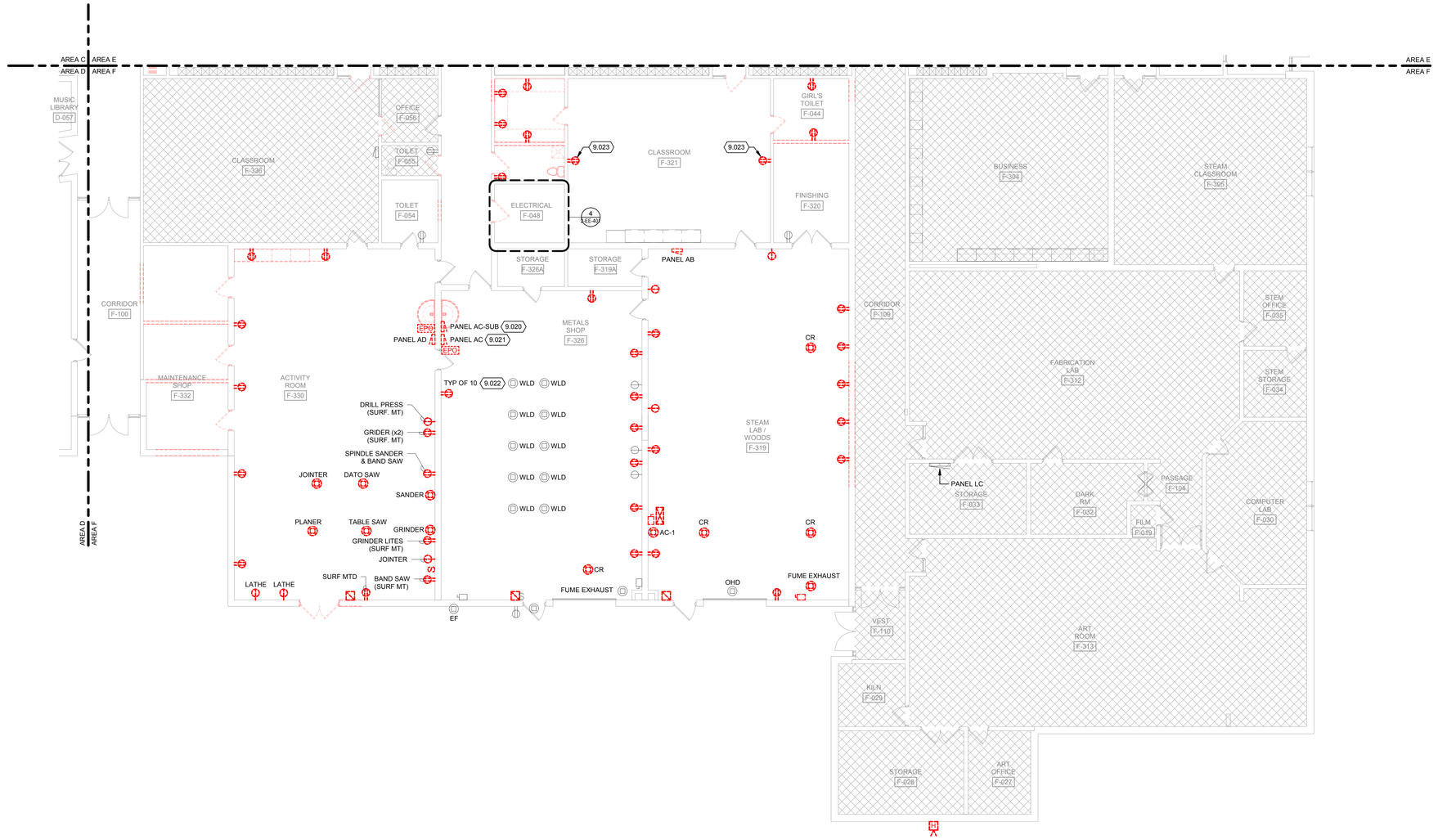
KEYED NOTES

9.020 DE-ENERGIZE AND REMOVE PANELBOARD AC-SUB. EXISTING LOADS SHALL BE TRANSFERRED TO NEW PANELBOARD AC. FOR BIDDING PURPOSES ASSUME THE TRANSFER OF (1) - 40A/3P CIRCUIT AND (4) - 40A/2P CIRCUITS TO NEW PANEL AC. SEE SHEET 2-EE-401 FOR NEW PANELBOARD LOCATION.

9.021 DE-ENERGIZE AND REMOVE PANELBOARD AC FOR REPLACEMENT WITH NEW PANELBOARD. DISCONNECT AND REMOVE EXISTING BRANCH CIRCUIT AND FEEDER CONDUITS TO ALLOW FOR INSTALLATION OF NEW PANELBOARD IN SAME LOCATION. TRANSFER ALL BRANCH CIRCUIT WIRING TO NEW PANELBOARD. FOR BIDDING PURPOSES ASSUME THE TRANSFER OF (1) - 40A/3P CIRCUIT, (7) - 40A/2P CIRCUITS, (6) - 20A/3P CIRCUITS, AND (1) - 20A/2P CIRCUIT TO NEW PANEL AC. SEE SHEET 2-EE-401 FOR NEW PANELBOARD LOCATION.

9.022 EXISTING WELDER 'SO' CORDS SHALL REMAIN FOR REUSE. REMOVE BRANCH CIRCUIT WIRING BACK TO SOURCE. EXISTING CONDUITS AND CEILING MOUNTED JUNCTION BOXES TO REMAIN.

9.023 REMOVE EXISTING RECEPTACLE, BRANCH CIRCUIT SHALL REMAIN FOR RE-USE.



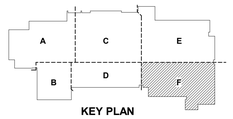
TRUE NORTH PLAN NORTH

FIRST FLOOR POWER & FA DEMOLITION PLAN - AREA F

1/8" = 1'-0"

PRELIMINARY
NOT FOR CONSTRUCTION
2019-06-06

FOR BIDS
NOT FOR CONSTRUCTION



KEY PLAN

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MANAWA, WI 54949

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PROJECT NO:	18268
CAD DWG FILE:	
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CHECKED BY:	IMR

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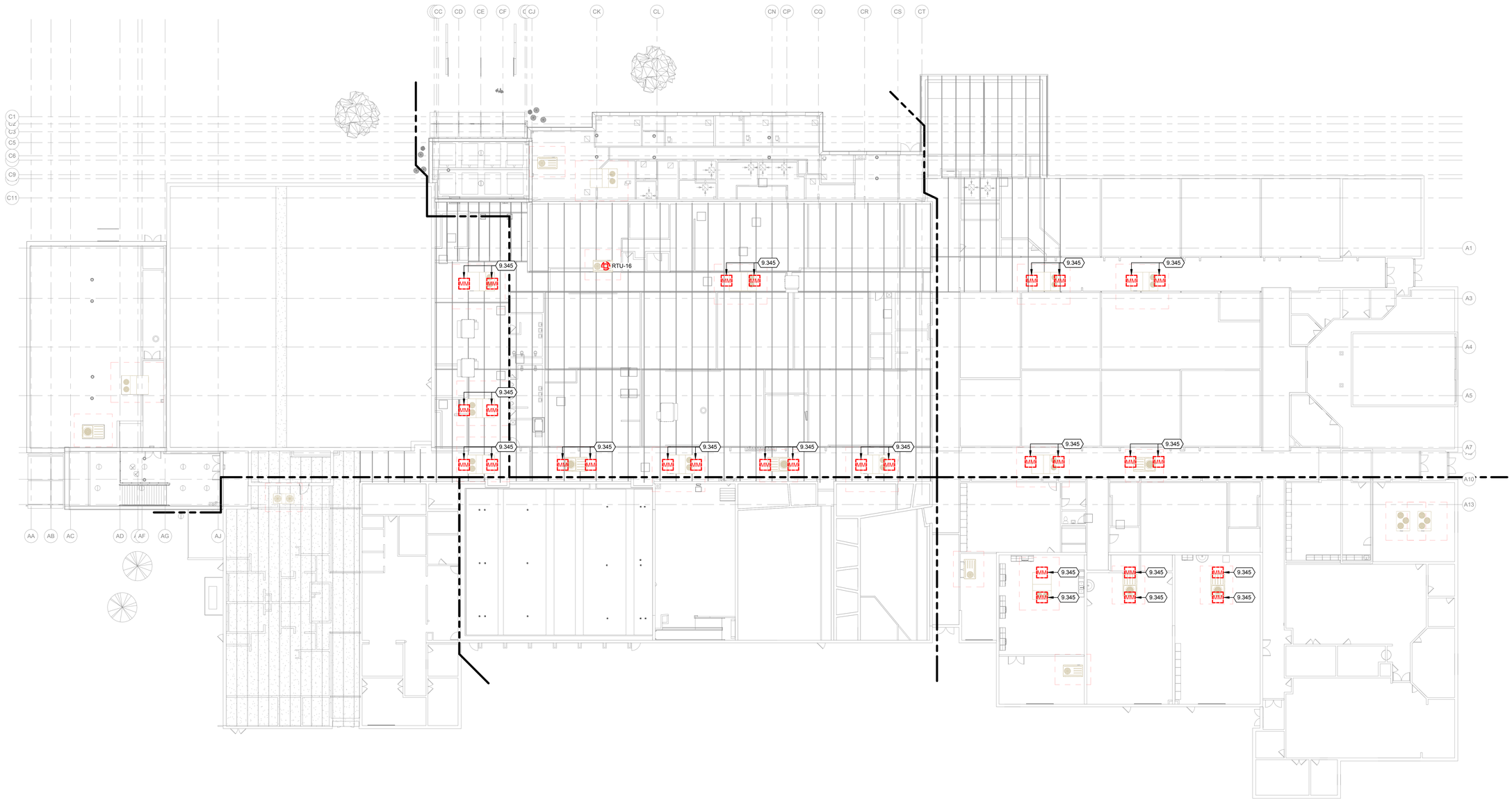
SHEET TITLE:
FIRST FLOOR POWER & FA DEMOLITION PLAN - AREA F

SHEET NUMBER:
2-EPD-107

KEYED NOTES

9.345 MONITOR MODULE SHALL INTEGRATE INTO THE ROOFTOP UNIT SMOKE DETECTOR TO INTERFACE DETECTOR INTO BUILDING FIRE ALARM SYSTEM.



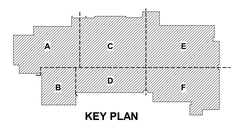
TRUE NORTH PLAN NORTH

1 OVERALL ROOF POWER & FA DEMOLITION PLAN

1/16" = 1'-0"

PRELIMINARY
NOT FOR CONSTRUCTION
2019-06-06

FOR BIDS
NOT FOR CONSTRUCTION



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PROJECT NO:	18268
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DRAWN BY:	Author
CHECKED BY:	IMR

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SHEET TITLE:
OVERALL ROOF POWER & FA DEMOLITION PLAN

SHEET NUMBER:
2-EPD-108

KEYED NOTES

9.008 DEMOLISH EXISTING FEEDER CONDUCTORS. LEAVE CONDUIT IN PLACE FOR INSTALLATION OF NEW CONDUCTORS.

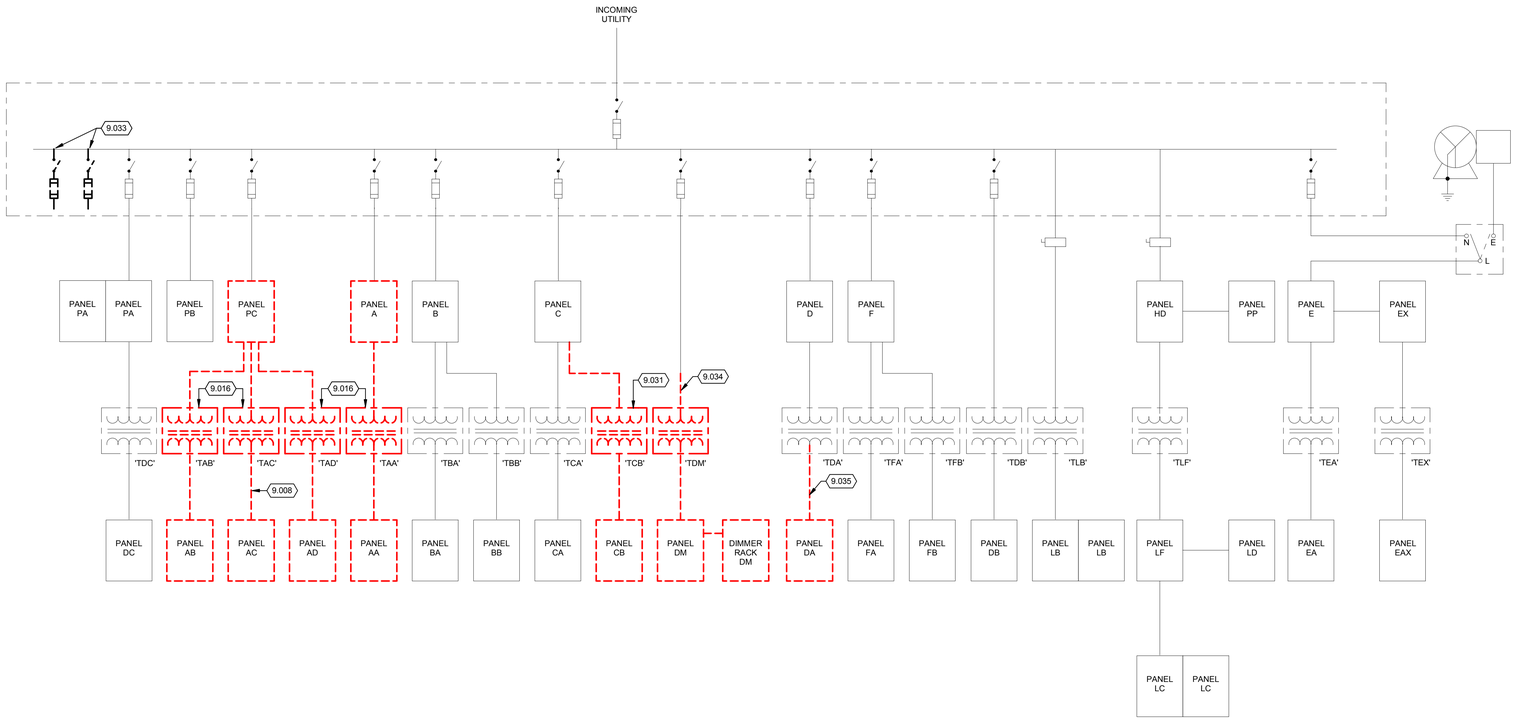
9.016 REMOVE EXISTING TRAPEZE MOUNTED TRANSFORMER.

9.031 DE-ENERGIZE AND DISCONNECT EXISTING WALL MOUNTED TRANSFORMER FOR RELOCATION. REMOVE PRIMARY AND SECONDARY FEEDERS BACK TO SOURCE. REFER TO SHEET 2-EP-104 FOR RELOCATED TRANSFORMER LOCATION.

9.033 DEMOLISH EXISTING SPARE TWIN MOUNTED 60A, 3-POLE SWITCHES AND REPLACE WITH NEW 100A, 3-POLE SWITCH AS SHOWN ON SHEET 2-EE-901.

9.034 TRANSFORMER T/DM SHALL BE RELOCATED. DEMOLISH EXISTING PRIMARY FEEDER TO A POINT BELOW THE STAGE FLOOR AND EXTEND TO RELOCATED TRANSFORMER LOCATION. SEE 2-EE-901 FOR MORE INFORMATION.

9.035 DEMOLISH SECONDARY FEEDER CONDUCTORS. DEMOLISH RACEWAY DIRECTLY BELOW TRANSFORMER TO ACCOMMODATE INSTALLATION OF NEW FUSED DISCONNECT, ALL OTHER RACEWAY SHALL REMAIN IN PLACE.



1 **ONE-LINE POWER DIAGRAM**
NO SCALE

PRELIMINARY
NOT FOR CONSTRUCTION
2019-06-06

FOR BIDS
NOT FOR CONSTRUCTION

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PROJECT NO: 18268
CAD DWG FILE:
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CHECKED BY: IMR

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SHEET TITLE:
ONE-LINE DIAGRAM - DEMOLITION

SHEET NUMBER:
2-EPD-901

KEYED NOTES

9.010 DISCONNECT AND REMOVE EXISTING, LIGHT FIXTURES, LIGHTING CONTROL DEVICE(S) AND ASSOCIATED WIRING BACK TO NEAREST JUNCTION BOX AT ACCESSIBLE CEILING. EXISTING LIGHTING CIRCUIT(S) SHALL REMAIN FOR RE-USE. REFER TO NEW LIGHTING PLANS FOR NEW WORK REQUIREMENTS IN THIS ROOM.

9.011 DISCONNECT AND REMOVE EXISTING SWITCH. MAINTAIN EXISTING BACKBOX AND CONDUIT FOR NEW SWITCH INSTALLATION WHEREVER FEASIBLE. PROVIDE BLANK COVER PLATE ON THE UN-USED EXISTING SWITCH BACK BOXES. TYPICAL FOR ALL SWITCHES SHOWN ON THIS PLAN BEING REMOVED, UNLESS NOTED OTHERWISE. REFER TO NEW LIGHTING PLANS FOR FURTHER INFORMATION.

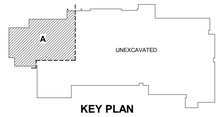
TRUE NORTH PLAN NORTH

1 LOWER LEVEL LIGHTING DEMOLITION PLAN

1/8" = 1'-0"

PRELIMINARY
NOT FOR CONSTRUCTION
2019-06-06

FOR BIDS
NOT FOR CONSTRUCTION



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CHECKED BY:	IMR

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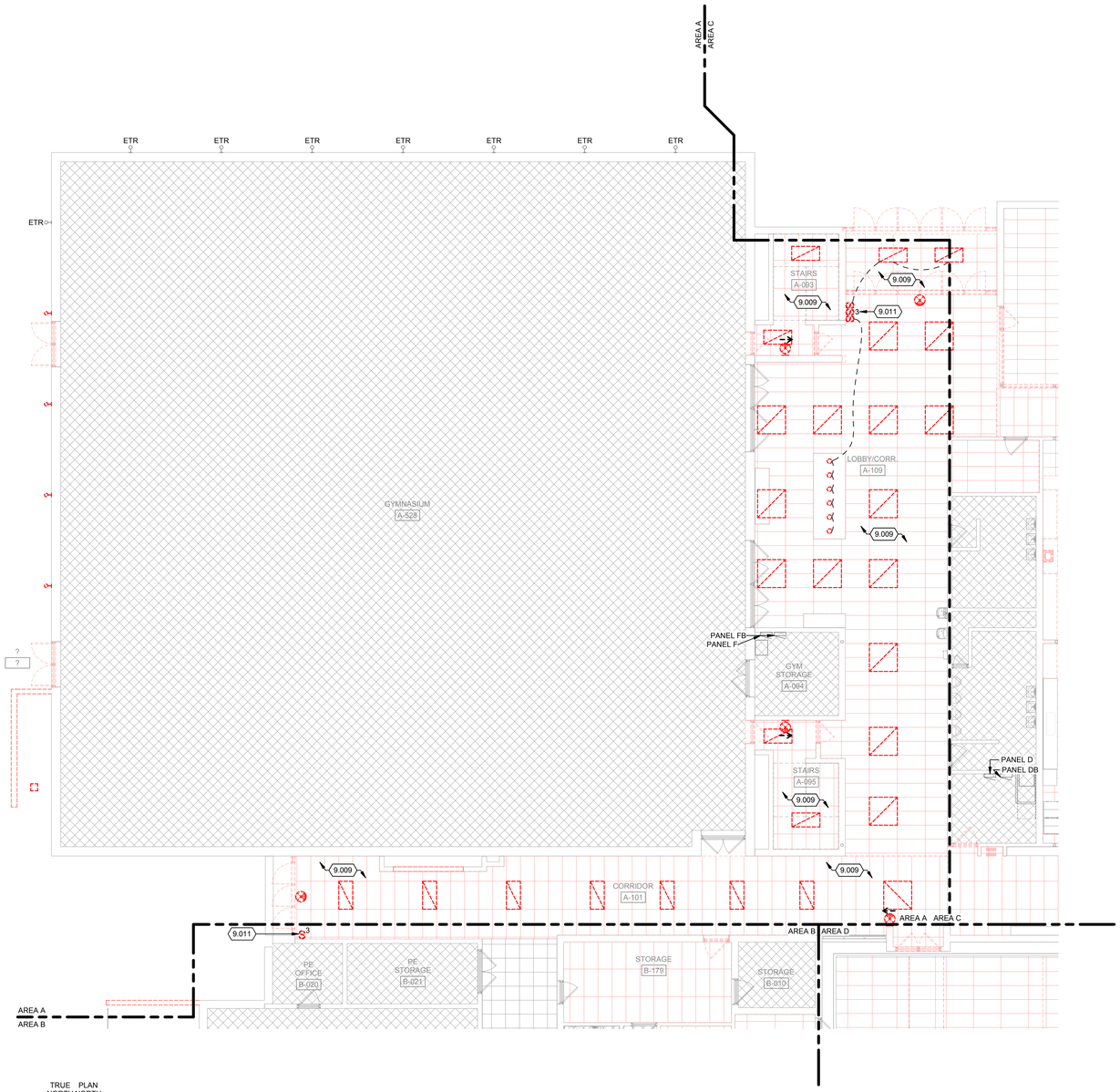
SHEET TITLE:
LOWER LEVEL LIGHTING DEMOLITION PLAN

SHEET NUMBER:
2-ELD-101

KEYED NOTES

9.009 DISCONNECT AND REMOVE EXISTING LIGHTING CONTROL DEVICE(S) AND ASSOCIATED WIRING BACK TO NEAREST JUNCTION BOX LOCATED ABOVE ACCESSIBLE CEILING. EXISTING LIGHTING CONTROL BACKBOX AND RACEWAY SHALL REMAIN FOR RE-USE. DISCONNECT AND REMOVE EXISTING LIGHT FIXTURES AND ASSOCIATED WIRING BETWEEN LIGHT FIXTURES AND NEAREST BACKBOX, UNLESS NOTED OTHERWISE. EXISTING LIGHTING CIRCUIT(S) SHALL REMAIN REMAIN FOR RE-USE. REFER TO NEW LIGHTING PLANS FOR NEW WORK REQUIREMENTS IN THIS ROOM.

9.011 DISCONNECT AND REMOVE EXISTING SWITCH. MAINTAIN EXISTING BACKBOX AND CONDUIT FOR NEW SWITCH INSTALLATION WHEREVER FEASIBLE. PROVIDE BLANK COVER PLATE ON THE UN-USED EXISTING SWITCH BACK BOXES. TYPICAL FOR ALL SWITCHES SHOWN ON THIS PLAN BEING REMOVED, UNLESS NOTED OTHERWISE. REFER TO NEW LIGHTING PLANS FOR FURTHER INFORMATION.



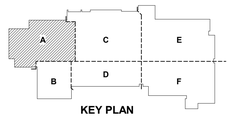
TRUE NORTH PLAN NORTH

1 **FIRST FLOOR LIGHTING DEMOLITION PLAN - AREA A**

1/8" = 1'-0"

PRELIMINARY
NOT FOR CONSTRUCTION
2019-06-06

FOR BIDS
NOT FOR CONSTRUCTION



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SHEET TITLE:
FIRST FLOOR LIGHTING DEMOLITION PLAN - AREA A

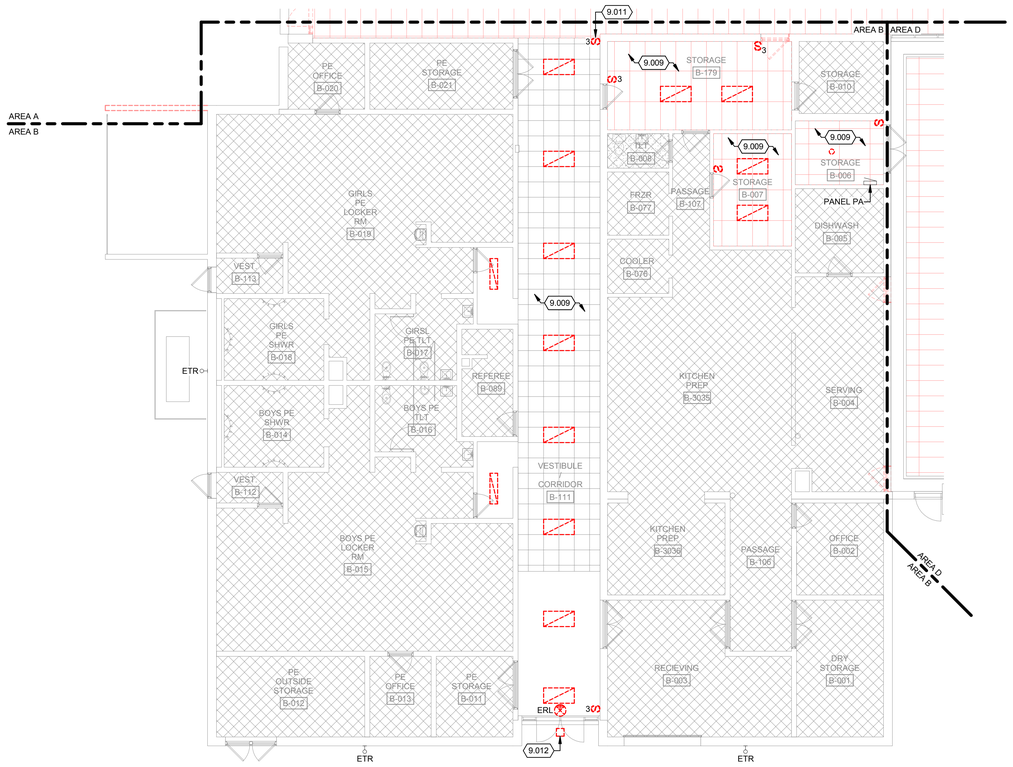
SHEET NUMBER:
2-ELD-102

KEYED NOTES

9.009 DISCONNECT AND REMOVE EXISTING LIGHTING CONTROL DEVICE(S) AND ASSOCIATED WIRING BACK TO NEAREST JUNCTION BOX LOCATED ABOVE ACCESSIBLE CEILING. EXISTING LIGHTING CONTROL BACKBOX AND RACEWAY SHALL REMAIN FOR RE-USE. DISCONNECT AND REMOVE EXISTING LIGHT FIXTURES AND ASSOCIATED WIRING BETWEEN LIGHT FIXTURES AND NEAREST BACKBOX, UNLESS NOTED OTHERWISE. EXISTING LIGHTING CIRCUIT(S) SHALL REMAIN REMAIN FOR RE-USE. REFER TO NEW LIGHTING PLANS FOR NEW WORK REQUIREMENTS IN THIS ROOM.

9.011 DISCONNECT AND REMOVE EXISTING SWITCH. MAINTAIN EXISTING BACKBOX AND CONDUIT FOR NEW SWITCH INSTALLATION WHEREVER FEASIBLE. PROVIDE BLANK COVER PLATE ON THE UN-USED EXISTING SWITCH BACK BOXES. TYPICAL FOR ALL SWITCHES SHOWN ON THIS PLAN BEING REMOVED, UNLESS NOTED OTHERWISE. REFER TO NEW LIGHTING PLANS FOR FURTHER INFORMATION.

9.012 REMOVE EXISTING 12" SQUARE RECESSED HID FIXTURE. RETAIN EXISTING BACK BOX AND CIRCUIT FOR NEW FIXTURE INSTALLATION.



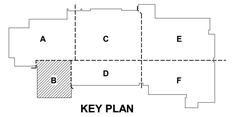
TRUE NORTH PLAN NORTH

FIRST FLOOR LIGHTING DEMOLITION PLAN - AREA B

1/8" = 1'-0"

PRELIMINARY
NOT FOR CONSTRUCTION
2019-06-06

FOR BIDS
NOT FOR CONSTRUCTION



KEY PLAN

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MANAWA

MANAWA ELEMENTARY SCHOOL - ALTERATIONS
MANAWA MIDDLE/HIGH SCHOOL - ADDITIONS & ALTERATIONS
PART 2 - MANAWA MIDDLE / HIGH SCHOOL
515 E. 4th STREET
MANAWA, WI 54949

MARK	DATE
ISSUED:	June 6, 2019
PROJECT NO:	18268
CAD DWG FILE:	
DRAWN BY:	MRF
CHECKED BY:	IMR

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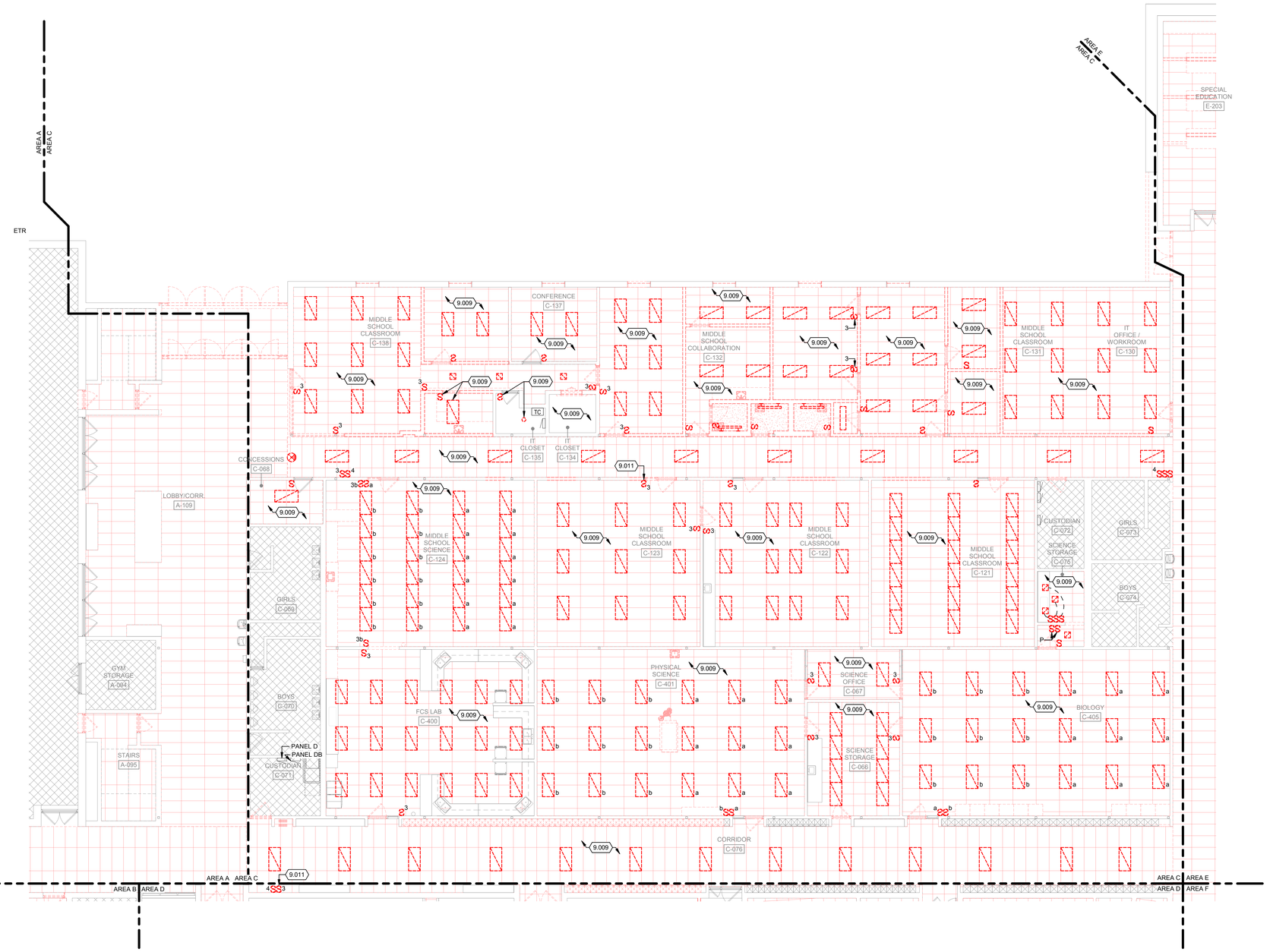
SHEET TITLE:
FIRST FLOOR LIGHTING DEMOLITION PLAN - AREA B

SHEET NUMBER:
2-ELD-103

KEYED NOTES

9.009 DISCONNECT AND REMOVE EXISTING LIGHTING CONTROL DEVICE(S) AND ASSOCIATED WIRING BACK TO NEAREST JUNCTION BOX LOCATED ABOVE ACCESSIBLE CEILING. EXISTING LIGHTING CONTROL BACKBOX AND RACEWAY SHALL REMAIN FOR RE-USE. DISCONNECT AND REMOVE EXISTING LIGHT FIXTURES AND ASSOCIATED WIRING BETWEEN LIGHT FIXTURES AND NEAREST BACKBOX, UNLESS NOTED OTHERWISE. EXISTING LIGHTING CIRCUIT(S) SHALL REMAIN REMAIN FOR RE-USE. REFER TO NEW LIGHTING PLANS FOR NEW WORK REQUIREMENTS IN THIS ROOM.

9.011 DISCONNECT AND REMOVE EXISTING SWITCH. MAINTAIN EXISTING BACKBOX AND CONDUIT FOR NEW SWITCH INSTALLATION WHEREVER FEASIBLE. PROVIDE BLANK COVER PLATE ON THE UN-USED EXISTING SWITCH BACK BOXES. TYPICAL FOR ALL SWITCHES SHOWN ON THIS PLAN BEING REMOVED, UNLESS NOTED OTHERWISE. REFER TO NEW LIGHTING PLANS FOR FURTHER INFORMATION.



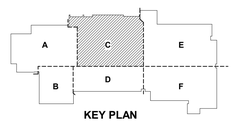
TRUE NORTH PLAN NORTH

1 FIRST FLOOR LIGHTING DEMOLITION PLAN - AREA C

1/8" = 1'-0"

PRELIMINARY
NOT FOR CONSTRUCTION
2019-06-06

FOR BIDS
NOT FOR CONSTRUCTION



KEY PLAN

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MANAWA, WI 54949

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PROJECT NO:	18268
CAD DWG FILE:	
DRAWN BY:	MRF
CHECKED BY:	IMR

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SHEET TITLE:
FIRST FLOOR LIGHTING DEMOLITION PLAN - AREA C

SHEET NUMBER:
2-ELD-104

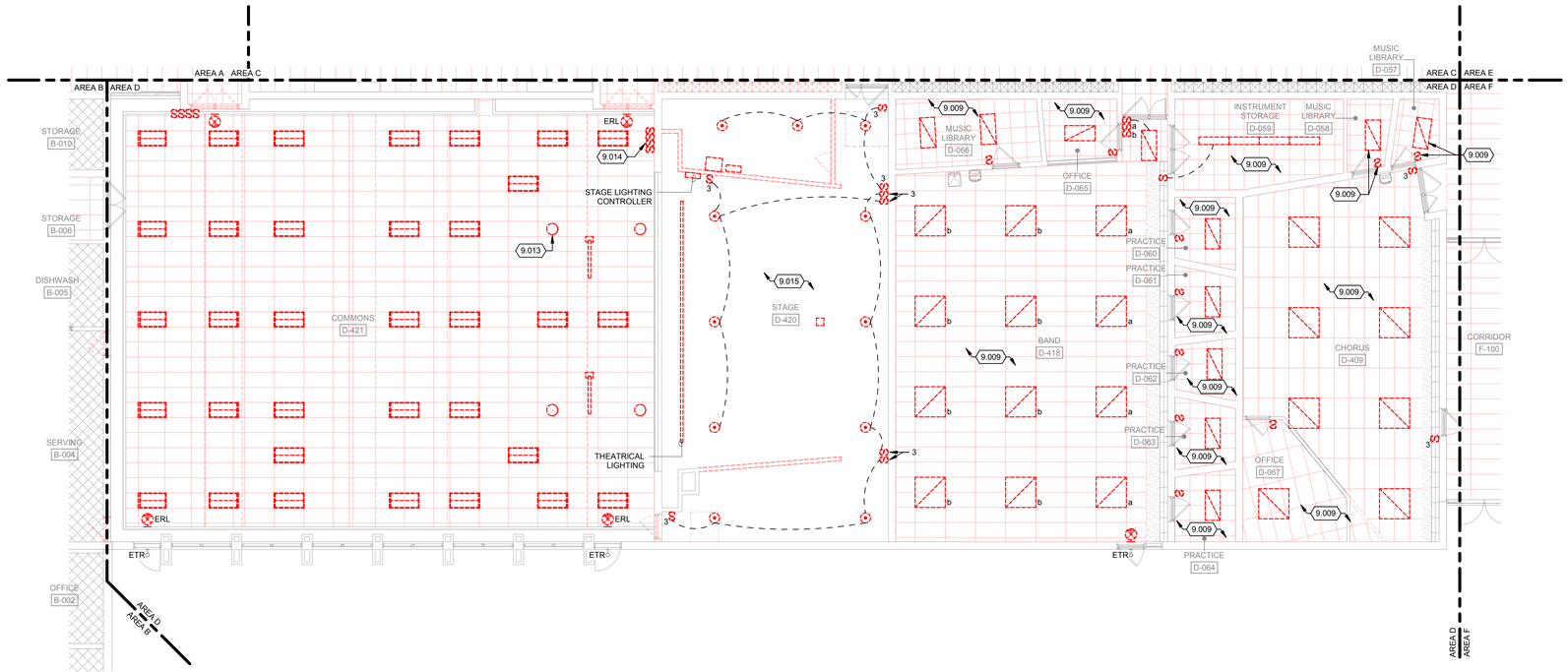
KEYED NOTES

9.009 DISCONNECT AND REMOVE EXISTING LIGHTING CONTROL DEVICE(S) AND ASSOCIATED WIRING BACK TO NEAREST JUNCTION BOX LOCATED ABOVE ACCESSIBLE CEILING. EXISTING LIGHTING CONTROL BACKBOX AND RACEWAY SHALL REMAIN FOR RE-USE. DISCONNECT AND REMOVE EXISTING LIGHT FIXTURES AND ASSOCIATED WIRING BETWEEN LIGHT FIXTURES AND NEAREST BACKBOX, UNLESS NOTED OTHERWISE. EXISTING LIGHTING CIRCUIT(S) SHALL REMAIN REMAIN FOR RE-USE. REFER TO NEW LIGHTING PLANS FOR NEW WORK REQUIREMENTS IN THIS ROOM.

9.013 REMOVE ALL EXISTING CYLINDERS LOCATED ABOVE EXISTING ACT CEILING AND ASSOCIATED WIRING AND CONDUIT BACK TO SOURCE OF ORIGIN.

9.014 AT THIS LOCATION THERE ARE (2) MOMENTARY CONTACT SWITCHES UNDER COMMON COVER PLATE AND (2) SEPARATE SINGLE GANG MOMENTARY CONTACT SWITCHES. (1) SWITCH BACK BOX SHALL REMAIN TO SERVE NEW CONSTRUCTION. ALL OTHERS SHALL BE REMOVED AND PROVIDED WITH A BLANK COVER PLATE.

9.015 UPON REMOVAL OF EXISTING THEATRICAL INSTRUMENTS BY OWNER, EC SHALL REMOVE ALL ASSOCIATED WIRING AND CONDUITS BACK THEIR SOURCE OF ORIGIN.



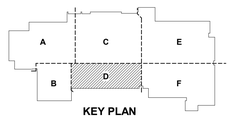
TRUE NORTH PLAN NORTH

FIRST FLOOR LIGHTING DEMOLITION PLAN - AREA D

1/8" = 1'-0"

PRELIMINARY
NOT FOR CONSTRUCTION
2019-06-06

FOR BIDS
NOT FOR CONSTRUCTION



KEY PLAN

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PART 2 - MANAWA MIDDLE / HIGH SCHOOL
515 E. 4th STREET
MANAWA, WI 54949

MARK	DATE

ISSUED: June 6, 2019
PROJECT NO.: 18268
CAD DWG FILE:
DRAWN BY: MRF
CHECKED BY: IMR

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SHEET TITLE:
FIRST FLOOR LIGHTING DEMOLITION PLAN - AREA D

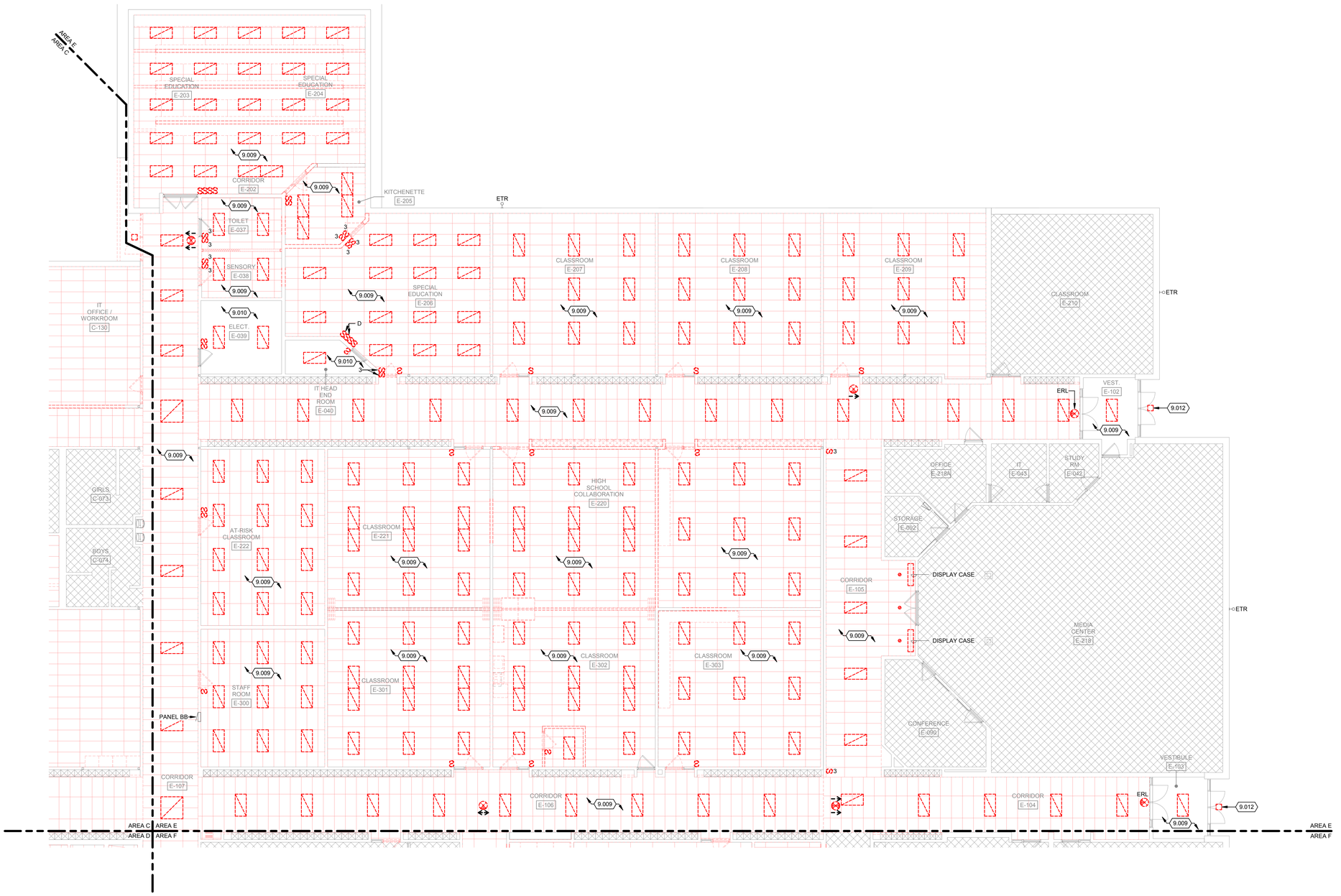
SHEET NUMBER:
2-ELD-105

KEYED NOTES

9.009 DISCONNECT AND REMOVE EXISTING LIGHTING CONTROL DEVICE(S) AND ASSOCIATED WIRING BACK TO NEAREST JUNCTION BOX LOCATED ABOVE ACCESSIBLE CEILING. EXISTING LIGHTING CONTROL BACKBOX AND RACEWAY SHALL REMAIN FOR RE-USE. DISCONNECT AND REMOVE EXISTING LIGHT FIXTURES AND ASSOCIATED WIRING BETWEEN LIGHT FIXTURES AND NEAREST BACKBOX, UNLESS NOTED OTHERWISE. EXISTING LIGHTING CIRCUIT(S) SHALL REMAIN REMAIN FOR RE-USE. REFER TO NEW LIGHTING PLANS FOR NEW WORK REQUIREMENTS IN THIS ROOM.

9.010 DISCONNECT AND REMOVE EXISTING, LIGHT FIXTURES, LIGHTING CONTROL DEVICE(S) AND ASSOCIATED WIRING BACK TO NEAREST JUNCTION BOX AT ACCESSIBLE CEILING. EXISTING LIGHTING CIRCUIT(S) SHALL REMAIN FOR RE-USE. REFER TO NEW LIGHTING PLANS FOR NEW WORK REQUIREMENTS IN THIS ROOM.

9.012 REMOVE EXISTING 12" SQUARE RECESSED HID FIXTURE. RETAIN EXISTING BACK BOX AND CIRCUIT FOR NEW FIXTURE INSTALLATION.



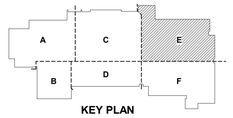
TRUE NORTH PLAN NORTH

FIRST FLOOR LIGHTING DEMOLITION PLAN - AREA E

1/8" = 1'-0"

PRELIMINARY
NOT FOR CONSTRUCTION
2019-06-06

FOR BIDS
NOT FOR CONSTRUCTION



KEY PLAN

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PART 2 - MANAWA MIDDLE / HIGH SCHOOL
515 E. 4th STREET
MANAWA, WI 54949

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ISSUED:	June 6, 2019
PROJECT NO:	18268
CAD DWG FILE:	
DRAWN BY:	MRF
CHECKED BY:	IMR

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SHEET TITLE:
FIRST FLOOR LIGHTING DEMOLITION PLAN - AREA E

SHEET NUMBER:
2-ELD-106

KEYED NOTES

9.009 DISCONNECT AND REMOVE EXISTING LIGHTING CONTROL DEVICE(S) AND ASSOCIATED WIRING BACK TO NEAREST JUNCTION BOX LOCATED ABOVE ACCESSIBLE CEILING. EXISTING LIGHTING CONTROL BACKBOX AND RACEWAY SHALL REMAIN FOR RE-USE. DISCONNECT AND REMOVE EXISTING LIGHT FIXTURES AND ASSOCIATED WIRING BETWEEN LIGHT FIXTURES AND NEAREST BACKBOX, UNLESS NOTED OTHERWISE. EXISTING LIGHTING CIRCUIT(S) SHALL REMAIN REMAIN FOR RE-USE. REFER TO NEW LIGHTING PLANS FOR NEW WORK REQUIREMENTS IN THIS ROOM.

9.010 DISCONNECT AND REMOVE EXISTING, LIGHT FIXTURES, LIGHTING CONTROL DEVICE(S) AND ASSOCIATED WIRING BACK TO NEAREST JUNCTION BOX AT ACCESSIBLE CEILING. EXISTING LIGHTING CIRCUIT(S) SHALL REMAIN FOR RE-USE. REFER TO NEW LIGHTING PLANS FOR NEW WORK REQUIREMENTS IN THIS ROOM.

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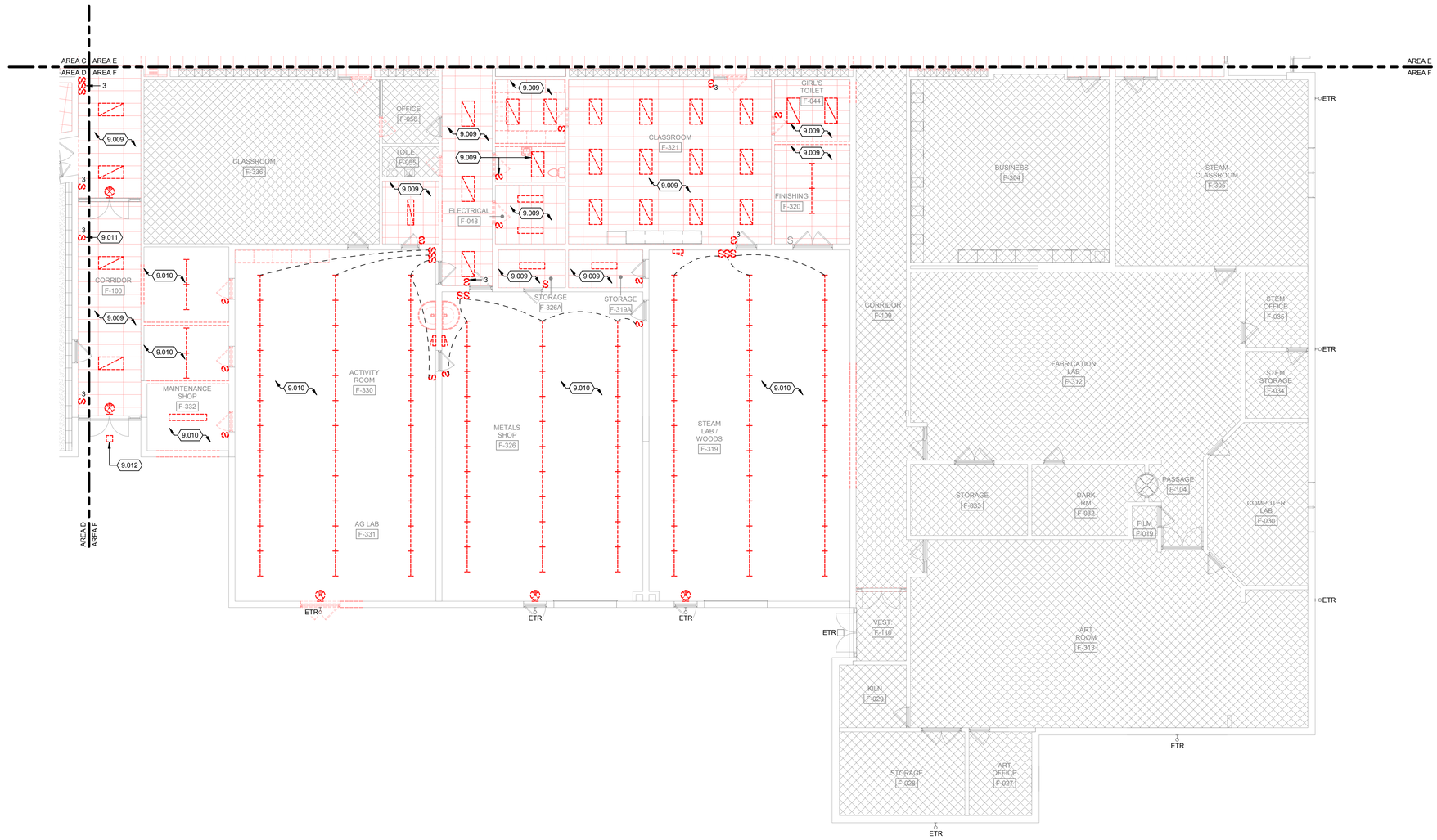


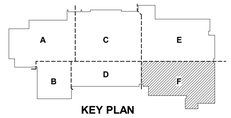
TRUE NORTH PLAN NORTH

1 FIRST FLOOR LIGHTING DEMOLITION PLAN - AREA F

1/8" = 1'-0"

PRELIMINARY
NOT FOR CONSTRUCTION
2019-06-06

FOR BIDS
NOT FOR CONSTRUCTION



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515 E. 4th STREET
MANAWA, WI 54949

MARK	DATE

ISSUED: June 6, 2019
PROJECT NO: 18268
CAD DWG FILE:
DRAWN BY: MRF
CHECKED BY: IMR

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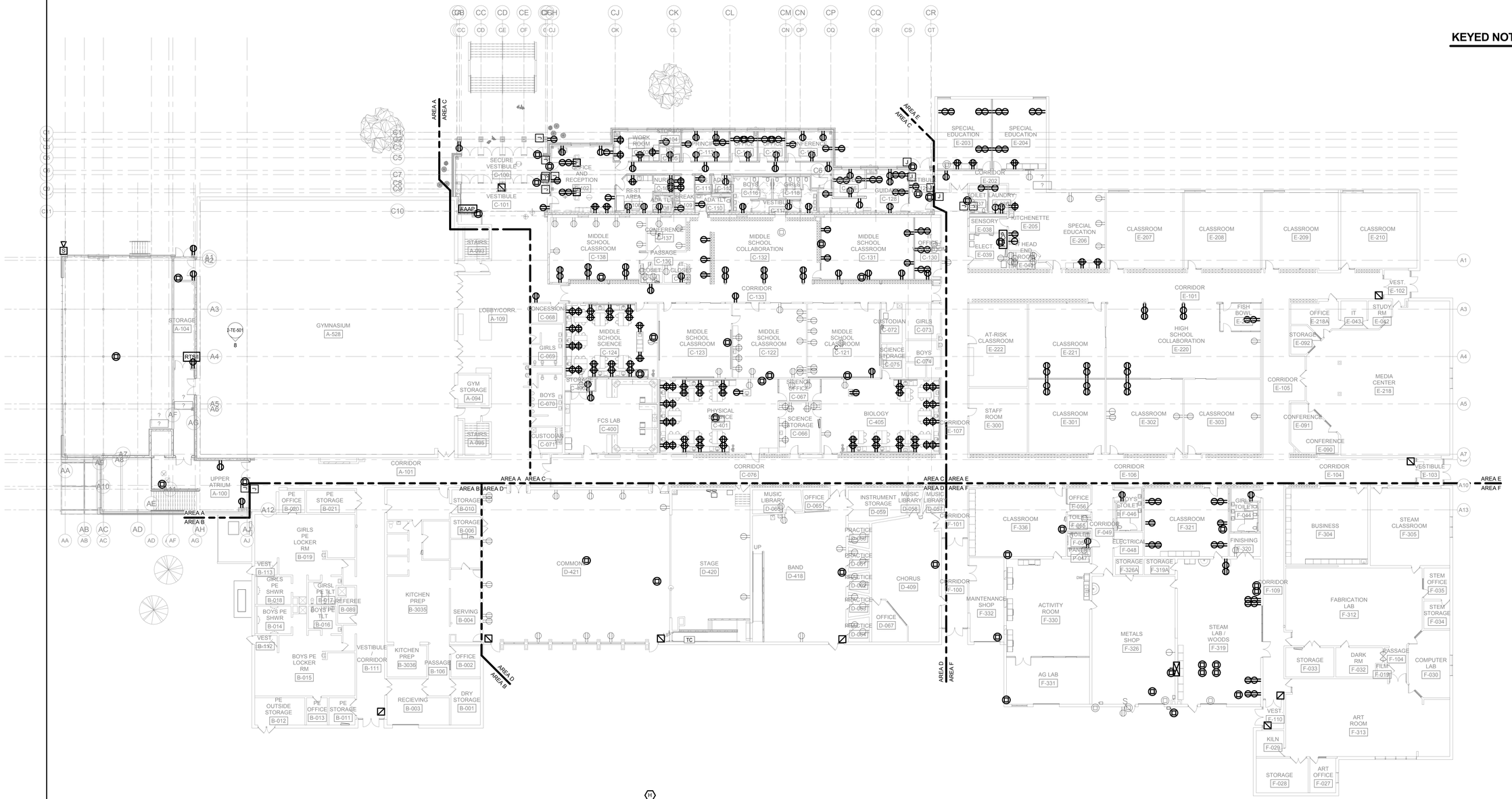
SHEET TITLE:
FIRST FLOOR LIGHTING DEMOLITION PLAN - AREA F

SHEET NUMBER:
2-ELD-107

POWER GENERAL NOTES:

1. PROVIDE WIREMOLD 700 SERIES FOR NEW SURFACE MOUNTED FIRE ALARM DEVICES, UNLESS NOTED OTHERWISE. PAINT TO MATCH EXISTING WALL SURFACE/COLOR.
2. NOTES START HERE.

KEYED NOTES



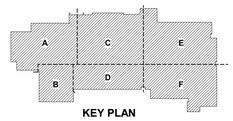
TRUE NORTH PLAN NORTH

OVERALL FIRST FLOOR POWER & FA PLAN

1/16" = 1'-0"

PRELIMINARY
NOT FOR CONSTRUCTION
2019-06-06

FOR BIDS
NOT FOR CONSTRUCTION



KEY PLAN

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MANAWA

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PART 2 - MANAWA MIDDLE / HIGH SCHOOL
515 E. 4th STREET
MANAWA, WI 54949

MARK	DATE

ISSUED: June 6, 2019
PROJECT NO: 18268
CAD DWG FILE:
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CHECKED BY: IMR

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SHEET TITLE:
OVERALL FIRST FLOOR POWER & FA PLAN

SHEET NUMBER:
2-EP-100

POWER GENERAL NOTES:

1. PROVIDE WIREMOLD 700 SERIES FOR NEW SURFACE MOUNTED FIRE ALARM DEVICES, UNLESS NOTED OTHERWISE. PAINT TO MATCH EXISTING WALL SURFACE/COLOR.
2. NOTES START HERE.

KEYED NOTES

9.321 INTERCEPT EXISTING CIRCUITS WHICH BECAME AVAILABLE UPON DEMOLITION AND EXTEND TO NEW RECEPTACLES. FIELD VERIFY EXISTING BRANCH CIRCUIT NUMBERS. CIRCUITING INFORMATION SHOWN IS BASED OFF EXISTING DRAWINGS.

9.324 COORDINATE INSTALLATION OF RECEPTACLE WITH MILLWORK CONTRACTOR PRIOR TO ROUGH-IN.

9.325 PROVIDE FIRE ALARM INTERFACE INTO NEW SOUND SYSTEM TO SHUT DOWN SYSTEM UPON ACTIVATION OF FIRE ALARM SYSTEM. COORDINATE LOCATION WITH AV CONTRACTOR.

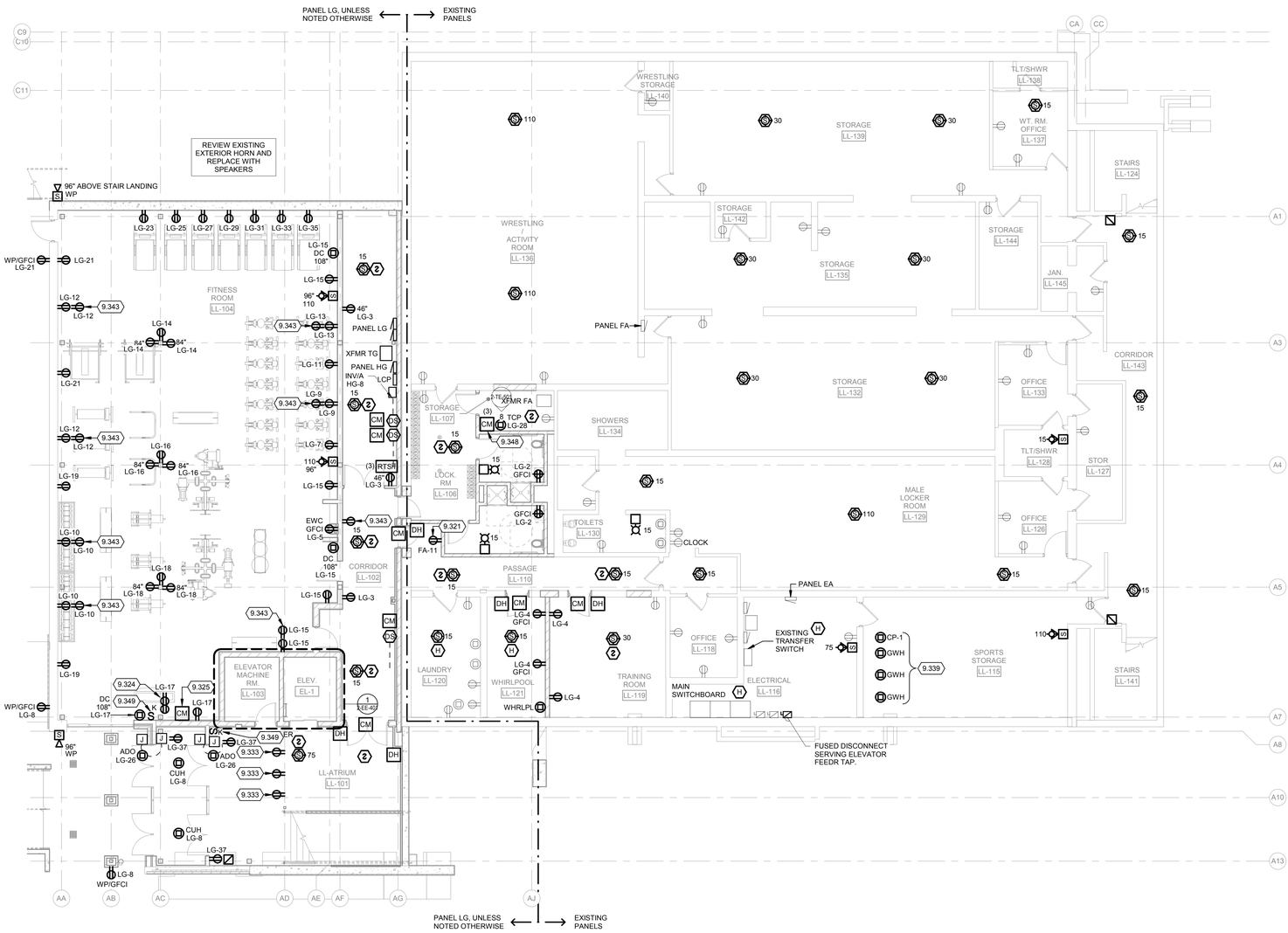
9.333 RECEPTACLE TO SERVE DISPLAY. MOUNT RECEPTACLE TO FACE OF SOFFIT BETWEEN CEILING OF LOWER LEVEL AND FLOOR OF FIRST LEVEL. COORDINATE EXACT LOCATION WITH DISPLAY AND DISPLAY MOUNTING BRACKET. RECEPTACLE SHALL BE GROUP MOUNTED WITH TELECOM DEVICES SERVING DISPLAY. SEE TECHNOLOGY SHEETS FOR MORE INFORMATION.

9.339 EXTEND EXISTING GAS WATER HEATER AND CIRCULATION PUMP CIRCUITS FROM DEMOLISHED GAS WATER EQUIPMENT TO NEW GAS WATER HEATER LOCATION.

9.343 RECEPTACLE TO SERVE DISPLAY. GROUP MOUNT RECEPTACLE WITH TELECOM DEVICES. SEE TECHNOLOGY SHEETS FOR MORE INFORMATION. COORDINATE EXACT LOCATION AND MOUNTING HEIGHT WITH DISPLAY AND DISPLAY MOUNTING BRACKET. RECEPTACLE AND DEVICES SHALL BE MOUNTED ABOVE CENTERLINE OF DISPLAY AND BE CONCEALED WHEN DISPLAY IS IN PLACE.

9.348 CONTROL MODULES FOR INTERFACE INTO THE BUILDING AUTOMATION DDC CONTROL SYSTEM FOR FIRE ALARM TROUBLE, SUPERVISORY AND ALARM STATUS.

9.349 KEY SWITCH TO SERVE REMOTE ON/OFF CONTROL OF DESTRATIFICATION FAN.



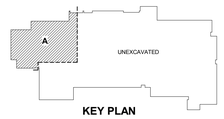
TRUE NORTH PLAN NORTH

1 LOWER LEVEL POWER & FA PLAN

1/8" = 1'-0"

PRELIMINARY
NOT FOR CONSTRUCTION
2019-06-06

FOR BIDS
NOT FOR CONSTRUCTION



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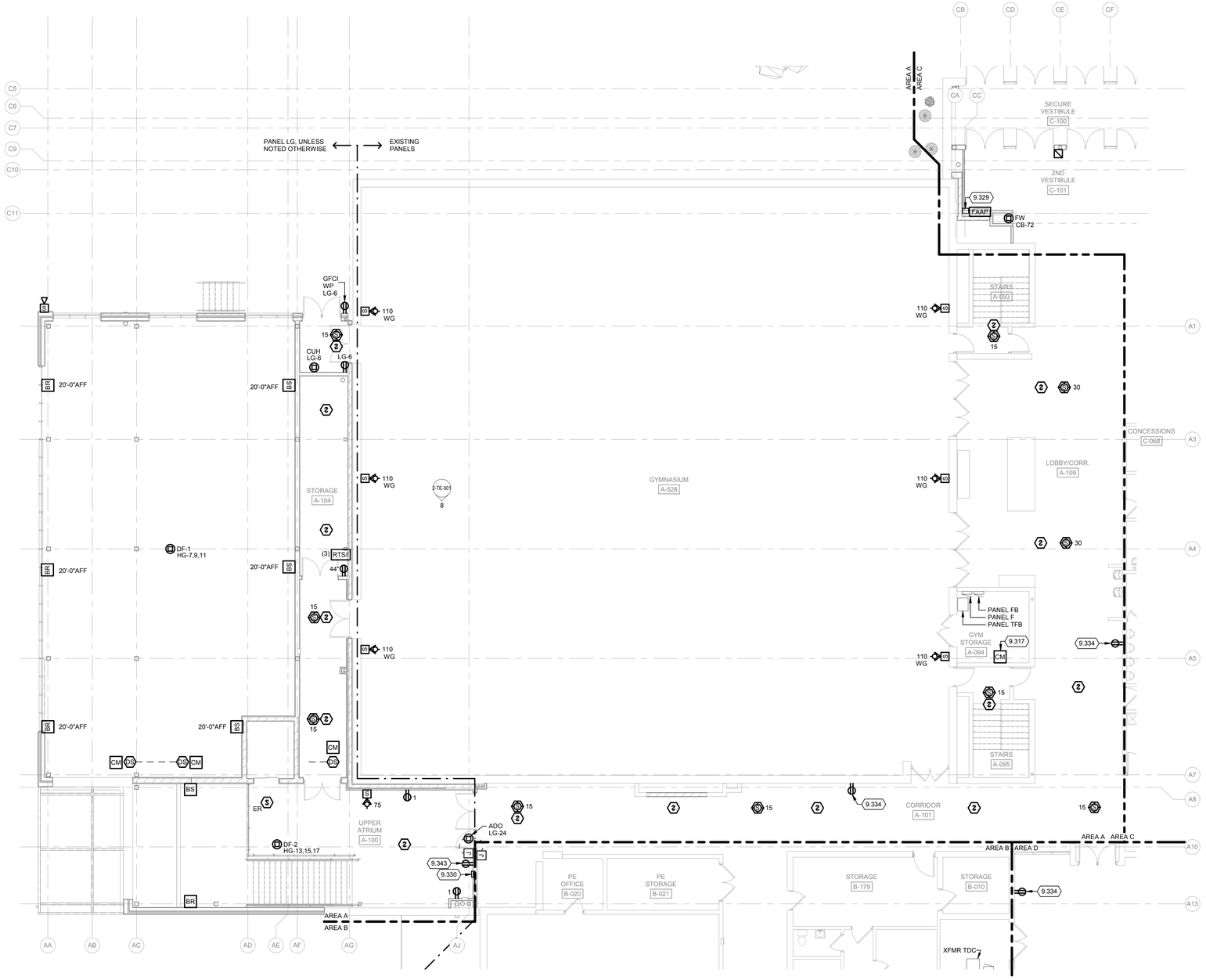
SHEET TITLE:
LOWER LEVEL POWER & FA PLAN

SHEET NUMBER:
2-EP-101



TRUE NORTH PLAN NORTH

FIRST FLOOR POWER & FA PLAN - AREA A

1/8" = 1'-0"

POWER GENERAL NOTES:

1. PROVIDE WIREMOLD 700 SERIES FOR NEW SURFACE MOUNTED FIRE ALARM DEVICES, UNLESS NOTED OTHERWISE. PAINT TO MATCH EXISTING WALL SURFACE/COLOR.
2. NOTES START HERE.

KEYED NOTES

9.317 PROVIDE FIRE ALARM INTERFACE INTO EXISTING SOUND SYSTEM TO SHUT DOWN SYSTEM UPON ACTIVATION OF FIRE ALARM SYSTEM.

9.329 4-ZONE (2-WAY COMMUNICATION) CALL SYSTEM ANNUNCIATOR PANEL. REFER TO SPECIFICATION SECTION 26 32 02 FOR ADDITIONAL INFORMATION. POWER SUPPLY SHALL BE LOCATED ABOVE ACCESSIBLE CEILING.

9.330 2-WAY COMMUNICATION CALL STATION. REFER TO SPECIFICATION SECTION 26 32 02 FOR ADDITIONAL INFORMATION. REFER TO SHEET E-161 FOR LOCATION OF CALL SYSTEM ANNUNCIATOR PANEL.

9.334 RECEPTACLE TO SERVE DISPLAY. PROVIDE DUAL CHANNEL, SURFACE MOUNTED RACEWAY TO LOCATION AND GROUP MOUNT RECEPTACLE WITH TELECOM DEVICES. SEE TECHNOLOGY SHEETS FOR MORE INFORMATION. COORDINATE EXACT LOCATION AND MOUNTING HEIGHT WITH DISPLAY AND DISPLAY MOUNTING BRACKET. RECEPTACLE AND DEVICES SHALL BE MOUNTED ABOVE CENTERLINE OF DISPLAY AND BE CONCEALED WHEN DISPLAY IS IN PLACE.

9.343 RECEPTACLE TO SERVE DISPLAY. GROUP MOUNT RECEPTACLE WITH TELECOM DEVICES. SEE TECHNOLOGY SHEETS FOR MORE INFORMATION. COORDINATE EXACT LOCATION AND MOUNTING HEIGHT WITH DISPLAY AND DISPLAY MOUNTING BRACKET. RECEPTACLE AND DEVICES SHALL BE MOUNTED ABOVE CENTERLINE OF DISPLAY AND BE CONCEALED WHEN DISPLAY IS IN PLACE.

PRELIMINARY
NOT FOR CONSTRUCTION
2019-06-06

FOR BIDS
NOT FOR CONSTRUCTION

KEY PLAN

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SHEET TITLE:
FIRST FLOOR POWER & FA PLAN - AREA A

SHEET NUMBER:
2-EP-102

POWER GENERAL NOTES:

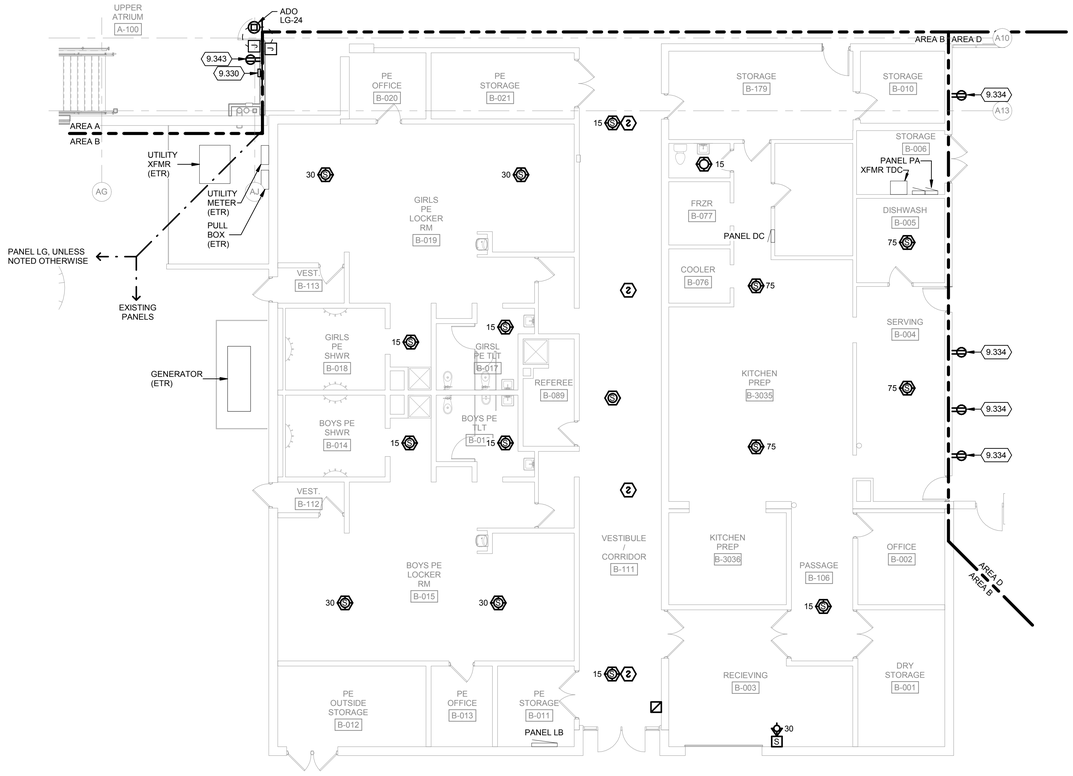
1. PROVIDE WIREMOLD 700 SERIES FOR NEW SURFACE MOUNTED FIRE ALARM DEVICES, UNLESS NOTED OTHERWISE. PAINT TO MATCH EXISTING WALL SURFACE/COLOR.
2. NOTES START HERE.

KEYED NOTES

9.330 2-WAY COMMUNICATION CALL STATION. REFER TO SPECIFICATION SECTION 26 32 02 FOR ADDITIONAL INFORMATION. REFER TO SHEET E-161 FOR LOCATION OF CALL SYSTEM ANNUNCIATOR PANEL.

9.334 RECEPTACLE TO SERVE DISPLAY. PROVIDE DUAL CHANNEL, SURFACE MOUNTED RACEWAY TO LOCATION AND GROUP MOUNT RECEPTACLE WITH TELECOM DEVICES. SEE TECHNOLOGY SHEETS FOR MORE INFORMATION. COORDINATE EXACT LOCATION AND MOUNTING HEIGHT WITH DISPLAY AND DISPLAY MOUNTING BRACKET. RECEPTACLE AND DEVICES SHALL BE MOUNTED ABOVE CENTERLINE OF DISPLAY AND BE CONCEALED WHEN DISPLAY IS IN PLACE.

9.343 RECEPTACLE TO SERVE DISPLAY. GROUP MOUNT RECEPTACLE WITH TELECOM DEVICES. SEE TECHNOLOGY SHEETS FOR MORE INFORMATION. COORDINATE EXACT LOCATION AND MOUNTING HEIGHT WITH DISPLAY AND DISPLAY MOUNTING BRACKET. RECEPTACLE AND DEVICES SHALL BE MOUNTED ABOVE CENTERLINE OF DISPLAY AND BE CONCEALED WHEN DISPLAY IS IN PLACE.



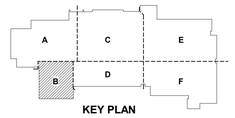
TRUE NORTH PLAN NORTH

FIRST FLOOR POWER & FA PLAN - AREA B

1/8" = 1'-0"

PRELIMINARY
NOT FOR CONSTRUCTION
2019-06-06

FOR BIDS
NOT FOR CONSTRUCTION



KEY PLAN

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PROJECT NO:	18268
CAD DWG FILE:	
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CHECKED BY:	IMR

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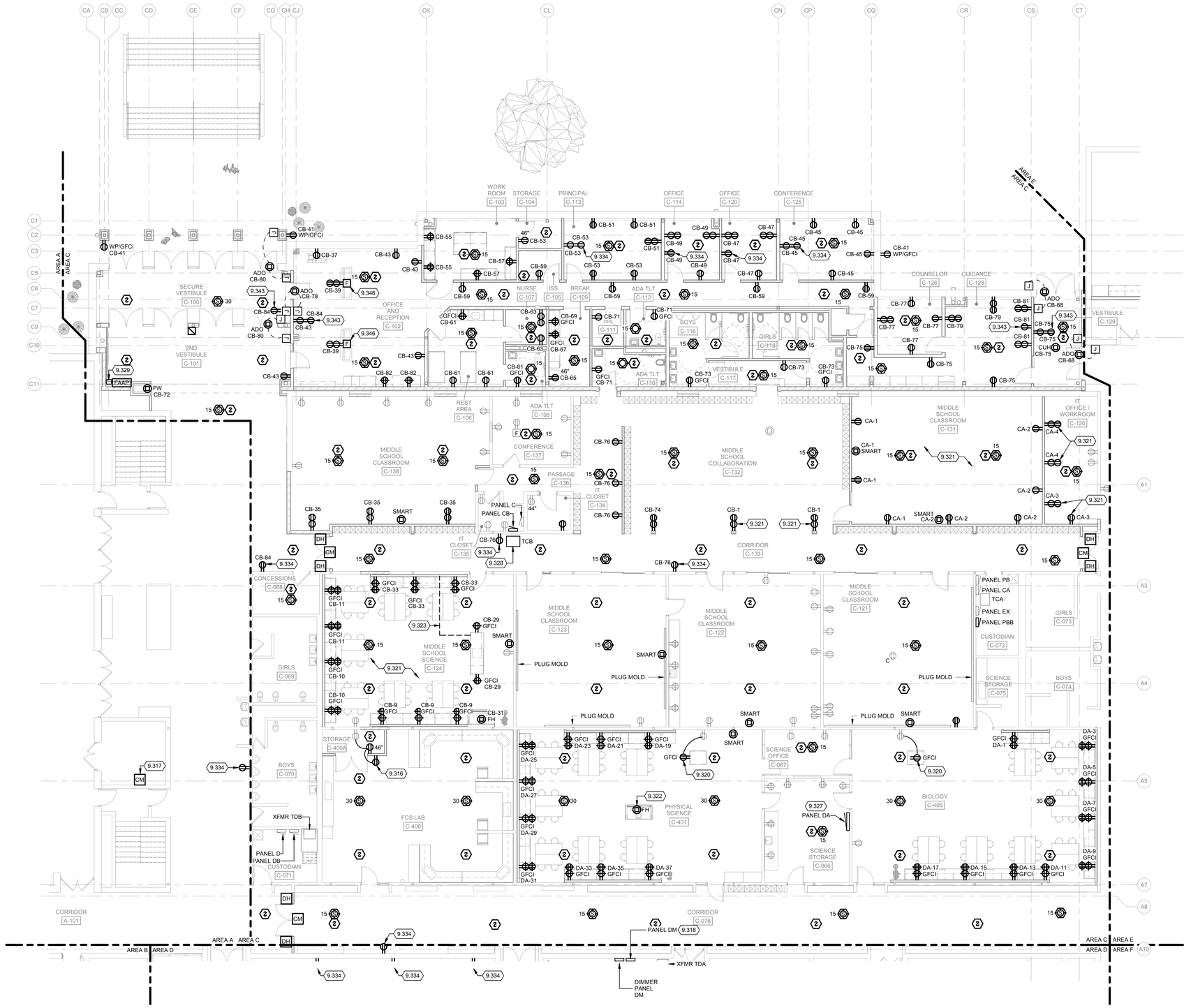
SHEET TITLE:
FIRST FLOOR POWER & FA PLAN - AREA B

SHEET NUMBER:
2-EP-103



TRUE NORTH PLAN NORTH

1 FIRST FLOOR POWER & FA PLAN - AREA C

1/8" = 1'-0"

POWER GENERAL NOTES:

1. PROVIDE WIREMOLD 700 SERIES FOR NEW SURFACE MOUNTED FIRE ALARM DEVICES, UNLESS NOTED OTHERWISE. PAINT TO MATCH EXISTING WALL SURFACE/COLOR.
2. NOTES START HERE.

KEYED NOTES

9.316 INTERCEPT EXISTING CIRCUIT AND EXTEND TO NEW RECEPTACLE.

9.317 PROVIDE FIRE ALARM INTERFACE INTO EXISTING SOUND SYSTEM TO SHUT DOWN SYSTEM UPON ACTIVATION OF FIRE ALARM SYSTEM.

9.318 DIMMING PANEL FURNISHED BY THEATRICAL EQUIPMENT INSTALLER, INSTALLED AND WIRED BY ELECTRICAL CONTRACTOR. PANEL WILL BE ETC SENSOR IQ RACK (48 BREAKERS) WITH MAIN CIRCUIT BREAKER.

9.320 COORDINATE INSTALLATION OF RECEPTACLE WITH MILLWORK CONTRACTOR. INTERCEPT EXISTING BRANCH CIRCUIT AND EXTEND VIA EXISTING UNDERGROUND CONDUIT PATH TO NEW RECEPTACLE.

9.321 INTERCEPT EXISTING CIRCUITS WHICH BECAME AVAILABLE UPON DEMOLITION AND EXTEND TO NEW RECEPTACLES. FIELD VERIFY EXISTING BRANCH CIRCUIT NUMBERS. CIRCUITING INFORMATION SHOWN IS BASED OFF EXISTING DRAWINGS.

9.322 INTERCEPT EXISTING DISCONNECT FUME HOOD CIRCUIT AND EXTEND TO NEW FUME HOOD LOCATION.

9.323 INSTALL NEW BRANCH CIRCUIT TO DEMONSTRATION WORKSTATION IN SAME TRENCH AS PLUMBING PIPE. COORDINATE INSTALLATION OF RECEPTACLES WITH MILLWORK CONTRACTOR. COORDINATE INSTALLATION WITH PLUMBING CONTRACTOR.

9.327 NEW PANELBOARD SHALL BE SURFACE MOUNTED OVER EXISTING FLUSH MOUNTED BACKBOX. REFER TO KEYED NOTE 9.030 ON SHEET 2-EPD-104 FOR ADDITIONAL INFORMATION.

9.328 TRAPEZE MOUNT RELOCATED TRANSFORMER ABOVE EXISTING CEILING.

9.329 4-ZONE (2-WAY COMMUNICATION) CALL SYSTEM ANNUNCIATOR PANEL. REFER TO SPECIFICATION SECTION 26 32 02 FOR ADDITIONAL INFORMATION. POWER SUPPLY SHALL BE LOCATED ABOVE ACCESSIBLE CEILING.

9.334 RECEPTACLE TO SERVE DISPLAY. PROVIDE DUAL CHANNEL, SURFACE MOUNTED RACEWAY TO LOCATION AND GROUP MOUNT RECEPTACLE WITH TELECOM DEVICES. SEE TECHNOLOGY SHEETS FOR MORE INFORMATION. COORDINATE EXACT LOCATION AND MOUNTING HEIGHT WITH DISPLAY AND DISPLAY MOUNTING BRACKET. RECEPTACLE AND DEVICES SHALL BE MOUNTED ABOVE CENTERLINE OF DISPLAY AND BE CONCEALED WHEN DISPLAY IS IN PLACE.

9.343 RECEPTACLE TO SERVE DISPLAY. GROUP MOUNT RECEPTACLE WITH TELECOM DEVICES. SEE TECHNOLOGY SHEETS FOR MORE INFORMATION. COORDINATE EXACT LOCATION AND MOUNTING HEIGHT WITH DISPLAY AND DISPLAY MOUNTING BRACKET. RECEPTACLE AND DEVICES SHALL BE MOUNTED ABOVE CENTERLINE OF DISPLAY AND BE CONCEALED WHEN DISPLAY IS IN PLACE.

9.346 PROVIDE MULTI-COMPARTMENT, ON-GRADE RATED, CAST IRON FLOORBOX TO ACCOMODATE POWER AND TECHNOLOGY DEVICES. SEE SHEET 2-TA-104 FOR TECHNOLOGY DEVICES. BOX SHALL BE EQUIVALENT TO WIREMOLD OMNIBOX 880CS SERIES. PROVIDE WITH BRUSHED ALUMINUM CARPET FLANGE AND COVERPLATES TO ACCOMMODATE DEVICES. PROVIDE WITH ALL INTERNAL BRACKETS AND COMPONENTS FOR A COMPLETE SYSTEM. COORDINATE EXACT LOCATIONS WITH ARCHITECTURAL PLANS AND SUPPLIED FURNITURE.

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2019-06-06

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KEY PLAN

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CAD DWG FILE:	
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CHECKED BY:	IMR

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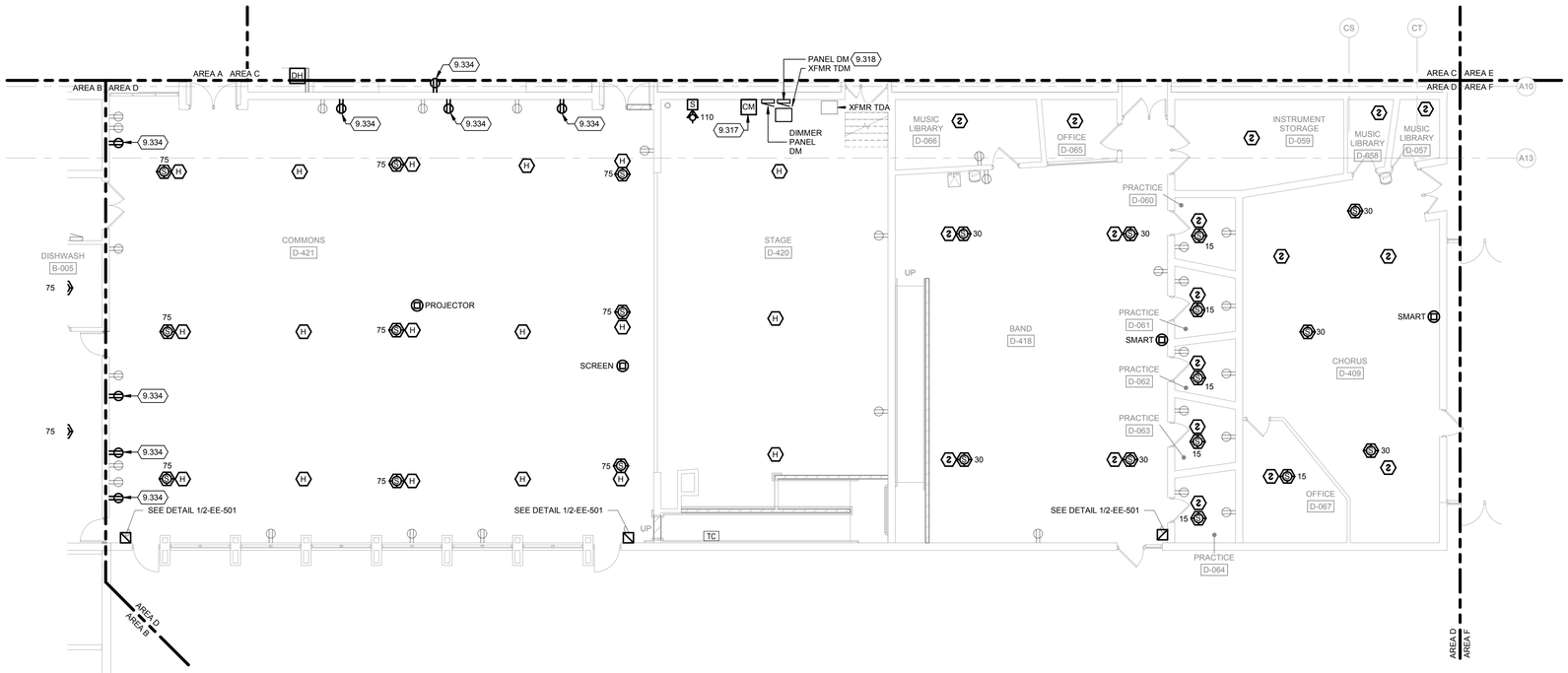
SHEET TITLE:
FIRST FLOOR POWER & FA PLAN - AREA C

SHEET NUMBER:
2-EP-104



TRUE NORTH PLAN NORTH

FIRST FLOOR POWER & FA PLAN - AREA D

1/8" = 1'-0"

POWER GENERAL NOTES:

1. PROVIDE WIREMOLD 700 SERIES FOR NEW SURFACE MOUNTED FIRE ALARM DEVICES, UNLESS NOTED OTHERWISE. PAINT TO MATCH EXISTING WALL SURFACE/COLOR.
2. NOTES START HERE.

KEYED NOTES

9.317 PROVIDE FIRE ALARM INTERFACE INTO EXISTING SOUND SYSTEM TO SHUT DOWN SYSTEM UPON ACTIVATION OF FIRE ALARM SYSTEM.

9.318 DIMMING PANEL FURNISHED BY THEATRICAL EQUIPMENT INSTALLER, INSTALLED AND WIRED BY ELECTRICAL CONTRACTOR. PANEL WILL BE ETC SENSOR IQ RACK (48 BREAKERS) WITH MAIN CIRCUIT BREAKER.

9.334 RECEPTACLE TO SERVE DISPLAY. PROVIDE DUAL CHANNEL SURFACE MOUNTED RACEWAY TO LOCATION AND GROUP MOUNT RECEPTACLE WITH TELECOM DEVICES. SEE TECHNOLOGY SHEETS FOR MORE INFORMATION. COORDINATE EXACT LOCATION AND MOUNTING HEIGHT WITH DISPLAY AND DISPLAY MOUNTING BRACKET. RECEPTACLE AND DEVICES SHALL BE MOUNTED ABOVE CENTERLINE OF DISPLAY AND BE CONCEALED WHEN DISPLAY IS IN PLACE.

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PROJECT NO: 18268
CAD DWG FILE:
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CHECKED BY: IMR

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SHEET TITLE:
FIRST FLOOR POWER & FA PLAN - AREA D

SHEET NUMBER:
2-EP-105

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2019-06-06

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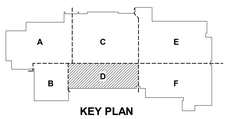
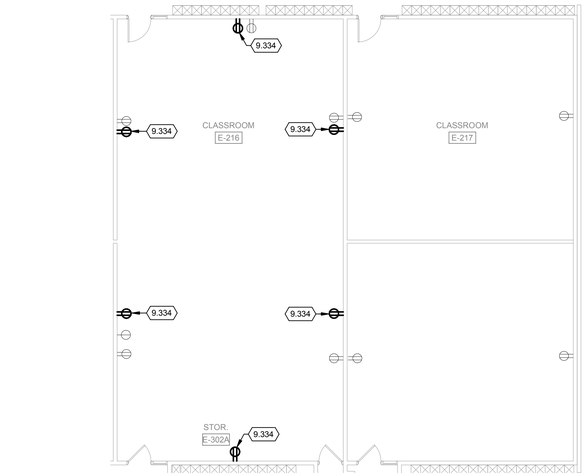


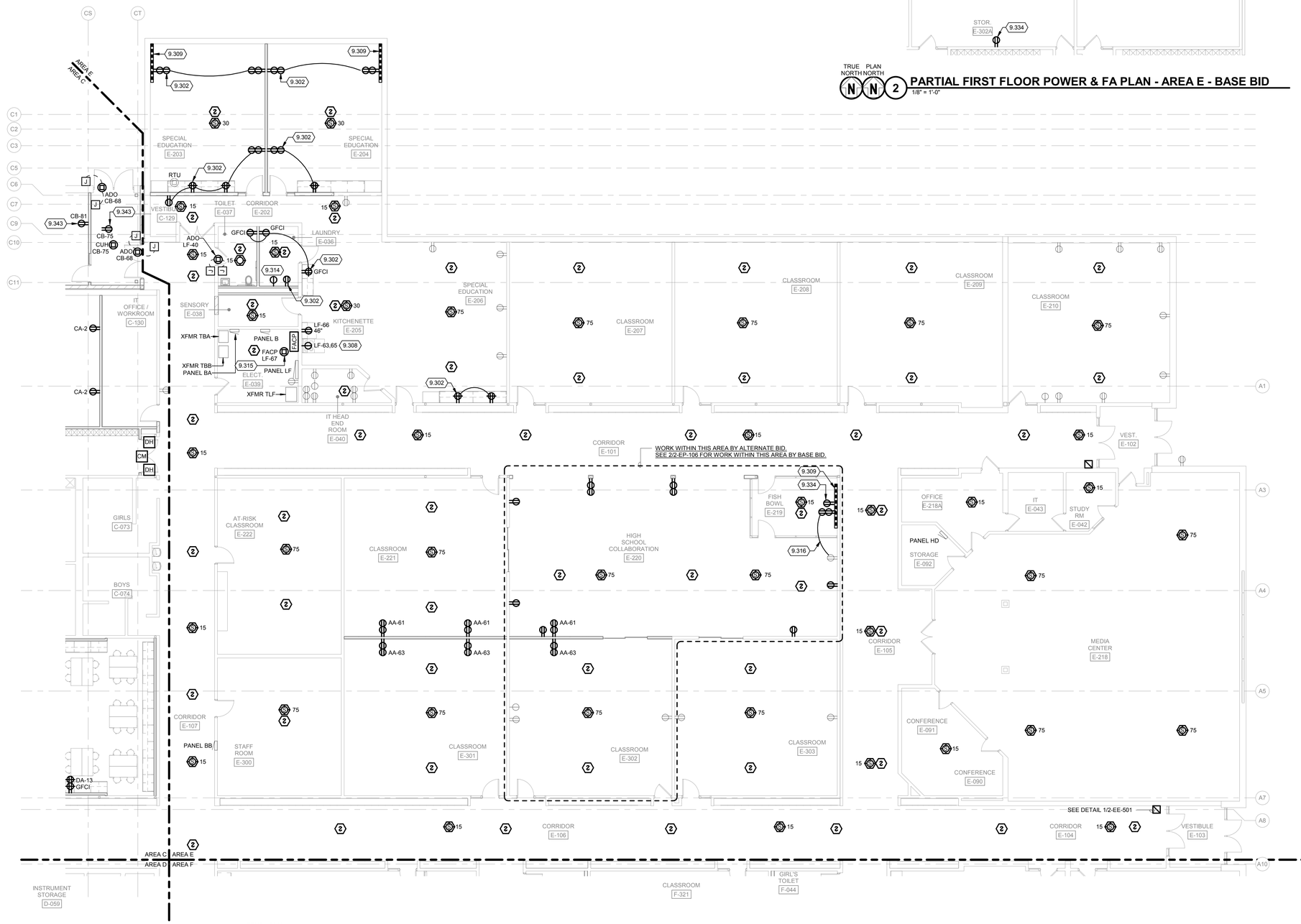
KEY PLAN



TRUE NORTH PLAN NORTH

PARTIAL FIRST FLOOR POWER & FA PLAN - AREA E - BASE BID

1/8" = 1'-0"



TRUE NORTH PLAN NORTH

FIRST FLOOR POWER & FA PLAN - AREA E

1/8" = 1'-0"

POWER GENERAL NOTES:

1. PROVIDE WIREMOLD 700 SERIES FOR NEW SURFACE MOUNTED FIRE ALARM DEVICES, UNLESS NOTED OTHERWISE. PAINT TO MATCH EXISTING WALL SURFACE/COLOR.
2. NOTES START HERE.

KEYED NOTES

9.302 UTILIZE (1) 120V CIRCUIT FROM PANEL 'LF' BECOMING AVAILABLE UPON DEMOLITION. PROVIDE 2#12, 1#12G. IN 1/2"C. FOR EACH GROUPING OF RECEPTACLES NOTED.

9.308 FOR BIDDING PURPOSES ASSUME NEMA 14-50R AND 3#6, 1#10G IN 1"C. COORDINATE FINAL INSTALLATION REQUIREMENTS OF ELECTRIC RANGE WITH OWNER.

9.309 PROVIDE SINGLE CHANNEL, STEEL SURFACE MOUNTED RACEWAY (WIREMOLD 700 OR EQUAL). PROVIDE RECEPTACLES AS INDICATED.

9.314 PROVIDE NEMA 14-30R FOR DRYER (COORDINATE WITH OWNER). PROVIDE 3#10, 1#10G IN 3/4" C BETWEEN RECEPTACLE AND PANEL LF-58,60. PROVIDE NEW 30A/2P (10KAIC) CIRCUIT BREAKER IN EXISTING SQUARE D PANELBOARD.

9.315 PROVIDE RED, LOCKABLE CIRCUIT BREAKER IN PANEL LF.

9.316 INTERCEPT EXISTING CIRCUIT AND EXTEND TO NEW RECEPTACLE.

9.334 RECEPTACLE TO SERVE DISPLAY. PROVIDE DUAL CHANNEL, SURFACE MOUNTED RACEWAY TO LOCATION AND GROUP MOUNT RECEPTACLE WITH TELECOM DEVICES. SEE TECHNOLOGY SHEETS FOR MORE INFORMATION. COORDINATE EXACT LOCATION AND MOUNTING HEIGHT WITH DISPLAY AND DISPLAY MOUNTING BRACKET. RECEPTACLE AND DEVICES SHALL BE MOUNTED ABOVE CENTERLINE OF DISPLAY AND BE CONCEALED WHEN DISPLAY IS IN PLACE.

9.343 RECEPTACLE TO SERVE DISPLAY. GROUP MOUNT RECEPTACLE WITH TELECOM DEVICES. SEE TECHNOLOGY SHEETS FOR MORE INFORMATION. COORDINATE EXACT LOCATION AND MOUNTING HEIGHT WITH DISPLAY AND DISPLAY MOUNTING BRACKET. RECEPTACLE AND DEVICES SHALL BE MOUNTED ABOVE CENTERLINE OF DISPLAY AND BE CONCEALED WHEN DISPLAY IS IN PLACE.

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CAD DWG FILE:	
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CHECKED BY:	IMR

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SHEET TITLE:
FIRST FLOOR POWER & FA PLAN - AREA E

SHEET NUMBER:
2-EP-106

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2019-06-06

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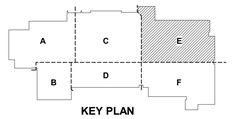


KEY PLAN

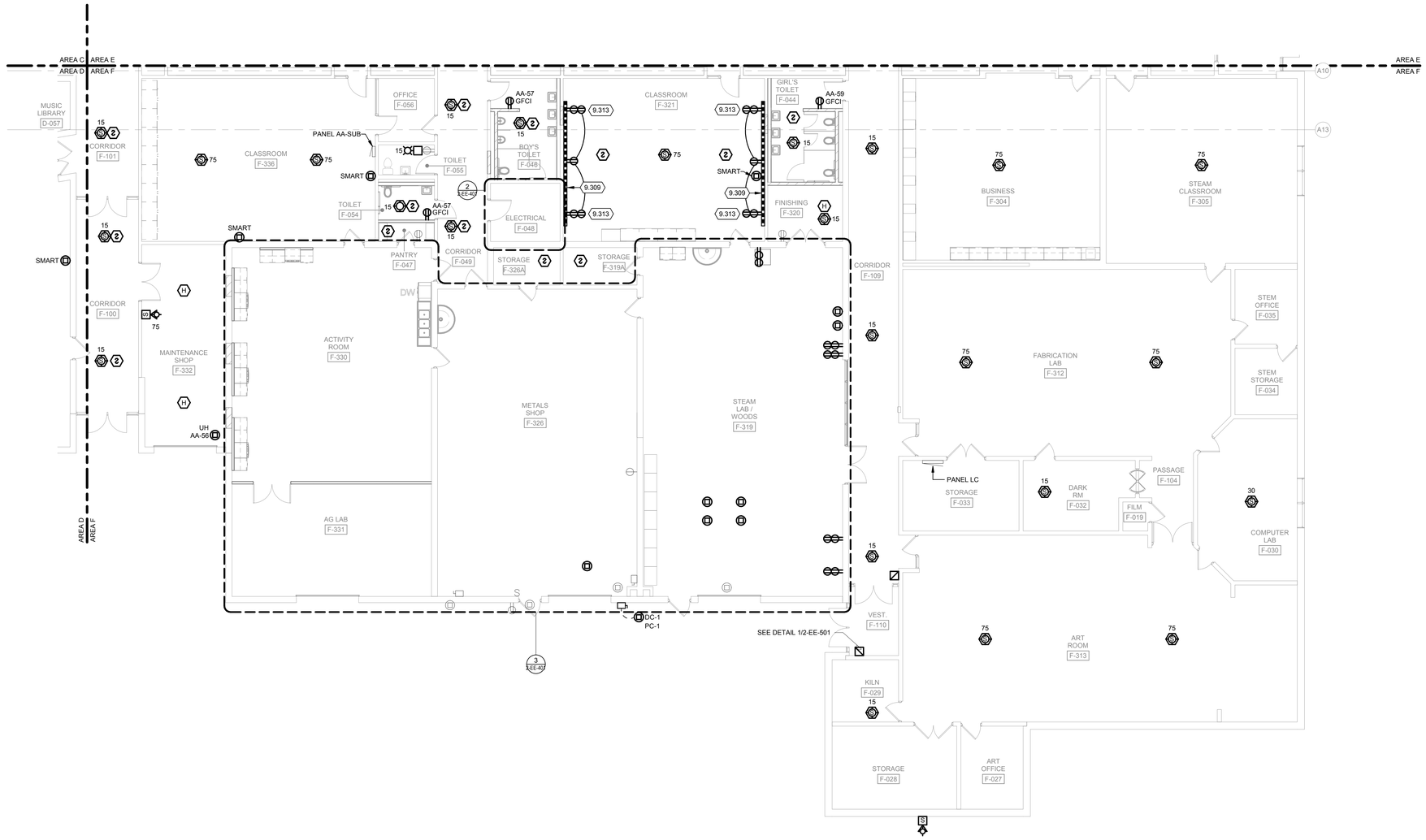
POWER GENERAL NOTES:

1. PROVIDE WIREMOLD 700 SERIES FOR NEW SURFACE MOUNTED FIRE ALARM DEVICES, UNLESS NOTED OTHERWISE. PAINT TO MATCH EXISTING WALL SURFACE/COLOR.
2. NOTES START HERE.

KEYED NOTES

9.309 PROVIDE SINGLE CHANNEL, STEEL SURFACE MOUNTED RACEWAY (WIREMOLD 700 OR EQUAL). PROVIDE RECEPTACLES AS INDICATED.

9.313 UTILIZE EXISTING BRANCH CIRCUIT TO SERVE NEW RECEPTACLES. INTERCEPT AND EXTEND AS REQUIRED.



TRUE NORTH PLAN NORTH

1 **FIRST FLOOR POWER & FA PLAN - AREA F**

1/8" = 1'-0"

PRELIMINARY
NOT FOR CONSTRUCTION
2019-06-06

FOR BIDS
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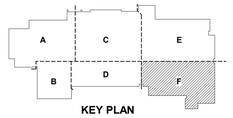

KEY PLAN

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PROJECT NO:	18268
CAD DWG FILE:	
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CHECKED BY:	IMR

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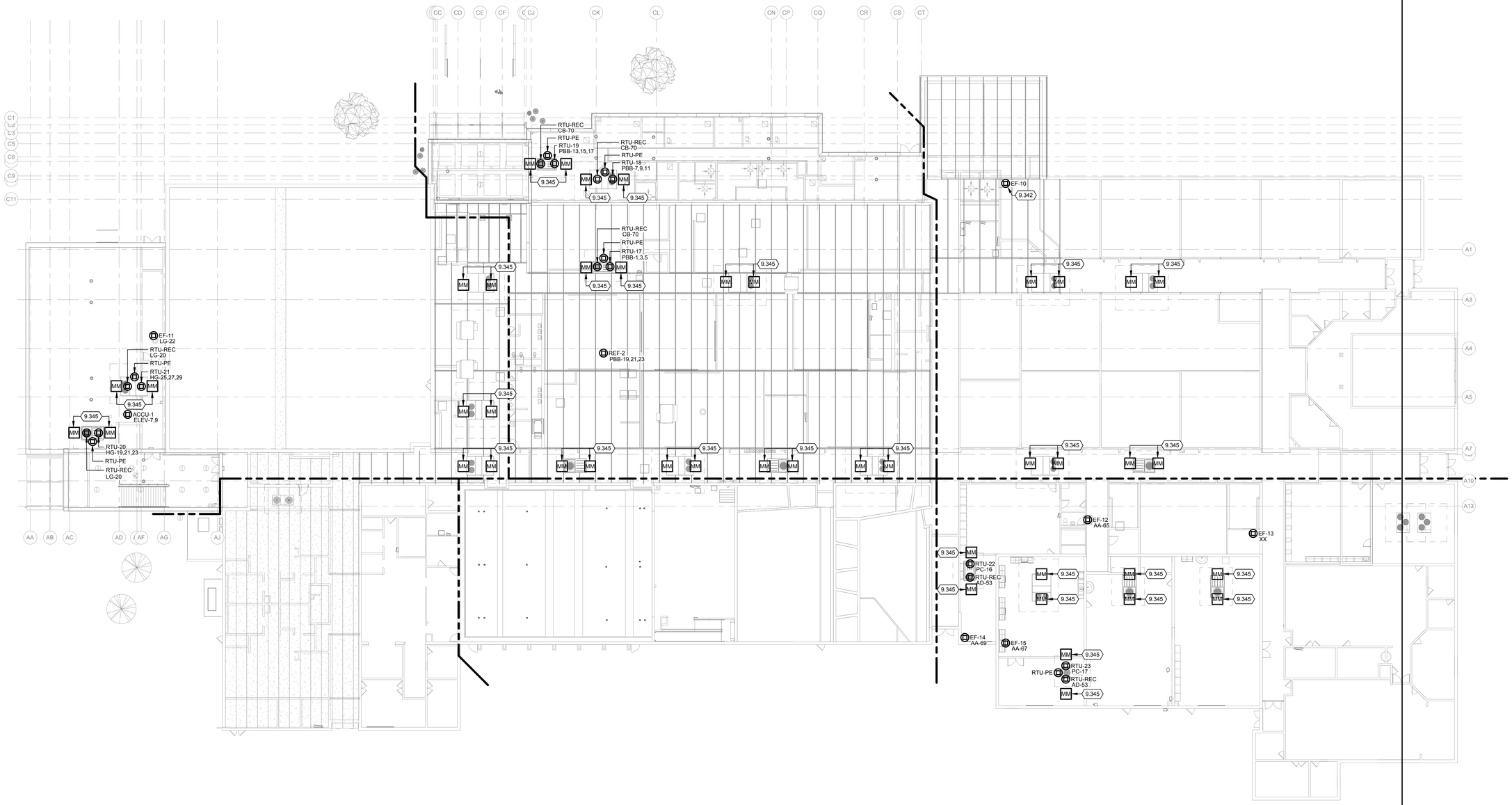
SHEET TITLE:
FIRST FLOOR POWER & FA PLAN - AREA F

SHEET NUMBER:
2-EP-107



TRUE NORTH PLAN NORTH

1 OVERALL ROOF POWER & FA PLAN

1/16" = 1'-0"

KEYED NOTES

9.342 UTILIZE (1) 120V CIRCUIT FROM PANEL 'LF' BECOMING AVAILABLE UPON DEMOLITION TO SERVE EXHAUST FAN.

9.345 MONITOR MODULE SHALL INTEGRATE INTO THE ROOFTOP UNIT SMOKE DETECTOR TO INTERFACE DETECTOR INTO BUILDING FIRE ALARM SYSTEM.

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2019-06-06

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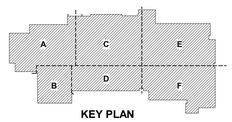

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SHEET TITLE:
OVERALL ROOF POWER & FA PLAN

SHEET NUMBER:
2-EP-108

LIGHTING GENERAL NOTES:

1. NOTES START HERE.
2. NOTES START HERE.

KEYED NOTES

9.201 MOUNT FIXTURE AT 9'-0" AFF MEASURED FROM BOTTOM OF FIXTURE.

9.203 MOUNT FIXTURE AT 44" ABOVE ELEVATOR PIT FLOOR MEASURED FROM BOTTOM OF FIXTURE.

9.226 UTILIZE EXISTING NORMAL AND EMERGENCY BRANCH LIGHTING CIRCUITS IN PLACE. RE-ROUTE AND EXTEND AS REQUIRED TO SERVE NEW LIGHTING. PROVIDE AND PT DEVICE TO ALLOW EMERGENCY LIGHTS TO BE SWITCHED ALONG WITH NORMAL LIGHTS. FIXTURES DESIGNATED WITH "NL" SHALL BE WIRED TO THE EMERGENCY LIGHTING CIRCUIT.

9.236 ALL WIRING BETWEEN NEW LIGHTING CONTROL DEVICES AND LIGHT FIXTURES SHALL BE NEW. EXISTING BRANCH CIRCUIT SHALL BE EXTENDED FROM ABOVE CEILING JUNCTION BOX TO THE NEW LIGHT FIXTURES. REFER TO DEMOLITION LIGHTING PLANS FOR DEMOLITION REQUIREMENTS IN THIS ROOM.

9.248 PROVIDE (1) 20A, 277V DEDICATED CIRCUIT FROM PANEL HG, CIRCUIT 8. PROVIDE 2#12, 1#12G. IN 3/4" C. BETWEEN PANEL HG AND INVERTER INV/A. REFER TO INVERTER SCHEDULE ON SHEET 2-EE-601 FOR ADDITIONAL INFORMATION.

9.249 MOUNT FIXTURE AT 14" AFG MEASURED FROM BOTTOM OF FIXTURE.

TRUE NORTH PLAN NORTH

LOWER LEVEL LIGHTING PLAN

1/8" = 1'-0"

PRELIMINARY
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2019-06-06

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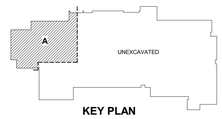

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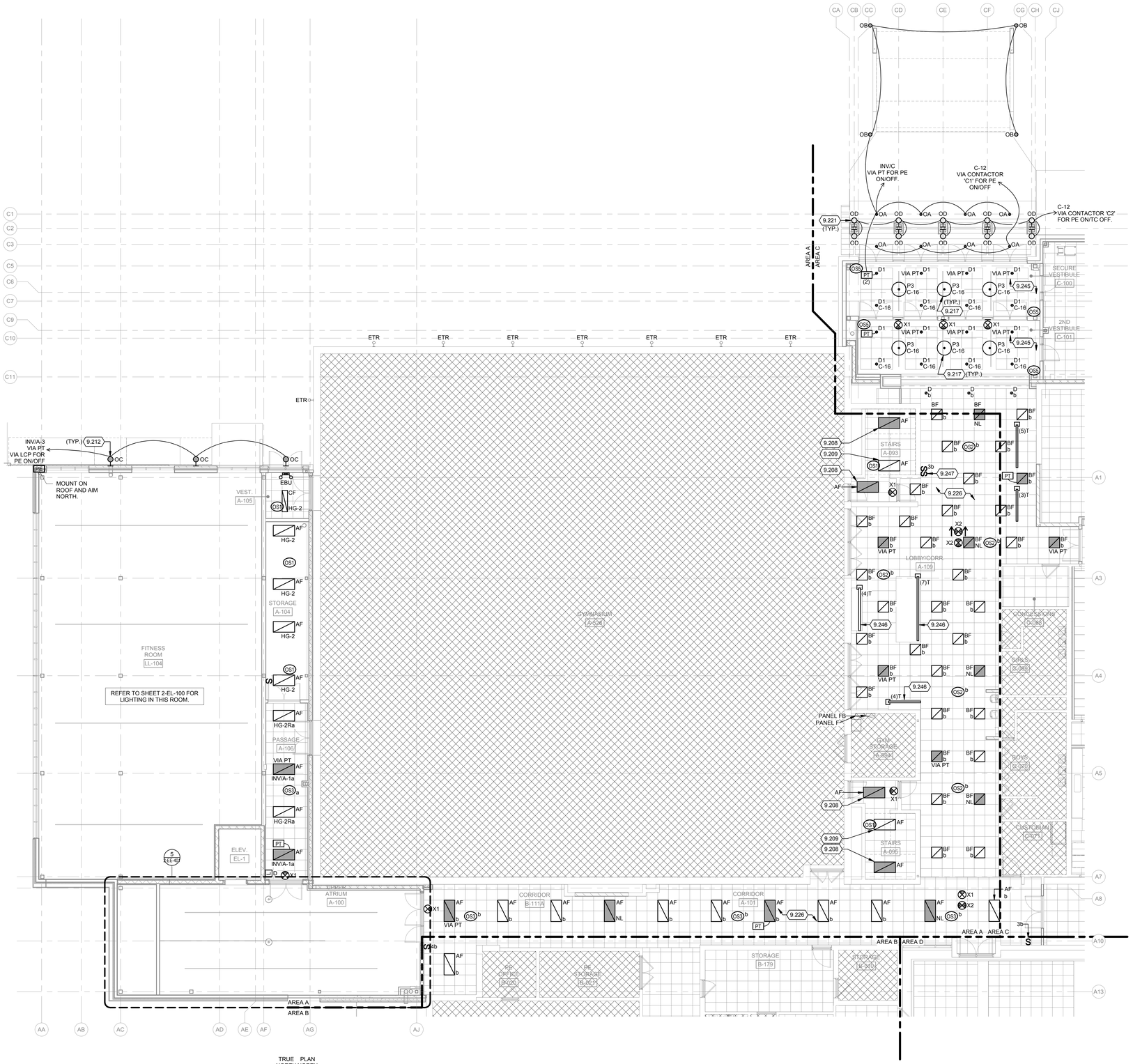
SHEET TITLE:
LOWER LEVEL LIGHTING PLAN

SHEET NUMBER:
2-EL-101



TRUE NORTH PLAN NORTH

1 FIRST FLOOR LIGHTING PLAN - AREA A

1/8" = 1'-0"

LIGHTING GENERAL NOTES:

1. NOTES START HERE.
2. NOTES START HERE.

KEYED NOTES

9.208 RE-CONNECT TO EXISTING EMERGENCY LIGHTING CIRCUIT BECOMING AVAILABLE UPON DEMOLITION OF EXISTING LIGHT FIXTURES.

9.209 EXTEND NEAREST UN-SWITCHED LIGHTING CIRCUIT TO NEW FIXTURE.

9.212 MOUNT FIXTURE AT 9'-0" AFG MEASURED FROM BOTTOM OF FIXTURE.

9.217 MOUNT FIXTURE AT 14'-0" AFF MEASURED FROM BOTTOM OF FIXTURE.

9.221 MOUNT FIXTURE 2'-2" BELOW CANOPY MEASURED FROM BOTTOM OF FIXTURE.

9.226 UTILIZE EXISTING NORMAL AND EMERGENCY BRANCH LIGHTING CIRCUITS IN PLACE. RE-ROUTE AND EXTEND AS REQUIRED TO SERVE NEW LIGHTING. PROVIDE AND PT DEVICE TO ALLOW EMERGENCY LIGHTS TO BE SWITCHED ALONG WITH NORMAL LIGHTS. FIXTURES DESIGNATED WITH "NL" SHALL BE WIRED TO THE EMERGENCY LIGHTING CIRCUIT.

9.245 EXTEND EXISTING CORRIDOR UNSWITCHED EMERGENCY CIRCUIT TO EMERGENCY FIXTURES (SHADED) LOCATED IN ROOMS C-100 AND C-101 AS REQUIRED.

9.246 TRACK LIGHT SHALL BE INSTALLED INSIDE DISPLAY CASE. EC TO COORDINATE WITH THE OWNER THE REMOVAL OF ARTIFACT AND TROPHIES TO ACCOMMODATE WORK REQUIRED.

9.247 DIGITAL PRESET TIMER AND SHALL CONTROL ALL TRACK LIGHTING SYSTEMS LOCATED IN ROOM A-109. TIMER SHALL BE PRESET FOR 12 HOURS; 7:00AM TO 7:00PM. PROVIDE ASTRONOMIC 24-HOUR PROGRAMMABLE TIMER, 0-800W @ 120V OR EQUAL.

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2019-06-06

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NOT FOR CONSTRUCTION

KEY PLAN

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CHECKED BY:	IMR

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SHEET TITLE:
FIRST FLOOR LIGHTING PLAN - AREA A

SHEET NUMBER:
2-EL-102

LIGHTING GENERAL NOTES:

1. NOTES START HERE.
2. NOTES START HERE.

KEYED NOTES

9.226 UTILIZE EXISTING NORMAL AND EMERGENCY BRANCH LIGHTING CIRCUITS IN PLACE. RE-ROUTE AND EXTEND AS REQUIRED TO SERVE NEW LIGHTING. PROVIDE AND PT DEVICE TO ALLOW EMERGENCY LIGHTS TO BE SWITCHED ALONG WITH NORMAL LIGHTS. FIXTURES DESIGNATED WITH "NL" SHALL BE WIRED TO THE EMERGENCY LIGHTING CIRCUIT.

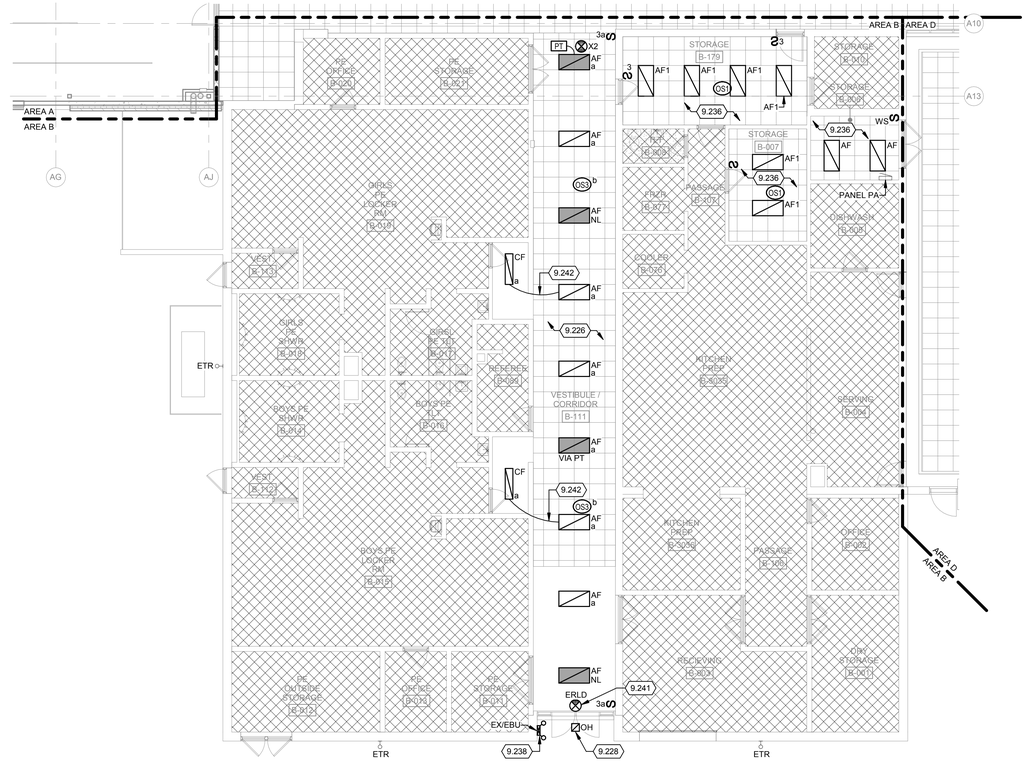
9.228 INSTALL IN EXISTING OPENING AND RE-WIRE TO EXISTING BRANCH CIRCUIT.

9.236 ALL WIRING BETWEEN NEW LIGHTING CONTROL DEVICES AND LIGHT FIXTURES SHALL BE NEW. EXISTING BRANCH CIRCUIT SHALL BE EXTENDED FROM ABOVE CEILING JUNCTION BOX TO THE NEW LIGHT FIXTURES. REFER TO DEMOLITION LIGHTING PLANS FOR DEMOLITION REQUIREMENTS IN THIS ROOM.

9.238 MOUNT FIXTURE AT 8'-6" AFF MEASURED FROM BOTTOM OF FIXTURE. TYPICAL FOR ALL WALL MOUNTED EBU'S AND COMBINATION EXIT/EBU'S SHOWN ON THIS PLAN.

9.241 REMOVE AND RE-INSTALLED EXISTING FIXTURE ON NEW CEILING.

9.242 EXTEND EXISTING CORRIDOR CIRCUIT TO NEW FIXTURE AS REQUIRED.



KEYED NOTES

9.201 MOUNT FIXTURE AT 9'-0" AFF MEASURED FROM BOTTOM OF FIXTURE.

9.202 MOUNT FIXTURE AT 8'-0" AFF MEASURED FROM BOTTOM OF FIXTURE.

9.222 MOUNT FIXTURE AT 10'-0" AFG MEASURED FROM BOTTOM OF FIXTURE.

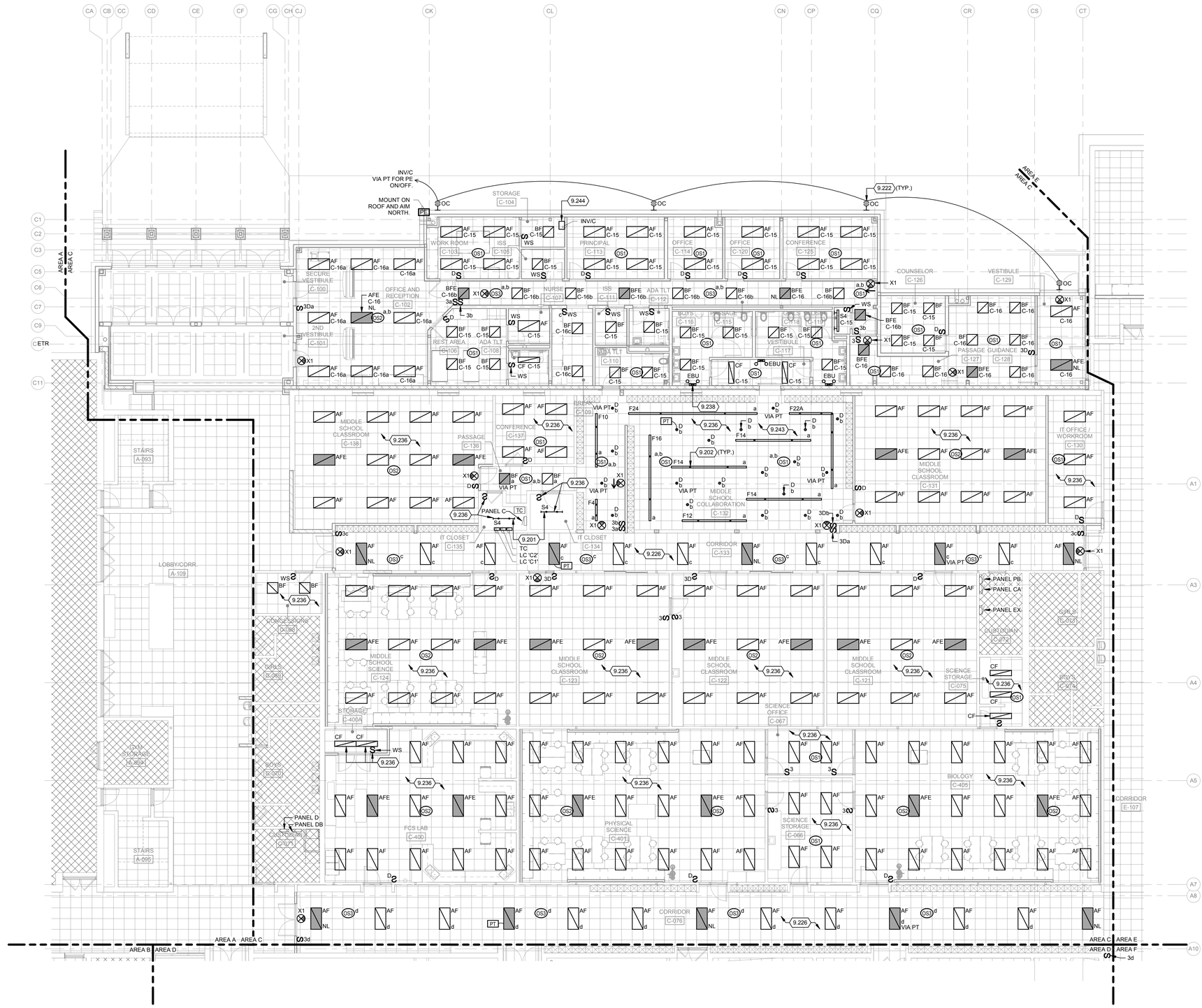
9.226 UTILIZE EXISTING NORMAL AND EMERGENCY BRANCH LIGHTING CIRCUITS IN PLACE. RE-ROUTE AND EXTEND AS REQUIRED TO SERVE NEW LIGHTING. PROVIDE AND PT DEVICE TO ALLOW EMERGENCY LIGHTS TO BE SWITCHED ALONG WITH NORMAL LIGHTS. FIXTURES DESIGNATED WITH "NL" SHALL BE WIRED TO THE EMERGENCY LIGHTING CIRCUIT.

9.236 ALL WIRING BETWEEN NEW LIGHTING CONTROL DEVICES AND LIGHT FIXTURES SHALL BE NEW. EXISTING BRANCH CIRCUIT SHALL BE EXTENDED FROM ABOVE CEILING JUNCTION BOX TO THE NEW LIGHT FIXTURES. REFER TO DEMOLITION LIGHTING PLANS FOR DEMOLITION REQUIREMENTS IN THIS ROOM.

9.238 MOUNT FIXTURE AT 8'-6" AFF MEASURED FROM BOTTOM OF FIXTURE. TYPICAL FOR ALL WALL MOUNTED EBU'S AND COMBINATION EXIT/EBU'S SHOWN ON THIS PLAN.

9.243 EXTEND EXISTING CORRIDOR UNSWITCHED EMERGENCY CIRCUIT TO EMERGENCY FIXTURES (SHADED) LOCATED IN ROOMS C-132 AND C-136 AS REQUIRED.

9.244 PROVIDE (1) 20A, 277V DEDICATED CIRCUIT FROM PANEL C, CIRCUIT 14. PROVIDE 2#12, 1#12G. IN 3/4" C. BETWEEN PANEL C AND INVERTER INV/C. REFER TO INVERTER SCHEDULE ON SHEET 2-EE-601 FOR ADDITIONAL INFORMATION.



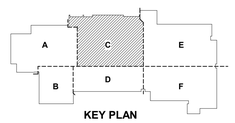
TRUE NORTH PLAN NORTH

FIRST FLOOR LIGHTING PLAN - AREA C

1/8" = 1'-0"

PRELIMINARY
NOT FOR CONSTRUCTION
2019-06-06

FOR BIDS
NOT FOR CONSTRUCTION



KEY PLAN

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MANAWA

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MANAWA MIDDLE/HIGH SCHOOL - ADDITIONS & ALTERATIONS
PART 2 - MANAWA MIDDLE / HIGH SCHOOL
515 E. 4th STREET
MANAWA, WI 54949

MARK	DATE
ISSUED:	June 6, 2019
PROJECT NO.:	18268
CAD DWG FILE:	
DRAWN BY:	MRF
CHECKED BY:	IMR

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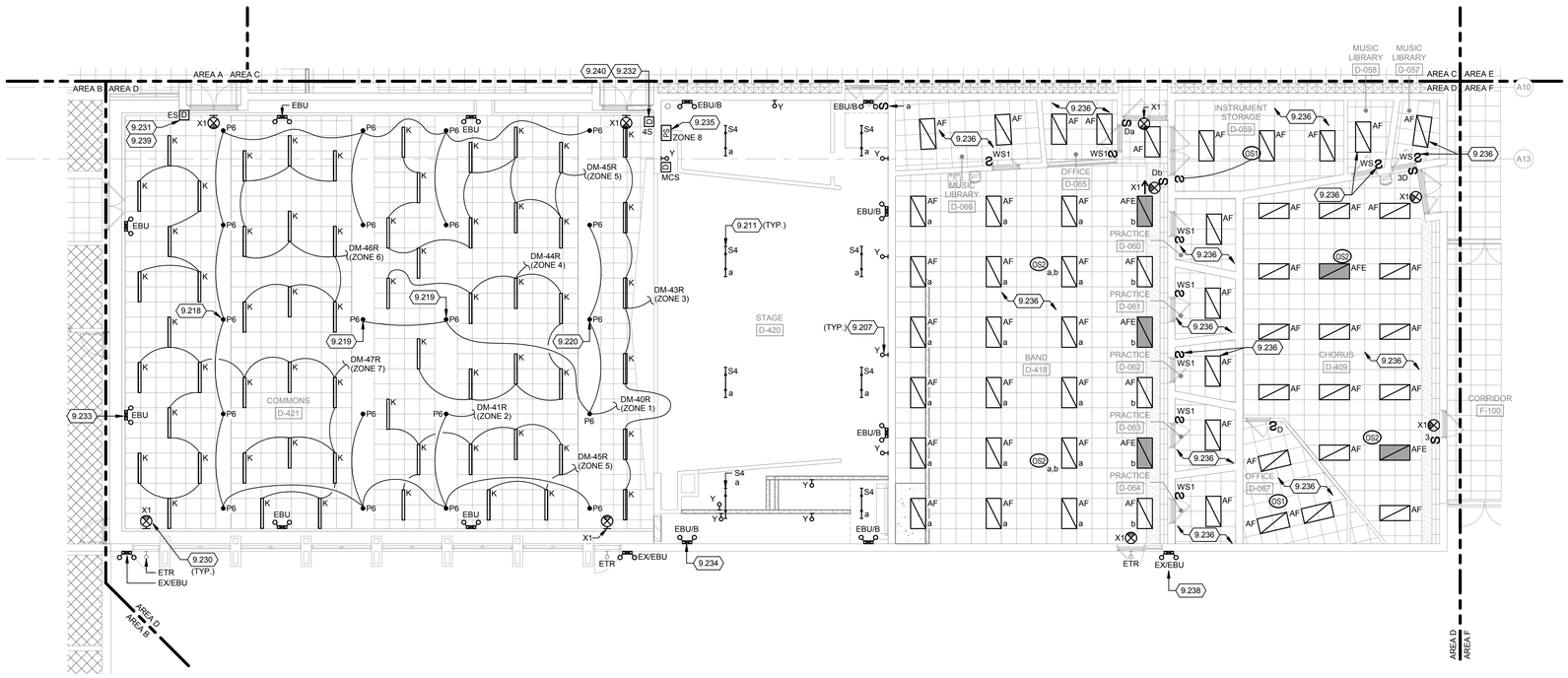
SHEET TITLE:
FIRST FLOOR LIGHTING PLAN - AREA C

SHEET NUMBER:
2-EL-104



TRUE NORTH PLAN NORTH

FIRST FLOOR LIGHTING PLAN - AREA D

1/8" = 1'-0"

LIGHTING GENERAL NOTES:

1. NOTES START HERE.
2. NOTES START HERE.

KEYED NOTES

9.207 MOUNT FIXTURE AT 20" AFF MEASURED FROM BOTTOM OF FIXTURE. FIXTURE SHALL BE MOUNTED ON SURFACE MOUNTED, PAINTED BLACK CONDUIT. PROVIDE WITH ONE-ZONE POWER SUPPLY AND INSTALL POWER SUPPLY NEAR NEW DIMMER RACK PANEL.

9.211 MOUNT FIXTURE AT 15'-0" AFF MEASURED FROM BOTTOM OF FIXTURE.

9.218 MOUNT FIXTURE AT 14'-9" AFF MEASURED FROM BOTTOM OF FIXTURE. TYPICAL FOR ALL 'P6' PENDANTS IN THIS ROW.

9.219 MOUNT FIXTURE AT 16'-1" AFF MEASURED FROM BOTTOM OF FIXTURE. TYPICAL FOR ALL 'P6' PENDANTS IN THIS ROW.

9.220 MOUNT FIXTURE AT 16'-6" AFF MEASURED FROM BOTTOM OF FIXTURE. TYPICAL FOR ALL 'P6' PENDANTS IN THIS ROW.

9.230 RE-CONNECT TO THE EXISTING EMERGENCY LIGHTING CIRCUITING.

9.231 UTILIZE EXISTING BOX TO INSTALL NEW PRE-SET STATION. PROVIDE BLANK COVER PLATE FOR THE REMAINDER OF THE EXISTING BOX.

9.232 UTILIZE EXISTING BOX TO INSTALL NEW PRE-SET STATION. PROVIDE BLANK COVER PLATES FOR THE REMAINDER OF THE OPEN BOXES.

9.233 INSTALL UNITS ON THE VALANCE FASCIA, WIRE TO THE UN-SWITCHED LEG OF THE LIGHTING CIRCUIT SERVING WORK LIGHTS ON STAGE (TYPE S4). TYPICAL FOR ALL EBU'S LOCATED IN COMMONS D-421.

9.234 MOUNT FIXTURE AT 9'-6" AFF MEASURED FROM BOTTOM OF FIXTURE. TYPICAL FOR ALL EBU'S LOCATED IN STAGE D-420.

9.235 POWER SUPPLY FOR TYPE 'Y' FIXTURES. INSTALL AT 60" AFF. COORDINATE EXACT LOCATION IN FIELD.

9.236 ALL WIRING BETWEEN NEW LIGHTING CONTROL DEVICES AND LIGHT FIXTURES SHALL BE NEW. EXISTING BRANCH CIRCUIT SHALL BE EXTENDED FROM ABOVE CEILING JUNCTION BOX TO THE NEW LIGHT FIXTURES. REFER TO DEMOLITION LIGHTING PLANS FOR DEMOLITION REQUIREMENTS IN THIS ROOM.

9.238 MOUNT FIXTURE AT 8'-6" AFF MEASURED FROM BOTTOM OF FIXTURE. TYPICAL FOR ALL WALL MOUNTED EBU'S AND COMBINATION EXIT/EBU'S SHOWN ON THIS PLAN.

9.239 ENTRY STATION SHALL BE PROGRAMMED FOR SCENCE 1, ALL HOUSE LIGHTS ON.

9.240 4-SCENE STATION SHALL BE PROGRAMMED PER OWNER DIRECTION.

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2019-06-06

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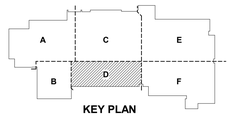
NOT FOR CONSTRUCTION



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PART 2 - MANAWA MIDDLE / HIGH SCHOOL
515 E. 4th STREET
MANAWA, WI 54949

MARK	DATE

ISSUED: June 6, 2019
PROJECT NO: 18268
CAD DWG FILE:
DRAWN BY: MRF
CHECKED BY: IMR

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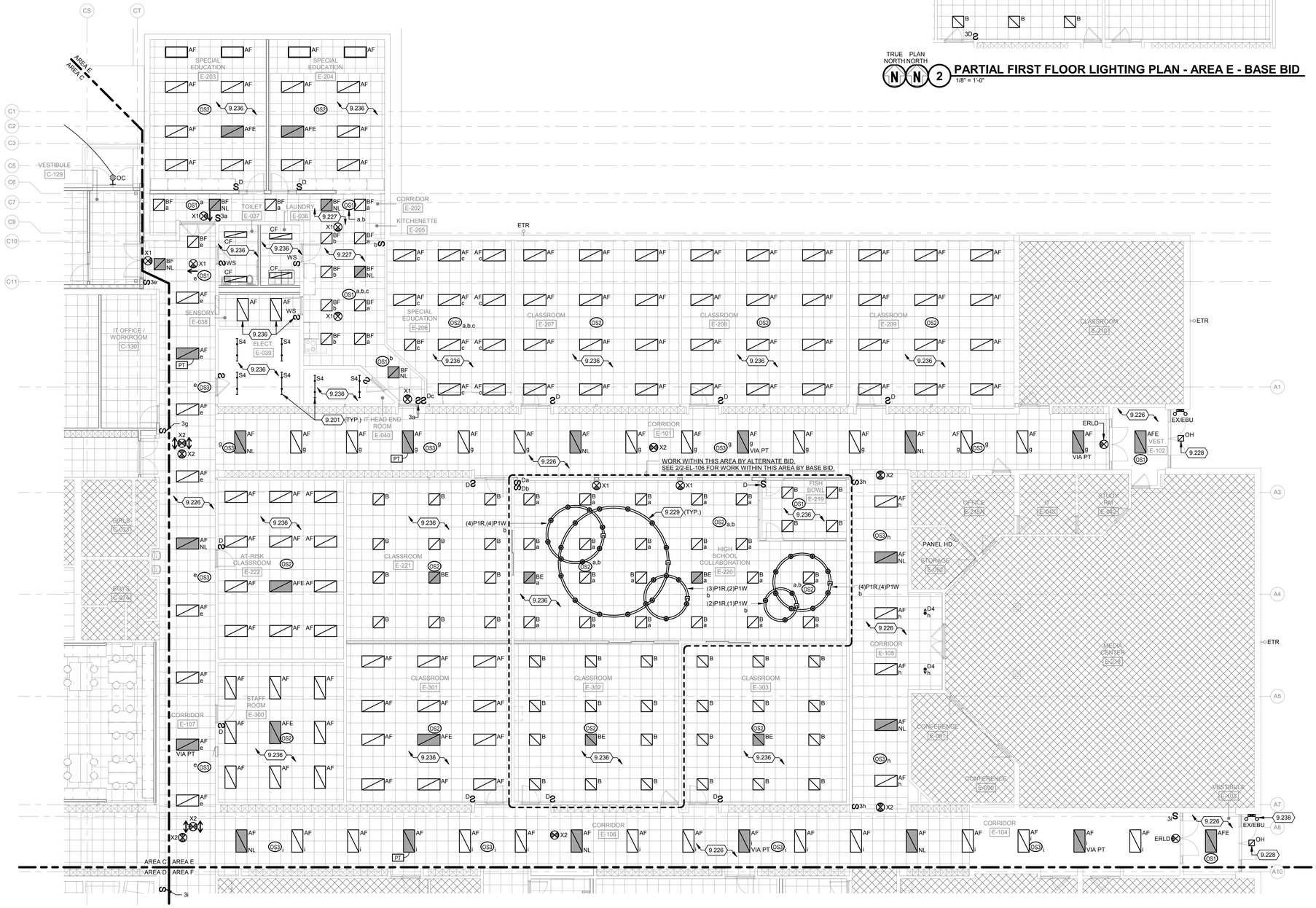
SHEET TITLE:
FIRST FLOOR LIGHTING PLAN - AREA D

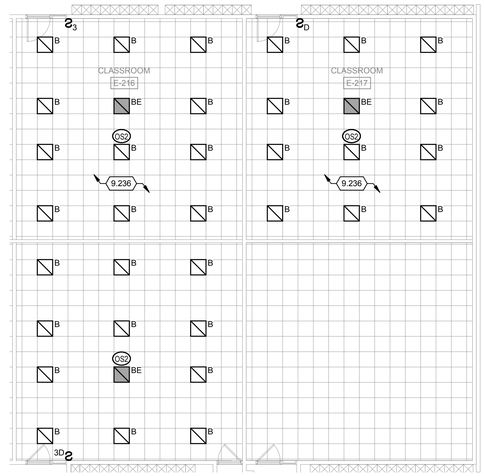
SHEET NUMBER:
2-EL-105



TRUE NORTH PLAN NORTH

PARTIAL FIRST FLOOR LIGHTING PLAN - AREA E - BASE BID

1/8" = 1'-0"



TRUE NORTH PLAN NORTH

FIRST FLOOR LIGHTING PLAN - AREA E

1/8" = 1'-0"

LIGHTING GENERAL NOTES:

1. NOTES START HERE.
2. NOTES START HERE.

KEYED NOTES

9.201 MOUNT FIXTURE AT 9'-0" AFF MEASURED FROM BOTTOM OF FIXTURE.

9.226 UTILIZE EXISTING NORMAL AND EMERGENCY BRANCH LIGHTING CIRCUITS IN PLACE. RE-ROUTE AND EXTEND AS REQUIRED TO SERVE NEW LIGHTING. PROVIDE AND PT DEVICE TO ALLOW EMERGENCY LIGHTS TO BE SWITCHED ALONG WITH NORMAL LIGHTS. FIXTURES DESIGNATED WITH "NL" SHALL BE WIRED TO THE EMERGENCY LIGHTING CIRCUIT.

9.227 UTILIZE EXISTING NORMAL AND EMERGENCY LIGHTING CIRCUITS IN PLACE. RE-ROUTE AND EXTEND AS REQUIRED TO SERVE NEW LIGHTING. FIXTURES DESIGNATED WITH "NL" SHALL BE WIRED TO THE EMERGENCY LIGHTING CIRCUIT.

9.228 INSTALL IN EXISTING OPENING AND RE-WIRE TO EXISTING BRANCH CIRCUIT.

9.229 TRACK LIGHTS SHALL BE INSTALLED STAGGERED AT VARIOUS HEIGHTS, BUT NOT LOWER THAN 7'-2" AFF. CABLES ARE FIELD ADJUSTABLE, CONTRACTOR TO INSTALL PENDANTS RANDOMLY AND ALLOW TIME FOR FINAL ADJUSTMENT.

9.236 ALL WIRING BETWEEN NEW LIGHTING CONTROL DEVICES AND LIGHT FIXTURES SHALL BE NEW. EXISTING BRANCH CIRCUIT SHALL BE EXTENDED FROM ABOVE CEILING JUNCTION BOX TO THE NEW LIGHT FIXTURES. REFER TO DEMOLITION LIGHTING PLANS FOR DEMOLITION REQUIREMENTS IN THIS ROOM.

9.238 MOUNT FIXTURE AT 8'-6" AFF MEASURED FROM BOTTOM OF FIXTURE. TYPICAL FOR ALL WALL MOUNTED EBU'S AND COMBINATION EXIT/EBU'S SHOWN ON THIS PLAN.

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CAD DWG FILE:	
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CHECKED BY:	IMR

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SHEET TITLE:
FIRST FLOOR LIGHTING PLAN - AREA E

SHEET NUMBER:
2-EL-106

PRELIMINARY
NOT FOR CONSTRUCTION
2019-06-06

FOR BIDS
NOT FOR CONSTRUCTION

KEY PLAN

LIGHTING GENERAL NOTES:

1. NOTES START HERE.
2. NOTES START HERE.

KEYED NOTES

9.201 MOUNT FIXTURE AT 9'-0" AFF MEASURED FROM BOTTOM OF FIXTURE.

9.204 MOUNT FIXTURE AT 10'-0" AFF MEASURED FROM BOTTOM OF FIXTURE.

9.205 MOUNT FIXTURE AT 14'-0" AFF MEASURED FROM BOTTOM OF FIXTURE.

9.206 KEYED SWITCH SHALL BE LOCKED IN THE "ON" POSITION.

9.226 UTILIZE EXISTING NORMAL AND EMERGENCY BRANCH LIGHTING CIRCUITS IN PLACE. RE-ROUTE AND EXTEND AS REQUIRED TO SERVE NEW LIGHTING. PROVIDE AND PT DEVICE TO ALLOW EMERGENCY LIGHTS TO BE SWITCHED ALONG WITH NORMAL LIGHTS. FIXTURES DESIGNATED WITH "NL" SHALL BE WIRED TO THE EMERGENCY LIGHTING CIRCUIT.

9.228 INSTALL IN EXISTING OPENING AND RE-WIRE TO EXISTING BRANCH CIRCUIT.

9.236 ALL WIRING BETWEEN NEW LIGHTING CONTROL DEVICES AND LIGHT FIXTURES SHALL BE NEW. EXISTING BRANCH CIRCUIT SHALL BE EXTENDED FROM ABOVE CEILING JUNCTION BOX TO THE NEW LIGHT FIXTURES. REFER TO DEMOLITION LIGHTING PLANS FOR DEMOLITION REQUIREMENTS IN THIS ROOM.

9.238 MOUNT FIXTURE AT 8'-6" AFF MEASURED FROM BOTTOM OF FIXTURE. TYPICAL FOR ALL WALL-MOUNTED EBU'S AND COMBINATION EXIT/EBU'S SHOWN ON THIS PLAN.

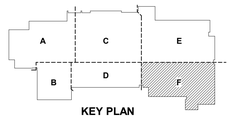
TRUE NORTH PLAN NORTH

1 FIRST FLOOR LIGHTING PLAN - AREA F

1/8" = 1'-0"

PRELIMINARY
NOT FOR CONSTRUCTION
2019-06-06

FOR BIDS
NOT FOR CONSTRUCTION



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CAD DWG FILE:	
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CHECKED BY:	IMR

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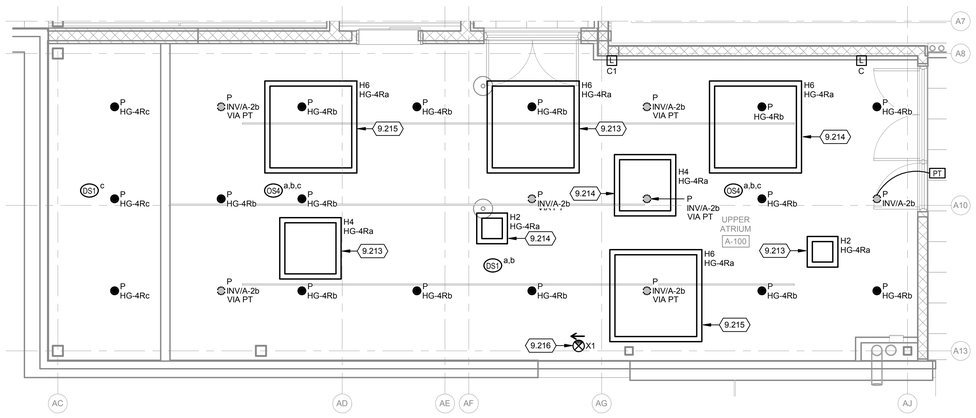
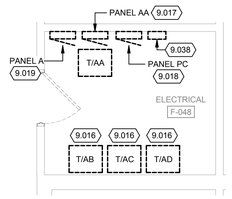
SHEET TITLE:
FIRST FLOOR LIGHTING PLAN - AREA F

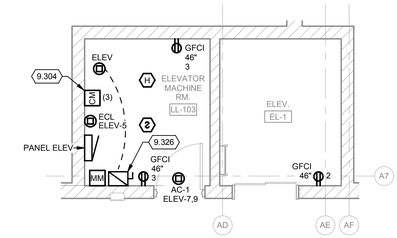
SHEET NUMBER:
2-EL-107



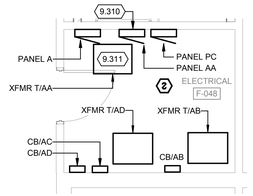
5 ENLARGED PLAN - UPPER ATRIUM A-100
1/4" = 1'-0"



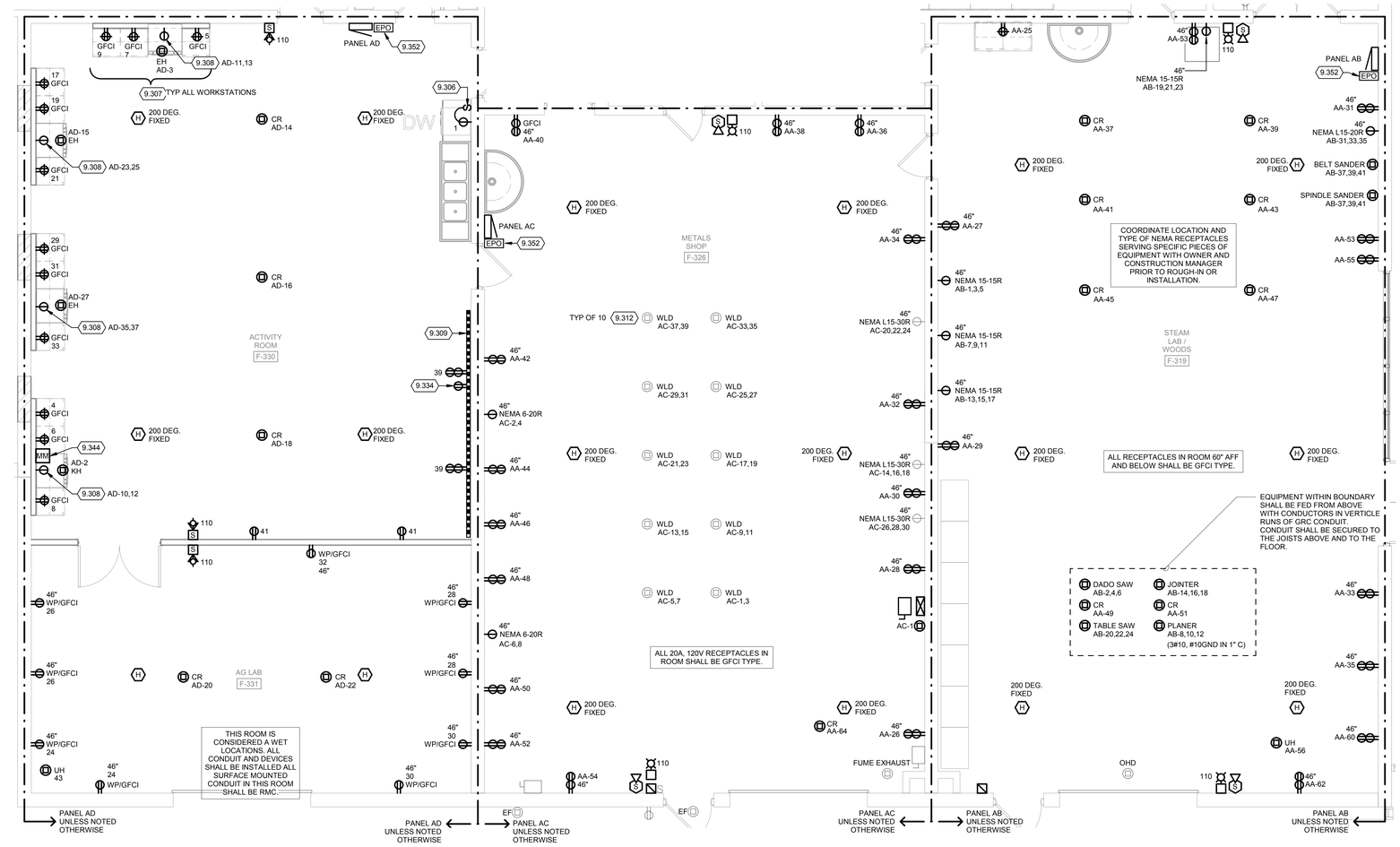
4 ENLARGED ELECTRICAL F-048 DEMOLITION
1/4" = 1'-0"



1 ENLARGED PLAN - ELEVATOR MACHINE RM LL-103
1/4" = 1'-0"



2 ENLARGED ELECTRICAL F-048
1/4" = 1'-0"



3 ENLARGED LABS
1/4" = 1'-0"

KEYED NOTES

9.016 REMOVE EXISTING TRAPEZE MOUNTED TRANSFORMER.

9.017 DE-ENERGIZE AND DISCONNECT EXISTING PANELBOARD AA. EXISTING BRANCH CIRCUITS SHALL REMAIN FOR RE-TERMINATION ON NEW PANELBOARD UNLESS NOTED OTHERWISE. FOR BIDDING PURPOSES ASSUME THE DISCONNECTION AND RE-TERMINATION OF TWENTY (20) - 20A/1P CIRCUITS, (1) - 40A/2P CIRCUIT, AND (1) - 60A/2P CIRCUIT.

9.018 DE-ENERGIZE AND DISCONNECT EXISTING PANELBOARD PC. EXISTING BRANCH CIRCUITS SHALL REMAIN FOR RE-TERMINATION ON NEW PANELBOARD UNLESS NOTED OTHERWISE. FOR BIDDING PURPOSES ASSUME THE DISCONNECTION AND RE-TERMINATION OF (10) - 30A/3P CIRCUITS.

9.019 DE-ENERGIZE AND DISCONNECT EXISTING PANELBOARD A. EXISTING BRANCH CIRCUITS SHALL REMAIN FOR RE-TERMINATION ON NEW PANELBOARD UNLESS NOTED OTHERWISE. FOR BIDDING PURPOSES ASSUME THE DISCONNECTION AND RE-TERMINATION OF TWENTY (20) - 20A/1P CIRCUITS AND THE ADDITION OF (1) 70A/3P CIRCUIT TO SERVE TRANSFORMER TAA.

9.038 DEMOLISH ENCLOSURE HOUSING (3) CONTACTORS AND ASSOCIATED WIRING SERVING EMERGENCY POWER OFF FUNCTIONS FOR LAB EQUIPMENT.

9.213 MOUNT FIXTURE 4'-0" BELOW EXPOSED CEILING MEASURED FROM BOTTOM OF FIXTURE.

9.214 MOUNT FIXTURE 5'-0" BELOW EXPOSED CEILING MEASURED FROM BOTTOM OF FIXTURE.

9.215 MOUNT FIXTURE 6'-0" BELOW EXPOSED CEILING MEASURED FROM BOTTOM OF FIXTURE.

9.216 EXIT SIGN SHALL BE PENDANT MOUNTED SO THAT BOTTOM OF FIXTURE IS AT 9'-6" AFF.

9.304 CONTROL MODULES SHALL BE FOR ELEVATOR PRIMARY RECALL, SECONDARY RECALL AND FIREFIGHTERS HAT OPERATION.

9.306 ENGRAVE SWITCH WALLPLATE WITH "DISHWASHER".

9.307 COORDINATE INSTALLATION OF RECEPTACLES AND CONDUIT ROUTING WITH MILLWORK CONTRACTOR. PROVIDE (2) TWO - 1" CONDUITS ROUTED OVERHEAD FROM PANEL INTO CHASE BEHIND CABINETS TO SERVE ELECTRIC RANGE, EXHAUST HOOD/LIGHT AND WORKSTATION ABOVE COUNTER RECEPTACLES.

9.308 FOR BIDDING PURPOSES ASSUME NEMA 14-50R AND 3#6, 1#10G IN 1"C. COORDINATE FINAL INSTALLATION REQUIREMENTS OF ELECTRIC RANGE WITH OWNER.

9.309 PROVIDE SINGLE CHANNEL, STEEL SURFACE MOUNTED RACEWAY (WIREMOLD 700 OR EQUAL). PROVIDE RECEPTACLES AS INDICATED.

9.310 TERMINATE EXISTING CIRCUITS INDICATED IN KEYED NOTE 9.017 (SHEET 2-EE-401) TO NEW PANELBOARD AA.

9.311 WALL MOUNTED TRANSFORMER 'T/AA' ABOVE PANEL AA.

9.312 EXISTING OVERHEAD RACEWAY AND WIRING SERVING WELDERS SHALL REMAIN IN PLACE AND SHALL BE RE-TERMINATED TO NEW PANEL AC. PROTECT DURING CONSTRUCTION. ANY RACEWAY OR WIRING DAMAGED DURING DEMOLITION OR CONSTRUCTION SHALL BE REPLACED.

9.326 PROVIDE 2#12, 1#12G IN 1/2"C. BETWEEN PANEL IN THIS ROOM AND SHUNT TRIP COIL IN ELEVATOR DISCONNECT.

9.334 RECEPTACLE TO SERVE DISPLAY. PROVIDE DUAL CHANNEL, SURFACE MOUNTED RACEWAY TO LOCATION AND GROUP MOUNT RECEPTACLE WITH TELECOM DEVICES. SEE TECHNOLOGY SHEETS FOR MORE INFORMATION. COORDINATE EXACT LOCATION AND MOUNTING HEIGHT WITH DISPLAY AND DISPLAY MOUNTING BRACKET. RECEPTACLE AND DEVICES SHALL BE MOUNTED ABOVE CENTERLINE OF DISPLAY AND BE CONCEALED WHEN DISPLAY IS IN PLACE.

9.344 INTEGRATE MONITOR MODULE INTO THE FUME HOOD SYSTEM SO THAT BUILDING FIRE ALARM SYSTEM GOES INTO ALARM UPON FUME HOOD SYSTEM ACTIVATION.

9.352 PROVIDE 30MM, RED PUSHBUTTON TO ACTIVATE SHUNT TRIP ON MAIN CIRCUIT BREAKER OF ADJACENT PANEL. PROVIDE IN SURFACE MOUNTED ENCLOSURE. PROVIDE WITH RED LAMINATED ACRYLIC SIGN WITH 1/2" TALL, WHITE LETTERS READING "EMERGENCY POWER OFF".

PRELIMINARY
NOT FOR CONSTRUCTION
2019-06-06

FOR BIDS
NOT FOR CONSTRUCTION

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CAD DWG FILE:	
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CHECKED BY:	IMR

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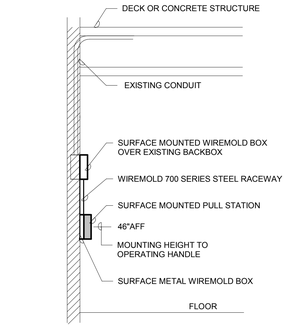
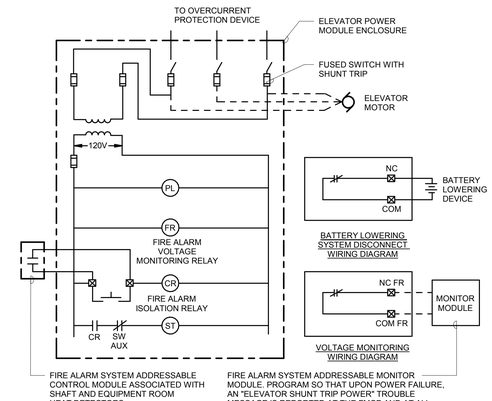
SHEET TITLE:
ENLARGED PLAN

SHEET NUMBER:
2-EE-401



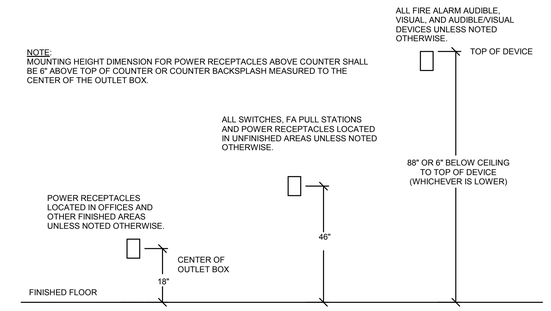
1 PULL STATION MOUNTING - SURFACE - MECH SPACES
NO SCALE



DETAIL NOTES:

1. PROVIDE ELEVATOR DISCONNECT WITH OPTIONAL CONTACT CLOSURES TO PREVENT "NUISANCE" FIRE ALARMS BY OVER-RIDING THE "CONTROL POWER NOT AVAILABLE" SIGNAL WHEN THE DISCONNECT IS MANUALLY TURNED OFF AND DISTINCTIVE SIGNALING FOR ON-OFF-TRIPPED CONDITIONS.

2 ELEVATOR POWER MODULE/SHUNT-TRIP CONTROL DIAGRAM
NO SCALE



3 DEVICE MOUNTING HEIGHTS DETAIL
NO SCALE

PRELIMINARY
NOT FOR CONSTRUCTION
2019-06-06

FOR BIDS
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SHEET TITLE:
DETAILS

SHEET NUMBER:
2-EE-501

OCCUPANCY/VACANCY/PHOTO SENSOR SCHEDULE

SENSOR ID	VOLTAGE	TECHNOLOGY		PATTERN	COVERAGE AREA	DESCRIPTION	MOUNTING	KEYED NOTE (TO BE SELECTED AS NEEDED)
		PIR	MICRO					
WS	120/277	X	X	180	UP TO 800 SF	SINGLE-POLE, WALL MOUNT SWITCH TYPE OCCUPANCY SENSOR. CAT# WSX PDT AUTO-ON OR VACANCY	WALL	1, 3
WS1	120/277	X	X	180	UP TO 800 SF	SINGLE-POLE, WALL MOUNT SWITCH TYPE DIMMING OCCUPANCY SENSOR. CAT# WSX D; 0-10 VOLT,1% ELDO DRIVER COMPATIBLE	WALL	1, 2
OS1	12-24V	X	X	360	UP TO 500 SF	CEILING MOUNTED PROGRAMMABLE WITH ADJUSTABLE TIME DELAY; CAT # CM PDT, SMALL MOTION	CEILING	4, 5, 6
OS2	12-24V	X	X	360	UP TO 2000 SF	CEILING MOUNTED PROGRAMMABLE WITH ADJUSTABLE TIME DELAY; CAT # CM PDT, LARGE MOTION	CEILING	4, 5, 6
OS3	12-24V	X	X	360	UP TO 28' @9' MH ; UP TO 36' @ 15' MH	CEILING MOUNTED PROGRAMMABLE WITH ADJUSTABLE TIME DELAY, CAT#CM PDT, HALLWAYS	CEILING	2, 6
OS4	12-24V	X		360	UP TO 20' @ 15' MH; UP TO 30' @ 45' MH	CEILING MOUNTED PROGRAMMABLE WITH ADJUSTABLE TIME DELAY, CAT#CM 6, HIGH BAY	CEILING	6
OS5	12-24V	X	X	120	8'-10' MH	WIDE VIEW CORNER MOUNTED WITH BRACKET, CAT # WV VR PDT 16 - LARGE MOTION UP TO 70'	WALL/ CORNER	2, 6
OS6	12-24V	X	X	120	8'-10' MH	WIDE VIEW CORNER MOUNTED WITH BRACKET, CAT # WV VR PDT 16 - SMALL MOTION UP TO 40'	WALL/ CORNER	2, 6
OS7	12-24V	X	X	120	8'-10' MH	SAME AS OS5 EXCEPT WITH CEILING CORNER BRACKET	CEILING/ CORNER	2, 6
OS8	12-24V	X	X	120	8'-10' MH	SAME AS OS6 EXCEPT WITH CEILING CORNER BRACKET	CEILING/ CORNER	2, 6
OS9	12-24V	X	X	360	UP TO 500 SF	SAME AS OS EXCEPT FAIL-ON	CEILING	4, 5, 6
OS10	12-24V	X	X	360	UP TO 500 SF	CEILING MOUNTED PROGRAMMABLE WITH ADJUSTABLE TIME DELAY; HIGH HUMIDITY AND WET LOCATION LISTED	CEILING	4, 5, 6
DS	12-24V	N/A	N/A	N/A		SINGLE ZONE DAYLIGHT SENSOR WITH SELECTABLE ON/OFF OR DIMMING APPLICATION, CAT # CM PC ADC	CEILING	7
PE	12-24V	N/A	N/A	N/A		0 FC (MIN) TO 50-750 FC (MAX) OUTDOOR PHOTOCELL INSTALLED IN APPROPRIATELY RATED ENCLOSURE	ROOF	8

GENERAL NOTES:

1. COLOR OF DEVICES SHALL BE COORDINATED/MATCHING COLOR OF RECEPTACLES AND SWITCHES AS IDENTIFIED IN SPECIFICATION SECTION 26 27 26
2. PROVIDE ADEQUATE SUPPORT FOR CONTROL WIRING, REFER TO WIRING DIAGRAMS SUPPLIED WITH SELECTED DEVICES. FOLLOW MANUFACTURER INSTRUCTIONS
3. FOR ADDITIONAL INFORMATION REFER TO SPECIFICATION SECTION 26 09 42.23.
4 ALL LOW VOLTAGE SENSORS SHALL BE PROVIDED WITH 20A RATED POWER PACKS WITH ZERO CROSS SWITCHING TECHNOLOGY AND MANUAL ON MODE
5 PROVIDE 8' OF ADDITIONAL WIRING ABOVE ACCESSIBLE CEILING.
6 ALL POWER PACKS AND SLAVE PACKS SHALL BE INSTALLED IN APPROVED ENCLOSURES RATED FOR THE ENVIROMENTAL SPACES WHERE THEY ARE INSTALLED
7 WHERE OCCUPANCY SENSORS CONTROLLING LIGHTS OF A DIFFERENT VOLTAGES A SEPARATE POWER/SLAVE PACK SHALL BE PROVIDED.
8 POWER PACKS ARE NOT SHOWN ON THE PLANS, IT SHALL BE CONTRACTOR/SUPPLIER RESPONSIBIILTY TO VERIFY AND COORDINATE ALL REQURIED QUANTITIES.
9 WHERE DAYLIGHT HARVESTING IS SELECTED - PROVIDE ALL REQUIRED LABOR TO SET UP DAYTIME AND NIGHT TIME TRESHOLDS PER MANUFACTURER RECOMMENDATIONS
10. SENSOR SWITCH MANUFACTURER CAT # /SERIES ARE SHOWN IN THIS SCHEDULE AS A BASIS OF DESIGN - REFER TO SPECIFICATION SECTION 26 09 23 FOR ACCEPTABLE SUBSTITUTIONS.

KEYED NOTES:

1. SMALL MOTION DETECTION
2. INTEGRATED PHOTOCELL OPTION
3. INTEGRATED PHOTOCELL IS DISABLED, REFER TO LIGHTING PLANS FOR DAYLIGHT HARVESTING INTENT AND ENABLE PHOTOCELL OPERATION AS INDICATED
4. OCCUPANCY CONTROLLED DIMMING
5. INTEGRATED PHOTOCELL WITH DIMMING CAPABILITY
6. PROVIDE WITH AUXILLARY RELAY
7. INSTALL WITHIN 3'-4' FROM THE WINDOW, PROVIDE WITH POWER PACK.
8. EXTERIOR PHOTOCELL WIRED VIA LOW VOLTAGE LIGHTING CONTROL PANEL LCP AND/OR DIMMER RACK PANEL. REFER TO RESPECTIVE LIGHTING CONTROL SCHEDULES FOR COORDINATION.

INVERTER SCHEDULE

DESCRIPTION	SIZE	INPUT VOLTAGE	OUTPUT VOLTAGE	OUTPUT CIRCUIT BREAKER QTY
INV/A	3000W	277	277	6
INV/C	500W	277	277	N/A

GENERAL NOTES:

1. ALL OUTPUT CIRCUIT BREAKERS SHALL BE NORMALLY-ON AND UNMONITORED.
2. PROVIDE ISOLITE, DUALITE, BODINE OR APPROVIDE EQUAL.
3. ALL INVERTERS SHALL HAVE A MINIMUM AIC RATING OF 10KIAC.
4. ALL OUTPUT BREAKERS FOR INVERTERS 750 WATTS OR LARGER SHALL BE NORMALLY "ON" AND HAVE 20A RATING.

LUMINAIRE SCHEDULE

NOTE: SEE SPECIFICATION FOR ADDITIONAL INFORMATION REGARDING LUMINAIRE AND INSTALLATION REQUIREMENTS. PROVIDE OPTIONS AND ACCESSORIES REFERENCED BY THE COLUMN TITLED " OPTIONS/ACCESSORIES". MANUFACTURERS LISTED ACCEPTABLE SHALL MEET ALL REQUIREMENTS AND FEATURES INDICATED. ACCEPTABLE MANUFACTURERS MUST MEET THE PHOTOMETRIC PERFORMANCE OF THE LISTED UNIT.

ABBREVIATIONS: GWB = GYPSUM WALL BOARD; ES = EXPOSED STRUCTURE; LG = LAY-IN GRID; P = PENDANT; PLAS = PLASTER; PL = POLE MOUNTED; R = RECESSED; S = SURFACE; V = VARIES; W = WALL MOUNTED; UNV = UNIVERSAL VOLTAGE

DES.	MANUFACTURER	CATALOG SERIES	DESCRIPTION	LAMP DATA	VOLTAGE	BALLAST/ DRIVER	MOUNT	CEILING TYPE	FIXTURE DEPTH	LED SYSTEM INPUT WATTAGE	LED DELIVERED LUMENS	OPTIONS / ACCESSORIES	ACCEPTABLE MANUFACTURERS	KEYED NOTE
AF	METALUX	24FP4750C	2' X 4' LED FLAT PANEL	LED, 5000K	UNV	A	R	LG	1-3/4"	40.3	5,005			
AFE	METALUX	24FP4750C-EL14W	SAME AS TYPE 'AF' EXCEPT WITH EMERGENCY BATTERY OPTION	LED, 5000K	UNV	A	R	LG	1-3/4"	40.3	5,005			
AF1	METALUX	24FP4750C-IPX5	SAME AS TYPE 'AF' EXCEPT IP5X RATED	LED, 5000K	UNV	A	R	LG	1-3/4"	40.3	5,005			
B	METALUX	22CZ2-44-S-UNV-GL-L840-CD1-U	2' X 2' VOLUMETRIC TROFFER	LED, 5000K	UNV	B	R	LG	3-1/4"	42.7	4,711			
BE	METALUX	22CZ2-44-S-UNV-GL-EL14W-L840-CD1-U	SAME AS TYPE 'B' EXCEPT WITH EMERGENCY BATTERY OPTION	LED, 5000K	UNV	B	R	LG	3-1/4"	42.7	4,711			
BF	METALUX	22FP3250C	2' X 2' LED FLAT PANEL	LED, 5000K	UNV	A	R	LG	1-3/4"	29.5	3,150			
BFE	METALUX	22FP3250C-EL14W	SAME AS TYPE 'BF' EXCEPT WITH EMERGENCY BATTERY OPTION	LED, 5000K	UNV	A	R	LG	1-3/4"	29.5	3,150			
CF	METALUX	14FP4250C	1' X 4' LED FLAT PANEL	LED, 5000K	UNV	A	R	LG	1-3/4"	38.9	4,521			
D	PORTFOLIO	LD4B-15-D010-EU4B-1020-80-40-4LB-M1-H	4" DIAMETER LED DOWNLIGHT	LED, 4000K	UNV	B	R	LG	5-1/2"	15.5	1,500			
D1	PORTFOLIO	LD4B-20-D010-EU4B-1020-80-40-4LB-M1-H	SAME AS TYPE 'D' EXCEPT LUMEN OUTPUT	LED, 4000K	UNV	B	R	LG	5-1/2"	21.2	2,000			
D4	PORTFOLIO	LD4B-20-D010TR-EU4B-1020-80-40-LWW-1H-HB26	4" DIAMETER LED DOWNLIGHT WALLWASH	LED, 4000K	UNV	C	R	LG	5-1/2"	21.2	2,000			
D5	HALO	H457-TAT-E010-EL406-9-40-TL402SNS	4" DIAMETER LED DOWNLIGHT (SHOWER RATED)	LED, 4000K	UNV	D	R	GWB	5-1/2"	11	1,000	13		
F4	LF ILLUMINATION	GSA-05L-9040-LN-48"-WW	0.79" X 4' LINEAR LED PENDANT	LED, 4000K	UNV	D	P	LG	2-1/4"	5 / FT	400 / FT			
F10	LF ILLUMINATION	GSA-05L-9040-LN-60"-WW	0.79" X 10' LINEAR LED PENDANT	LED, 4000K	UNV	D	P	LG	2-1/4"	5 / FT	400 / FT			
F12	LF ILLUMINATION	GSA-05L-9040-LN-144"-WW	0.79" X 12' LINEAR LED PENDANT	LED, 4000K	UNV	D	P	LG	2-1/4"	5 / FT	400 / FT			
F14	LF ILLUMINATION	GSA-05L-9040-LN-168"-WW	0.79" X 14' LINEAR LED PENDANT	LED, 4000K	UNV	D	P	LG	2-1/4"	5 / FT	400 / FT			
F16	LF ILLUMINATION	GSA-05L-9040-LN-192"-WW	0.79" X 16' LINEAR LED PENDANT	LED, 4000K	UNV	D	P	LG	2-1/4"	5 / FT	400 / FT			
F22A	LF ILLUMINATION	GSA-05L-9040-LN-96"-168"-WW-2WY	0.79" X 22' LINEAR LED PENDANT	LED, 4000K	UNV	D	P	LG	2-1/4"	5 / FT	400 / FT			
F24	LF ILLUMINATION	GSA-05L-9040-LN-288"-WW	0.79" X 24' LINEAR LED PENDANT	LED, 4000K	UNV	D	P	LG	2-1/4"	5 / FT	400 / FT			
G	METALUX	LHB-18-UNV-L850-CD-U-LHB-PMK	12-5/8" X 2' LINEAR LED HIGH BAY	LED, 5000K	UNV	D	P	ES	3-5/8"	132	18,000			
H2	LF ILLUMINATION	GSA-05L-9040-LN-024-WW-2WY	2' X 2' LINEAR LED PENDANT	LED, 4000K	UNV	D	P	LG	2-1/4"	5 / FT	400 / FT			
H4	LF ILLUMINATION	GSA-05L-9040-LN-048-WW-2WY	4' X 4' LINEAR LED PENDANT	LED, 4000K	UNV	D	P	LG	2-1/4"	5 / FT	400 / FT			
H6	LF ILLUMINATION	GSA-05L-9040-LN-072-WW-2WY	6' X 6' LINEAR LED PENDANT	LED, 4000K	UNV	D	P	LG	2-1/4"	5 / FT	400 / FT			
J4	METALUX	4VT3-8-W-UNV-L850-CD1-SSL-VT3-SS-VBK-U	5-7/8" X 4' LED INDUSTRIAL VAPORTITE PENDANT	LED, 5000K	UNV	D	P	ES	3-5/8"	70	9,552	38		
J8	METALUX	4VT3-8-W-UNV-L850-CD1-SSL-VT3-SS-VBK-U	5-7/8" X 8' LED INDUSTRIAL VAPORTITE PENDANT	LED, 5000K	UNV	D	P	ES	3-5/8"	70 / 4FT	9,552 / 4FT	38		
J12	METALUX	4VT3-8-W-UNV-L850-CD1-SSL-VT3-SS-VBK-U	5-7/8" X 12' LED INDUSTRIAL VAPORTITE PENDANT	LED, 5000K	UNV	D	P	ES	3-5/8"	70 / 4FT	9,552 / 4FT	38		
K	AXIS LIGHTING	MBSLED-500-80-S-4'-W-120-DP-1	2-3/8" X 4' LINEAR LED	LED, 4000K	120	B	S	LG	4-11/16"	4.54 / FT	500 / FT			
P	LUMINIS	AR168-L1L40-38W-4018-80-4000K-277V-WHT-STM	6" DIAMETER CYLINDER LED PENDANT (12" STEM LENGTH)	LED, 4000K	277	B	P	ES	12.1"	38	4,018			
P1R	TECH LIGHTING	700-FIRF-MO-R-S-LEDS930	4.5" DIAMETER DECORATIVE RED GLASS LED PENDANT	LED, 3000K	UNV	D	P	TRACK	7.3"	8	300			1
P1W	TECH LIGHTING	700-FIRF-MO-W-S-LEDS930	4.5" DIAMETER DECORATIVE WHITE GLASS LED PENDANT	LED, 3000K	UNV	D	P	TRACK	7.3"	8	300			1
P3	LF ILLUMINATION	RINGER-32L-8030-DMU-SS	32" DIAMTER LED RING PENDANT	LED, 3000K	UNV	D	P	ES	2"	32	2,560			
P6	LUMINIS	AR168-L1L40-38W-4018-80-4000K-277V-DGT-DMX/RDM-DSPG	6" DIAMETER CYLINDER LED PENDANT	LED, 4000K	277	DMX	P	ES	12.1"	38	4,018			3
S4	METALUX	4SNLED-LD5-41SL-LC-UNV-L850-CD1-U-AYC-CHAIN/SET	3" X 4' LINEAR LED STRIP	LED, 5000K	UNV	A	V	V	3-11/16"	31	4,269			
S4E	METALUX	4SNLED-LD5-41SL-LC-UNV-EL14W-L850-CD1-U-AYC-CHAIN/SET	SAME AS TYPE 'S4' EXCEPT WITH INTEGRAL BATTERY OPTION	LED, 5000K	UNV	A	V	V	3-11/16"	31	4,269			
T	HALO	L-806SM-NF-80-40-P	ADJUSTABLE LED TRACK HEAD SYSTEM	LED, 4000K	UNV	D	S	TRACK	4.52"	12	1,073			2

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MANAWA

MANAWA ELEMENTARY SCHOOL - ALTERATIONS
MANAWA MIDDLE/HIGH SCHOOL - ADDITIONS & ALTERATIONS
PART 2 - MANAWA MIDDLE / HIGH SCHOOL
515 E. 4th STREET
MANAWA, WI 54949

MARK	DATE

ISSUED: June 6, 2019
PROJECT NO: 18268
CAD DWG FILE:
DRAWN BY: MRF
CHECKED BY: IMR

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SHEET TITLE:
SCHEDULES

SHEET NUMBER:
2-EE-601

LV STATION SCHEDULE

AREA / ROOM #	SWITCH ID	SWITCH LEG ID	SWITCH TYPE	CONTROLLING RELAY / CIRCUIT	DESCRIPTION	COMMENTS	KEYED NOTES
AREA A / LL-104	A	ALL ON	PUSH BUTTON	LCP-1,2	CONTROLLING FIXTURE TYPE G IN FITNESS ROOM, ALL ON	SINGLE BUTTON TO ENABLE ON ONLY FUNCTION	1,2,3
		a	PUSH BUTTON	LCP-1	CONTROLLING FIXTURE TYPE G IN FITNESS ROOM	SINGLE BUTTON ENABLE ON/OFF FUNCTION	1,2,3
		b	PUSH BUTTON	LCP-2	CONTROLLING FIXTURE TYPE G IN FITNESS ROOM	SINGLE BUTTON ENABLE ON/OFF FUNCTION	
		a	DIMMER	LCP-1	CONTROLLING FIXTURE TYPE G IN FITNESS ROOM	2-BUTTON DIMMING FUNCTION RAISE/LOWER	1,2,3
		b	DIMMER	LCP-2	CONTROLLING FIXTURE TYPE G IN FITNESS ROOM	2-BUTTON DIMMING FUNCTION RAISE/LOWER	
		ALL OFF	PUSH BUTTON	LCP-1,2	CONTROLLING FIXTURE TYPE G IN FITNESS ROOM, ALL OFF	SINGLE BUTTON TO ENABLE OFF ONLY FUNCTION	1,2,3
AREA A / LL-104	A1	ALL ON	PUSH BUTTON	LCP-1,2	CONTROLLING FIXTURE TYPE G IN FITNESS ROOM, ALL ON	SINGLE BUTTON TO ENABLE ON ONLY FUNCTION	1,2,3
		a	PUSH BUTTON	LCP-1	CONTROLLING FIXTURE TYPE G IN FITNESS ROOM	SINGLE BUTTON ENABLE ON/OFF FUNCTION	1,2,3
		b	PUSH BUTTON	LCP-2	CONTROLLING FIXTURE TYPE G IN FITNESS ROOM	SINGLE BUTTON ENABLE ON/OFF FUNCTION	
		a	DIMMER	LCP-1	CONTROLLING FIXTURE TYPE G IN FITNESS ROOM	2-BUTTON DIMMING FUNCTION RAISE/LOWER	1,2,3
		b	DIMMER	LCP-2	CONTROLLING FIXTURE TYPE G IN FITNESS ROOM	2-BUTTON DIMMING FUNCTION RAISE/LOWER	
		ALL OFF	PUSH BUTTON	LCP-1,2	CONTROLLING FIXTURE TYPE G IN FITNESS ROOM, ALL OFF	SINGLE BUTTON TO ENABLE OFF ONLY FUNCTION	1,2,3
AREA A / LL-102	B	a	PUSH BUTTON	LCP-3	CONTROLLING FIXTURE TYPE AF IN CORRIDOR	2-BUTTON STATION FOR ALL ON / ALL OFF FUNCTION	1,3
AREA A / LL-102	B1	a	PUSH BUTTON	LCP-3	CONTROLLING FIXTURE TYPE AF IN CORRIDOR	2-BUTTON STATION FOR ALL ON / ALL OFF FUNCTION	1,3
AREA A / A-100	C	ALL ON	PUSH BUTTON	LCP-4 THRU 8	CONTROLLING FIXTURE TYPES H SERIES, P, D, AND D1 IN VEST., LL-ATRIUM AND UPPER ATRIUM	SINGLE BUTTON ON ONLY FUNCTION	1
		a	PUSH BUTTON	LCP-4	CONTROLLING FIXTURE TYPE H SERIES IN UPPER ATRIUM	SINGLE BUTTON ENABLE ON/OFF FUNCTION	
		b	PUSH BUTTON	LCP-5	CONTROLLING FIXTURE TYPE P IN UPPER ATRIUM	SINGLE BUTTON ENABLE ON/OFF FUNCTION	1
		c	PUSH BUTTON	LCP-6	CONTROLLING FIXTURE TYPE P IN UPPER ATRIUM	SINGLE BUTTON ENABLE ON/OFF FUNCTION	
		d	PUSH BUTTON	LCP-7	CONTROLLING FIXTURE TYPE D IN VEST.	SINGLE BUTTON ENABLE ON/OFF FUNCTION	1
		e	PUSH BUTTON	LCP-8	CONTROLLING FIXTURE TYPE D1 IN LL-ATRIUM	SINGLE BUTTON ENABLE ON/OFF FUNCTION	1
		ALL OFF	PUSH BUTTON	LCP-4 THRU 8	CONTROLLING FIXTURE TYPES H SERIES, P, D, AND D1 IN VEST., LL-ATRIUM AND UPPER ATRIUM	SINGLE BUTTON OFF ONLY FUNCTION	1
AREA A / A-100	C1	ALL ON	PUSH BUTTON	LCP-4 THRU 8	CONTROLLING FIXTURE TYPES H SERIES, P, D, AND D1 IN VEST., LL-ATRIUM AND UPPER ATRIUM	SINGLE BUTTON ON ONLY FUNCTION	1
		a	PUSH BUTTON	LCP-4	CONTROLLING FIXTURE TYPE H SERIES IN UPPER ATRIUM	SINGLE BUTTON ENABLE ON/OFF FUNCTION	
		b	PUSH BUTTON	LCP-5	CONTROLLING FIXTURE TYPE P IN UPPER ATRIUM	SINGLE BUTTON ENABLE ON/OFF FUNCTION	1
		c	PUSH BUTTON	LCP-6	CONTROLLING FIXTURE TYPE P IN UPPER ATRIUM	SINGLE BUTTON ENABLE ON/OFF FUNCTION	
		d	PUSH BUTTON	LCP-7	CONTROLLING FIXTURE TYPE D IN VEST.	SINGLE BUTTON ENABLE ON/OFF FUNCTION	1
		e	PUSH BUTTON	LCP-8	CONTROLLING FIXTURE TYPE D1 IN LL-ATRIUM	SINGLE BUTTON ENABLE ON/OFF FUNCTION	1
		ALL OFF	PUSH BUTTON	LCP-4 THRU 8	CONTROLLING FIXTURE TYPES H SERIES, P, D, AND D1 IN VEST., LL-ATRIUM AND UPPER ATRIUM	SINGLE BUTTON OFF ONLY FUNCTION	1
LOWER LEVEL / LL-101	C2	ALL ON	PUSH BUTTON	LCP-4 THRU 8	CONTROLLING FIXTURE TYPES H SERIES, P, D, AND D1 IN VEST., LL-ATRIUM AND UPPER ATRIUM	SINGLE BUTTON ON ONLY FUNCTION	1
		a	PUSH BUTTON	LCP-4	CONTROLLING FIXTURE TYPE H SERIES IN UPPER ATRIUM	SINGLE BUTTON ENABLE ON/OFF FUNCTION	
		b	PUSH BUTTON	LCP-5	CONTROLLING FIXTURE TYPE P IN UPPER ATRIUM	SINGLE BUTTON ENABLE ON/OFF FUNCTION	1
		c	PUSH BUTTON	LCP-6	CONTROLLING FIXTURE TYPE P IN UPPER ATRIUM	SINGLE BUTTON ENABLE ON/OFF FUNCTION	
		d	PUSH BUTTON	LCP-7	CONTROLLING FIXTURE TYPE D IN VEST.	SINGLE BUTTON ENABLE ON/OFF FUNCTION	1
		e	PUSH BUTTON	LCP-8	CONTROLLING FIXTURE TYPE D1 IN LL-ATRIUM	SINGLE BUTTON ENABLE ON/OFF FUNCTION	1
		ALL OFF	PUSH BUTTON	LCP-4 THRU 8	CONTROLLING FIXTURE TYPES H SERIES, P, D, AND D1 IN VEST., LL-ATRIUM AND UPPER ATRIUM	SINGLE BUTTON OFF ONLY FUNCTION	1
AREA A / A-102	D	a	PUSH BUTTON	LCP-9	CONTROLLING FIXTURE TYPE AF IN CORRIDOR	2-BUTTON STATION FOR ALL ON / ALL OFF FUNCTION	1,3
AREA A / A-102	D1	a	PUSH BUTTON	LCP-9	CONTROLLING FIXTURE TYPE AF IN CORRIDOR	2-BUTTON STATION FOR ALL ON / ALL OFF FUNCTION	1,3

GENERAL NOTES:

1. FACEPLATE SHALL MATCH COLOR OF OTHER WIRING DEVICES.
2. ALL DIMMERS SHALL BE CAPABLE OF CONTROLLING 0-10V DRIVERS. SEE LUMINAIRE SCHEDULE FOR ADDITIONAL INFORMATION.

KEYED NOTES:

1. ALLOW EMERGENCY LIGHTING TO BE CONTROLLED WITH NORMAL LIGHTS VIA PT DEVICES.
2. DAYLIGHT SENSOR OVERRIDE.
3. OCCUPANCY SENSOR OVERRIDE.

LIGHTING CONTROL PANEL SCHEDULE (LCP)

RELAY NUMBER	RELAY TYPE POLES	RELAY TYPE VOLTAGE	RELAY TYPE SIZE	CIRCUIT	OVERRIDE DEVICE	KEYED NOTE
1	1	277V	20A	HG-2Ra; INV-1a	LV A, LV A1, DS, OS	1
2	1	277V	20A	HG-2Rb	LV A, LV A1, OS	
3	1	277V	20A	HG-2Ra; INV-1a	LV B, LV B1, OS	1
4	1	277V	20A	HG-4Ra	LV C, LV C1, LV C2, DS, OS	
5	1	277V	20A	HG-4Rb; INV-2b	LV C, LV C1, LV C2, DS, OS	1
6	1	277V	20A	HG-4Rc	LV C, LV C1, LV C2, DS, OS	
7	1	277V	20A	HG-4Rd; INV-2d	LV C, LV C1, LV C2, DS, OS	1
8	1	277V	20A	HG-4Re; INV-2e	LV C, LV C1, LV C2, DS, OS	1
9	1	277V	20A	HG-2Ra; INV-1a	LV D, LV D1, OS	1
10	1	277V	20A	HG-6Ra; INV-3a	PE	1
11	1	277V	20A	SPARE		
12	1	277V	20A	SPARE		
13	1	277V	20A	SPARE		
14	1	277V	20A	SPARE		
15	1	277V	20A	SPARE		
16	1	277V	20A	SPARE		

GENERAL NOTES:

1. SITE LIGHTING TO TURN ON AT MIDNIGHT.
2. INTERIOR BUILDING LIGHTING SHALL BE SCHEDULES TO BE TURNED OFF WITHIN ONE HOUR AFTER END OF SCHOOL DAY. LIGHTS SHALL BLINK 5 MINUTES PRIOR TO SHUTOFF. LV SWITCH OVERRIDE ON FOR 2 HRS.
3. EMERGENCY TRANSFER DEVICES SHALL BE WIRED TO ALLOW EMERGENCY LIGHTS TO BE CONTROLLED WITH NORMAL LIGHTING IN THE SAME SPACES.
4. VERIFY PROGRAMMING WITH OWNER.
5. ALL RELAYS SHALL BE CAPABLE OF CONTROLLING 0-10 VOLT DIMMING DRIVERS.

KEYED NOTES:

1. EMERGENCY CIRCUIT IS WIRED VIA PT DEVICE TO ALLOW LIGHTS TO BE SWITCHED TOGETHER WITH NORMAL LIGHTING. NOTE THAT EMERGENCY CIRCUIT SHALL NOT BE WIRED THROUGH RELAY PANEL AND SHOWN FOR INFORMATIONAL PURPOSES ONLY.

ABBREVIATIONS:

LVx - LOW VOLTAGE SWITCH (x=SWITCH NUMBER)
PE - EXTERIOR PHOTOEYE
DS - DAYLIGHT SENSOR
OS - OCCUPANCY SENSOR
TS - TIME SCHEDULE BY CONTROL PANEL
S - STANDARD LINE VOLTAGE SWITCH

LUMINAIRE SCHEDULE

NOTE: SEE SPECIFICATION FOR ADDITIONAL INFORMATION REGARDING LUMINAIRE AND INSTALLATION REQUIREMENTS. PROVIDE OPTIONS AND ACCESSORIES REFERENCED BY THE COLUMN TITLED " OPTIONS/ACCESSORIES". MANUFACTURERS LISTED ACCEPTABLE SHALL MEET ALL REQUIREMENTS AND FEATURES INDICATED. ACCEPTABLE MANUFACTURERS MUST MEET THE PHOTOMETRIC PERFORMANCE OF THE LISTED UNIT.

ABBREVIATIONS: GWB = GYPSUM WALL BOARD; ES = EXPOSED STRUCTURE; LG = LAY-IN GRID; P = PENDANT; PLAS = PLASTER; PL = POLE MOUNTED; R = RECESSED; S = SURFACE; UNV = UNIVERSAL VOLTAGE; V = VARIES; W = WALL MOUNTED

DES.	MANUFACTURER	CATALOG SERIES	DESCRIPTION	LAMP DATA	VOLTAGE	BALLAST/ DRIVER	MOUNT	CEILING TYPE	FIXTURE DEPTH	LED SYSTEM INPUT WATTAGE	LED DELIVERED LUMENS	OPTIONS / ACCESSORIES	ACCEPTABLE MANUFACTURERS	KEYED NOTE
Y	ETC	BS-D-B-F	BLUE DOME LUMINAIRE	LED	UNV	DMX	W	-	1.42"	3	-			
Z	FAIL-SAFE	HVSL4-LD4-2-STD-50-UNV-EDC1-ALHA	4" X 4' LED VANDAL RESISTANT LINEAR	LED, 5000K	UNV	H	W	-	3.31"	67.6	6,541			
OA	LF ILLUMINATION	5911-1AA-T-13C-8040-M-DMU-SS	5" DIAMETER EXTERIOR LED DOWNLIGHT	LED, 4000K	UNV	D	R	PLAS	7.36"	13	1,506	38		
OB	FC LIGHTIING	FCB8C-UNV-39-LED-4K-1 464-BZ-LD	7.87" DIAMETER LED EXTERIOR BOLLARD	LED, 4000K	UNV	A	S	-	39-1/2"	30	1,610	38		
OC	RAB LIGHTING	WPLED26N	EXTERIOR LED WALL PACK	LED, 4000K	UNV	A	W	-	9-1/4"	26	3,527	38		
OD	AMETRIX	ASYX-WM-S-L-OD-U-W-1-UNV-Z-C-STD-FM	EXTERIOR LED INDERIECT WALL PACK	LED, 4000K	UNV	A	W	-	12-3/4"	28	3,355	38		
OF	BEGA LIGHTING	33 050-K4-BLK	13" X 5" LOUVERED & GASKETED LED RECESSED STEP LIGHT	LED, 4000K	UNV	D	W	-	5-1/2"	8	62	38		
OH	BARRON LIGHTING	TLED-RC-20-VS-LG-WW	16" X 16" RECESSED DOWNLIGHT	LED, 4000K	UNV	D	R	PLAS	3.45"	23	2,320	38		
EBU	SURE-LITES	APLEL	EMERGENCY BATTERY UNIT	LED	UNV	-	W	-	2-5/8"	2.5	125 / HEAD	15		
EBU/B	SURE-LITES	SEL-50-BK-SD	EMERGENCY BATTERY UNIT (BLACK HOUSING)	LED	UNV	-	W	-	1-3/4"	2.5	219 / HEAD			
EX/EBU	ISOLIT	ELED-EM-BZ-IH	EXTERIOR RATED EMERGENCY BATTERY UNIT	LED	UNV	-	W	-	3.78"	11	1,050			
X1	SURE-LITES	APXH7-R	SINGLE FACE LED EXIT SIGN	LED	UNV	-	V	V	7-5/8"	2.5	-			
X2	SURE-LITES	APXH7-R	DOUBLE FACE LED EXIT SIGN	LED	UNV	-	V	V	7-5/8"	2.5	-			
X1/EBU	SURE-LITES	APC7R	COMBINATION SINGLE FACE LED EXIT SIGN / EMERGENCY BATTERY UNIT	LED	UNV	-	W	-	8-1/4"	2.5	125 / HEAD			

OPTIONS/ACCESSORIES CODE LISTING:

13 DAMP LOCATION LISTED
38 WET LOCATION LISTED

BALLAST/DRIVER CODE LISTING: (SEE SPECIFICATIONS)

A LED DIMMABLE POWER SUPPLY (0-10V, 10%).
B LED DIMMABLE POWER SUPPLY (0-10V, 1%).
C LED DIMMABLE POWER SUPPLY (0-10V, 5%).
D LED DIMMABLE POWER SUPPLY (0-10V).
E LED DIMMABLE POWER SUPPLY (TRAILING EDGE).
F LED DIMMABLE POWER SUPPLY 1% DIMMING LUTRON HI LUME OR EQUAL.
G LED DIMMABLE POWER SUPPLY ADVANCE XITANIUM OR EQUAL.
H LED NON-DIMMABLE POWER SUPPLY.

GENERAL NOTES:

1. ALL LED REPLACEMENT LAMPS SHALL BE TESTED FOR DIMMING COMPATABILITY WITH DIMMING SYSTEM BEING SUPPLIED. CONTRACTOR SHALL PROVIDE MINIMUM OF (4) FOUR LAMPS OF EACH TYPE LISTED IN THIS SCHEDULE OR ANY SUBSTITUTE TO BE SUPPLIES TO DIMMING SYSTEMS/DEVICE MANUFACTURER FOR TESTING TO VERIFY LAMP PERFORMANCE.
2. EC SHALL VERIFY AND COORDINATE ALL LUMINAIRE TRIMS/FLANGES WITH RESPECTIVE CEILING TYPES SCHEDULED AND/OR SUBMITTED BY THE GC PRIOR TO ORDERING OF THE LUMINAIRES. SCHEDULE INDICATES TRIM TYPES BASED ON THE GENERIC CEILING INFORMATION AVAILABLE AT THE TIME BIDDING DOCUMENTS WERE ISSUED AND DOES NOT REFLECT ACTUAL THICKNESS OF GYPSUM WALL BOARD OR PLASTER CEILING OR EXACT GRID TYPE SPECIFIED BY THE ARCHITECT.

KEYED NOTES:

1. PROVIDE WITH TECH LIGHTING MONORAIL SINGLE CIRCUIT TRACK WITH 4" ROUND SATIN NICKEL POWER FEED CANOPY. TRACK SHALL BE SURFACE MOUNTED AND PROVIDE SATIN NICKEL RIGID STANDOFFS AS REQUIRED TO ALLOW ROUND TRACK SYSTEMS TO OVERLAP AS SHOWN ON THE LIGHTING PLANS. FIELD VERIFY AND PROVIDE EXACT LENGTH OF TRACK AND CURRENT LIMITER REQUIRED TO ACCOMMODATE THE DESIGNED LOCATION AND LENGTH SHOWN ON LIGHTING PLANS. PROVIDE ALL ACCESSORIES REQUIRED TO CREATE A COMPLETE AND OPERATIONAL SYSTEM.
2. PROVIDE WITH HALO LAZER SINGLE CIRCUIT TRACK. TRACK WILL BE SURFACE MOUNTED. FIELD VERIFY AND PROVIDE EXACT LENGTH OF TRACK AND CURRENT LIMITER REQUIRED TO ACCOMMODATE THE DESIGNATED LOCATION AND LENGTH SHOWN ON LIGHTING PLANS. PROVIDE ALL ACCESSORIES REQUIRED TO CREATE A COMPLETE AND OPERATIONAL SYSTEM.
3. PROVIDE STEM LENGTH AS REQUIRED TO ALLOW FIXTURE TO BE MOUNTED AT THE HEIGHTS SHOWN ON THE LIGHTING PLANS.

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MARK	DATE

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SHEET TITLE: SCHEDULES

SHEET NUMBER: 2-EE-602

Stage Lighting Contractor, Electrical Contractor, Structural Steel Contractor Relationship

Stage Lighting System

Items or Components to provide/install	Electrical Contractor to FURNISH	Electrical Contractor to INSTALL	Electrical Contractor to WIRE	Stage Curtain Contractor to FURNISH	Stage Curtain Contractor to INSTALL	Stage Lighting Supplier to FURNISH	Stage Lighting Supplier to INSTALL	Stage Lighting Supplier to WIRE
Dimming and Control Equipment		X	X			X		
Dimmer Equipment Rack Power Disconnects	X	X	X					
Dimmer Equipment Load Centers and Branch Breakers	X	X	X					
Dimming Equipment Racks		X	X			X		
Dimmer Equipment Rack Feeder Conduit & Wiring	X	X	X					
Dimmer Equipment Control Stations & Faceplates		X	X			X		
Dimmer Equipment Control Station Back Boxes/Conduit and Wiring	X	X	X					
Dimming and Control Pull Boxes	X	X	X					
Dimmer Equipment Rack Electrical Load wiring & Conduit	X	X	X					
Dimmer Equipment Connector Strip Raceways, Grid Boxes, Plug Boxes		X	X			X		
Lighting Position Pipes on Stage				X	X			
Portable Theatre Lighting Equipment & Accessories						X	X	
Dimming System Data Cabling (CAT5e) and Terminations	X	X						X
Kellems Strain Relief, SO Multiconductor Cables (for Lineset #24 only)	X	X	X					

TRACK SCHEDULE

Set Name	Dist. From Plasterline (ft.)	Type	Finish	No. of Pieces	Length each	Mounting
Main Draw	1.5	H&H 410S Track	Mill	2	24'0"	Pipe hangers to brackets
Midstage Draw	13.5	H&H 410S Track	Mill	2	24'0"	Pipe hangers to brackets
Rear Draw	26.25	H&H 410S Track	MIll	2	24'0"	Pipe hangers to brackets

CURTAIN SCHEDULE

Position	Set Name	Material	Color	Qty	Finish Height	Finish Width	Sewing Instructions	Top Finish	Bottom Finish
1	Main Valance	23.5 - 24.5 oz. Charisma IFR Velour	TBD	1	3'-0"	42'-0"	Sewn with 50% fullness with 3" turnbacks	Grommets, polypro webbing, and ties	5-Inch hem
2	Main Draw	23.5 - 24.5 oz. Charisma IFR Velour	TBD	2	13'0"	24'-0"	Sewn with 50% fullness with 12" turnback onstage and 3" offstage	Grommets, polypro webbing, and bitsnaps	5-Inch hem with internal chain weight.
4	Border #1	18 - 20 oz. Crescent IFR Velour	Black	1	3'-0"	52'-0"	Sewn flat with 3" turnback	Grommets, polypro webbing, and ties	Pipe pocket for 1/2" wt. pipe
5	Leg #1	18 - 20 oz. Crescent IFR Velour	Black	2	13'0"	6'-0"	Sewn Flat with 3" turnback / grommet for 50% fullness	Grommets, polypro webbing, and ties	5-Inch hem with internal chain weight.
7	Border #2	18 - 20 oz. Crescent IFR Velour	Black	1	3'-0"	52'-0"	Sewn flat with 3" turnback	Grommets, polypro webbing, and ties	Pipe pocket for 1/2" wt. pipe
8	Legs #2	18 - 20 oz. Crescent IFR Velour	Black	2	13'0"	6'-0"	Sewn Flat with 3" turnback / grommet for 50% fullness	Grommets, polypro webbing, and ties	5-Inch hem with internal chain weight.
9	Midstage Draw	18 - 20 oz. Crescent IFR Velour	Black	2	13'0"	24'-0"	Sewn with 50% fullness with 12" turnback onstage and 3" offstage	Grommets, polypro webbing, and bitsnaps	5-Inch hem with internal chain weight.
11	Border #3	18 - 20 oz. Crescent IFR Velour	Black	1	3'-0"	52'-0"	Sewn flat with 3" turnback	Grommets, polypro webbing, and ties	Pipe pocket for 1/2" wt. pipe
12	Legs #3	18 - 20 oz. Crescent IFR Velour	Black	2	13'0"	6'-0"	Sewn Flat with 3" turnback / grommet for 50% fullness	Grommets, polypro webbing, and ties	5-Inch hem with internal chain weight.
13	Rear Draw	18 - 20 oz. Crescent IFR Velour	Black	2	13'0"	24'-0"	Sewn with 50% fullness with 12" turnback onstage and 3" offstage	Grommets, polypro webbing, and bitsnaps	5-Inch hem with internal chain weight.
15	Cyclorama	Poly Muslin	Grey	1	14'-0"	48'-0"	Sewn Flat with 3" turnback	Grommets, polypro webbing, and ties	Lined Pipe pocket for 1/2" wt. pipe
	SR Tab Curtain	18 - 20 oz. Crescent IFR Velour	Black	1	13'0"	6'-0"	Sewn Flat with 3" turnback / grommet for 50% fullness	Grommets, polypro webbing, and bitsnaps	5-Inch hem with internal chain weight.

Position	Set Name	Dist. From Plasterline (ft)	Type	Attaches to	Batten Length	# Lines	Misc.
1	Main Valance	0"	Deadhung	1 1/2" Sched 40 pipe	42	6	
2	Main Draw	1'-4"	Deadhung	H&H 400 Series track	42	6	
3	1st Electric	3'-4"	Deadhung	1 1/2" Sched 40 pipe	40	6	
4	Border #1	5'-4"	Deadhung	1 1/2" Sched 40 pipe	40	6	1/2" weight pipe
5	Leg #1	7'-4"	Deadhung	1 1/2" Sched 40 pipe	42	6	
6	2nd Electric	9'-4"	Deadhung	1 1/2" Sched 40 pipe	42	6	
7	Border #2	11'4"	Deadhung	1 1/2" Sched 40 pipe	42	6	1/2" weight pipe
8	Leg #2	13'4	Deadhung	1 1/2" Sched 40 pipe	42	6	
9	Mid-stage Draw	15'4	Deadhung	H&H 400 Series track	42	6	
10	3rd Electric	17'4	Deadhung	1 1/2" Sched 40 pipe	42	6	
11	Border #3	19'4	Deadhung	1 1/2" Sched 40 pipe	42	6	1/2" weight pipe
12	Leg #3	21'10	Deadhung	1 1/2" Sched 40 pipe	42	6	
13	Rear Draw	34'8	Deadhung	H&H 400 Series track	42	6	
14	Cyc Electric	31'7	Deadhung	1 1/2" Sched 40 pipe	42	6	
15	Cyclorama	33'7	Deadhung	1 1/2" Sched 40 pipe	42	6	1/2" weight pipe

Contact theatrical rigging consultant immediately if there are location issues as...
Line sets must be located as indicated on this schedule.

Stage Curtain Contractor, Stage Lighting Contractor, Electrical Contractor, Structural Steel Contractor Relationship

Stage Rigging System

Items or Components to provide/install	Electrical Contractor to FURNISH	Electrical Contractor to INSTALL	Electrical Contractor to WIRE	Stage Lighting Contractor to FURNISH	Stage Curtain Contractor to FURNISH	Stage Curtain Contractor to INSTALL	Struct. Steel Contractor to FURNISH	Struct. Steel Contractor to INSTALL
Curtain and Track System					X	X		
Electrical Distribution		X	X	X				
Kellems Strain Relief, SO Multiconductor Cables	X	X	X					
Lighting Position Pipes on Stage				X	X			
All Rigging Support Steel and Bracing							X	X

Theatrical Power Control Equipment Schedule
Theatrical Fixture Load - ETC Sensor IQ48 with 200A MCB

Label	Location	Total Circuits	Stagepin Connectors	Circuit #	Edison Connectors	Circuit #	Notes
PB1	FOH	2	2 - 24" pigtail	1,2	1-flush Edison	29	Mount to FOH Pipe
PB2	FOH	2	2 - 24" pigtail	3,4	1-flush Edison	30	Mount to FOH Pipe
PB3	1st Electric	3	2 - 24" pigtail	5,6	1-flush Edison	31	Mount to 1st Pipe
PB4	1st Electric	2	2 - 24" pigtail	7,8	1-flush Edison	32	Mount to 1st Pipe
PB5	2nd Electric	3	2 - 24" pigtail	9,10	1-flush Edison	33	Mount to 2nd Pipe
PB6	2nd Electric	3	2 - 24" pigtail	11,12	1-flush Edison	34	Mount to 2nd Pipe
PB7	3rd Electric	2	2 - 24" pigtail	13,14	1-flush Edison	35	Mount to 3rd Pipe
PB8	3rd Electric	2	2 - 24" pigtail	15,16	1-flush Edison	36	Mount to 3rd Pipe
PB9	Cyc	2	2 - 24" pigtail	17,18	1-flush Edison	37	Mount to Cyc Pipe
WP1	DSR	2	2 - 18" pigtail stagepin	21,22	1-flush Edison	38	Surface Mount Box
WP2	DSL	2	2 - 18" pigtail stagepin	23,24	1-flush Edison	38	Surface Mount Box
WP3	USR	2	2 - 18" pigtail stagepin	25,26	1-flush Edison	39	Surface Mount Box
WP4	USL	2	2 - 18" pigtail stagepin	27,28	1-flush Edison	39	Surface Mount Box

Dimming System - Data

Label	Signal	Location	Wire Type	Description	Mounting	Box Type	Notes
N1	Network	Control Room (A204)	(2) Belden 1583A	(2) Net Jacks	Surface-mount backbox by...	(1) Two gang backbox	
N2	Network						
N6	Network	Sound Desk (A114)	(2) Belden 1583A	(2) Net Jacks	Surface-mount backbox by...	(1) Two gang backbox	
N7	Network						
D1	DMX	PB1	Belden 1583A	Net Jack	(2) U-Bolt Assemblies for Box	In Plug Box	IDC Connectors
D2	DMX	PB3	Belden 1583A	Net Jack	(2) U-Bolt Assemblies for Box	In Plug Box	IDC Connectors
D3	DMX	PB5	Belden 1583A	Net Jack	(2) U-Bolt Assemblies for Box	In Plug Box	IDC Connectors
D4	DMX	PB7	Belden 1583A	Net Jack	(2) U-Bolt Assemblies for Box	In Plug Box	IDC Connectors
D5	DMX	PB9	Belden 1583A	Net Jack	(2) U-Bolt Assemblies for Box	In Plug Box	IDC Connectors
D6	DMX	WP1	Belden 1583A	Net Jack	Surface-mount backbox by Stage Lighting Supplier	In Surface Box	IDC Connectors
D7	DMX	WP2	Belden 1583A	Net Jack	Surface-mount backbox by Stage Lighting Supplier	In Surface Box	IDC Connectors

Label	Signal	Location	Wire Type	Relay Circuit	Mounting	Box Type	Notes
LV	0-10V	House Lights	MCLED	40	ceiling	N/A	see note 2
LV	0-10V	House Lights	MCLED	41	ceiling	N/A	see note 2
LV	0-10V	House Lights	MCLED	42	ceiling	N/A	see note 2
LV	0-10V	House Lights	MCLED	43	ceiling	N/A	see note 2
LV	0-10V	House Lights	MCLED	44	ceiling	N/A	see note 2
LV	0-10V	House Lights	MCLED	45	ceiling	N/A	see note 2
LV	0-10V	House Lights	MCLED	46	ceiling	N/A	see note 2
LV	0-10V	House Lights	MCLED	47	ceiling	N/A	see note 2
LV	DMX	Stage blue lights	Belden 1583A	48	stage wall	N/A	see note 1

NOTE: 1. All data wire must be run in conduit. No splices. Belden 1583A wire for CRP stations follows typical network rules and homeruns to the equipment rack.
2. All home runs shall be installed in conduit, MCLED cables for huse lights are allowed from the common box to the fixture - line voltage and control 0-10 wiring between panel and boxes shall be installed in a separate raceways.

Dimming System - Architectural Control

Label	Location	Wire Type	Description	Mounting
ES1	Vestibule HL Rear	Belden 8471 + (1) #14AWG	5 button entry station	Surface
ES2	Vestibule HR Rear	Belden 8471 + (1) #14AWG	5 button entry station	Flush
ES3	Vestibule 6	Belden 8471 + (1) #14AWG	5 button entry station	Flush
ES4	Vestibule HR	Belden 8471 + (1) #14AWG	5 button entry station	Flush
ES5	Vestibule 9	Belden 8471 + (1) #14AWG	5 button entry station	Flush

NOTE: All data wire must be run in conduit. No splices. Belden 1583A wire for CRP stations follows typical network rules and homeruns to the equipment rack. Belden 8471 wire for ES stations is topology free.

NOTE: All ES & SMP control stations to be mounted at standard switch height.

THEATRICAL LIGHTING SYSTEM NOTES:

1. ALL DEVICES SHALL BE PROVIDED BY THEATRICAL LIGHTING DEALER UNLESS OTHERWISE NOTED:
2. ALL DIMMED CIRCUITS MUST BE TWO WIRE. NO SHARED NEUTRALS SHALL BE PERMITTED.
4. FOR THEATRES, NEC 2014 ARTICLE 520.6 EXCEPTS THE STANDARD 30 CONDUCTOR WIREWAY FILL...
5. FOR FIXED STAGE EQUIPMENT, NEC 2014 ARTICLE 520.42 SPECIFIES THE CONDUCTOR INSULATION AND DERATING REQUIREMENTS.
6. ELECTRICAL CONTRACTOR SHALL PROVIDE ALL 0-10V CONTROL WIRING. CONTROL WIRING REQUIREMENTS VARY GREATLY AMONG MANUFACTURERS, ELECTRICAL CONTRACTOR SHALL OBTAIN CONTROL WIRING REQUIREMENTS FROM THEATRICAL LIGHTING MANUFACTURER PRIOR TO BID AND INSTALLATION. ELECTRICAL CONTRACTOR SHALL OBTAIN SHOP DRAWINGS FROM THEATRICAL LIGHTING MANUFACTURER PRIOR TO SIZING OR ROUTING ANY CONTROL SYSTEM CONDUITS.
7. ALL NETWORK AND / OR DMX WIRING RUNS SHALL BE CONTINUOUS AND WITHOUT BREAKS OR...
8. ALL NETWORK WIRING RUNS SHALL BE CATEGORY 5E, 100 BASE T AND CONFORM TO THE ESTA (Entertainment Services & Technology Association) RECOMMENDED PRACTICE FOR ETHERNET CABLING IN ENTERTAINMENT LIGHTING APPLICATIONS.

GENERAL NOTES:

A. INSTALLATION SHALL CONFORM TO ALL APPLICABLE NEC, UL, STATE AND LOCAL CODES.
B. ALL DIMMING CIRCUITS ARE TWO-WIRE. NO COMMON NEUTRALS SHALL BE USED.

CONTROL WIRING LEGEND

SYMBOL	WIRE TYPE(S)	SIGNAL
U*	(1) BELDEN 8471 + (1) #14AWG	UNISON
P*	(2) #15 AWG STRANDED WIRES	PANIC
D*	(1) BELDEN #1583A	DMX
N*	(1) BELDEN #1583A	NETWORK
LV*	0-10Volt control wiring	LOW VOLTAGE
* = WIRE IDENTIFICATION NUMBER (NOT QUANTITY)		

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MARK	DATE

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SHEET TITLE:
SCHEDULES

SHEET NUMBER:
2-EE-603

ELECTRICAL EQUIPMENT WIRING SCHEDULE

STARTER/DISCONNECT TYPE:			KEY:
MX - MANUAL MOTOR SWITCH	2SP - 2 SPEED, 2 WINDING	ECB - ENCLOSED CIRCUIT BREAKER	MFR - MANUFACTURER
MS - MANUAL MOTOR STARTER (W/OVERLOAD RELAYS)	SW - 2 SPEED, 1 WINDING		F- FUSED
YD - WYE- DELTA	CS - COMBINATION MAGNETIC CONTROLLER		NF - NON-FUSED
FV - FULL VOLTAGE	FS - FUSED SWITCH		EC - ELECTRICAL CONTRACTOR
SS - REDUCED VOLTAGE, SOLID STATE	VFD - VARIABLE FREQUENCY DRIVE		MC - MECHANICAL CONTRACTOR
RE - REVERSING	RVS - REDUCED VOLTAGE (MAGNETIC)		PC - PLUMBING CONTRACTOR

EQUIPMENT	EQUIPMENT DESCRIPTION	LOCATION	LOAD					EQUIPMENT		BRANCH WIRING				STARTER			DISCONNECT TYPE AND RATING				KEYED NOTE
			KW	HP	FLA (AMPS)	MCA (AMPS)	MOCP (AMPS)	VOLTS	PHASE	NO.	SIZE	GND.	C	TYPE	NEMA SIZE	FURNISHED/ INSTALLED BY	TYPE	SIZE / FUSE	NEMA ENCLOSURE	FURNISHED/ INSTALLED BY	
AC-1	AIR COMPRESSOR	F-326		3				240	3	3	12	12	3/4"			EXISTING/EC	NF	30A	NEMA 1	EC/EC	
ACCU-1	AIR COOLED CONDENSING UNIT	ROOF				13	30	208	1	2	10	10	3/4"			INTEGRAL				INTEGRAL	8
ACU-1	DUCTLESS SPLIT INDOOR UNIT	LL-103				13	20	208	1	2	10	10	3/4"			INTEGRAL				INTEGRAL	8
ADO	AUTO DOOR OPERATOR	VARIES	0.5					120	1	2	12	12	1/2"								1
CP-1	CIRCULATION PUMP	LL-115																			
CR	CEILING RECEPTACLE	VARIES	0.5					120	1	2	10	10	1/2"								2
CUH	CABINET UNIT HEATER	VARIES		1/12				120	1	2	12	12	1/2"			INTEGRAL				INTEGRAL	
DC	DROP CORD	VARIES	0.5					120	1	2	12	12	1/2"								
DC	DIGITAL CLOCK	VARIES	0.1					120	1	2	12	12	1/2"							RECEPTACLE	
DC-1	DUST COLLECTOR	SITE		7-1/2				480	3	3	10	10	3/4"			MC/EC				MC/EC	13
DF-1	DESTRATIFICATION FAN	LL-104		3/4				480	3					VFD		INTEGRAL				INTEGRAL	8
DF-2	DESTRATIFICATION FAN	A-100		3/4				480	3					VFD		INTEGRAL				INTEGRAL	8
ECL	ELEVATOR CAB LIGHT...	LL-103	.05					120	1	2	12	12	1/2"								
EF-10	EXHAUST FAN	ROOF		1/4				120	1	2	12	12	1/2"			INTEGRAL				INTEGRAL	
EF-11	EXHAUST FAN	ROOF		1/2				120	1	2	12	12	1/2"			INTEGRAL				INTEGRAL	
EF-12	EXHAUST FAN	ROOF		1/2				120	1	2	12	12	1/2"			INTEGRAL				INTEGRAL	
EF-13	EXHAUST FAN	ROOF		1/4				120	1	2	12	12	1/2"			INTEGRAL				INTEGRAL	
EF-14	EXHAUST FAN	ROOF		1/4				120	1	2	12	12	1/2"			INTEGRAL				INTEGRAL	
EH	KITCHEN EXHAUST HOOD	F-130	1.5					120	1	2	10	10	1/2"								
ELEV	ELEVATOR	LL-103		40				480	3	3	1	8	2"								3
ESP-1	SUMP PUMP	PIT																			
FACP	FIRE ALARM CONTROL PANEL	E-039	1.0					120	1	2	12	12	1/2"								
FH	FUME HOOD	VARIES	1.0					120	1	2	12	12	1/2"								
KH	KITCHEN EXHAUST HOOD	VARIES	1.0					120	1	2	12	12	1/2"								10
FSD	FLAT SCREEN SCREEN	VARIES	0.5					120	1	2	12	12	1/2"								
FW	FIRE WALL	C-101	1.0					120	1	2	12	12	1/2"								6
GWH	GAS WATER HEATER	LL-115	0.25					120	1	2	12	12	1/2"							RECEPTACLE	
PROJECTOR	PROJECTOR	VARIES	1.0					120	1	2	12	12	1/2"								
REF-2	ROOF EXHAUST FAN	ROOF		1				480	3	3	12	12	3/4"	CS	NEMA 3R	EC/EC				EC/EC	12
RTU-17	ROOFTOP UNIT	ROOF					30	480	3	3	12	12	3/4"	VFD		INTEGRAL	F	60A/30A	3R	EC/EC	
RTU-18	ROOFTOP UNIT	ROOF					50	480	3	3	6	10	1"	VFD		INTEGRAL	F	60A/50A	3R	EC/EC	
RTU-19	ROOFTOP UNIT	ROOF					30	480	3	3	10	10	1"	VFD		INTEGRAL	F	60A/30A	3R	EC/EC	
RTU-20	ROOFTOP UNIT	ROOF					30	480	3	3	10	10	1"	VFD		INTEGRAL	F	60A/30A	3R	EC/EC	
RTU-21	ROOFTOP UNIT	ROOF					50	480	3	3	6	10	1"	VFD		INTEGRAL	F	60A/50A	3R	EC/EC	
RTU-22	ROOFTOP UNIT	ROOF					15	480	3	3	12	12	3/4"	VFD		INTEGRAL	F	30A/15A	3R	EC/EC	
RTU-23	ROOFTOP UNIT	ROOF					30	480	3	3	10	10	1"	VFD		INTEGRAL	F	60A/30A	3R	EC/EC	
RTU-PE	RTU POWER EXHAUST KIT	ROOF		1				480	3	3	12	12	3/4"			INTEGRAL	F	30A/15A	3R	EC/EC	11
RTU-REC	ROOFTOP UNIT RECEPTACLE	VARIES	0.18					120	1	2	12	12	1/2"								7
SCREEN	PROJECTION SCREEN	VARIES	0.2					120	1	2	12	12	1/2"							INTEGRAL	4
SMART	SMART BOARD	VARIES	0.5					120	1	2	12	12	1/2"								
TCP	TEMPERATURE CONTROL PANEL	VARIES	1.0					120	1	2	12	12	1/2"								
UH	UNIT HEATER	VARIES		1/12				120	1	2	12	12	1/2"			INTEGRAL				INTEGRAL	
WHRLPL	WHIRLPOOL	LL-121	0.85					120	1	2	12	12	1/2"							GFCI...	5
WLD	WELDING OUTLET	F-326			40A			240	1	2	8	10	3/4"								

EQUIPMENT SCHEDULE GENERAL NOTES:

1. ALL WORK BY THIS CONTRACTOR TO COMPLY WITH ALL LOCAL, STATE AND NATIONAL ELECTRICAL CODES.
2. THIS CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATION WITH OTHER TRADES TO AVOID CONFLICTS AND TO VERIFY ALL EQUIPMENT CONNECTIONS AND FOR COMPLETE INSTALLATION.
3. THIS CONTRACTOR SHALL BE RESPONSIBLE FOR INSTALLING A COMPLETE ELECTRICAL SYSTEM PER CONTRACT DRAWINGS AND ENSURING THAT THE SYSTEM IS OPERATIONAL UPON JOB COMPLETION.
4. PROVIDE ALL POWER WIRING INCLUDING ALL CIRCUITRY CARRYING ELECTRICAL ENERGY FROM PANELBOARD OR OTHER SOURCE THROUGH STARTERS AND DISCONNECTS TO MOTORS, PACKAGED EQUIPMENT OR PACKAGED CONTROL PANELS. PROVIDE ALL WIRING BETWEEN CONTROL PANELS AND MOTORS. INCLUDE STARTERS, DISCONNECTS AND OVERLOAD PROTECTION IF NOT INCLUDED HVAC SPECIFICATION. COORDINATE WITH HVAC SPECIFICATIONS.
5. MOTORS CONNECTED TO EMERGENCY SYSTEMS CIRCUITRY SHALL HAVE CIRCUITRY INSTALLED IN SEPARATE RACEWAY PER NEC ARTICLE 700.
6. THIS CONTRACTOR SHALL VERIFY WITH MECHANICAL CONTRACTOR, ELECTRICAL REQUIREMENTS INCLUDING VOLTAGES, HORSE POWER, DISCONNECTING MEANS, STARTERS FOR MOTORS AND EQUIPMENT PRIOR TO ORDERING CIRCUIT BREAKERS, FUSIBLE SWITCHES AND STARTERS.
7. ALL INTERLOCKING REQUIRED BY THE DRIVE MANUFACTURER BETWEEN THE VARIABLE FREQUENCY DRIVE AND THE DISCONNECT SWITCHES SHALL BE THE RESPONSIBILITY OF THE ELECTRICAL CONTRACTOR.

EQUIPMENT SCHEDULE KEYED NOTES:

1. AUTO DOOR OPERATOR SHALL BE FURNISHED AND INSTALLED BY GC, WIRED BY DIVISION 26. DOOR OPERATOR PUSH PLATE WIRING AND RACEWAYS SHALL BE PROVIDED BY DIVISION 26. COORDINATE EXACT REQUIREMENTS AND LOCATIONS WITH GC.
2. INSTALL DUPLEX RECEPTACLE HORIZONTALLY ON STRUCTURAL TRUSS. RECEPTACLE SHALL BE INSTALLED ON TOP OF THE BOTTOM CHORD OF TRUSS. PROVIDE RECEPTACLES IN WEATHERPROOF IN-USE COVERS IN AG LAB F-331.
3. SEE DETAIL 2 ON SHEET 2-EE-501 FOR MORE INFORMATION ON ELEVATOR DISCONNECT REQUIREMENTS.
4. PROJECTION SCREEN FURNISHED WITH LOW VOLTAGE UP/DOWN CONTROL. EC SHALL INSTALL CONTROL DEVICE AND PROVIDE ASSOCIATED RACEWAY AND LOW VOLTAGE WIRING (2#14) TO ACCOMMODATE SCREEN CONTROL.
5. COORDINATE EXACT CONNECTION REQUIREMENTS WITH ACTUAL FURNISHED WHIRLPOOL PRIOR TO RACEWAY ROUGH-IN AND NOTIFY A/E IF CONNECTION REQUIRED IS DIFFERENT THAN SPECIFIED.
6. EQUIPMENT SUPPLIED WITH LOOSE-SHIPPED MANUAL OVERRIDE DEVICE. EC SHALL MOUNT AND WIRE DEVICE PER MANUFACTURER'S REQUIREMENTS.
7. RECEPTACLE PROVIDED INTEGRAL TO ROOFTOP UNIT BY MANUFACTURER.
8. PROVIDE REMOTE MOUNTED KEYED SWITCH WITH 2#12 FOR REMOTE ON/OFF CONTROL. SEE PLANS FOR EXACT LOCATIONS OF SWITCHS.
9. PROVIDE SINGLE POINT CONNECTION TO OUTDOOR UNIT. INDOOR UNIT SHALL BE POWERED FROM OUTDOOR CONDENSING UNIT. PROVIDE ALL INTERCONNECTION POWER WIRING BETWEEN INDOOR AND OUTDOOR UNITS.
10. FUME HOOD PROVIDED WITH INTEGRAL CONTACTOR TO SHUNT ELECTRIC RANGE UPON HOOD SUPPRESSION DISCHARGE. POWER TO RANGE DIRECTLY BELOW HOOD SHALL BE ROUTED THROUGH HOOD CONTACTOR. EC TO PROVIDE ALL INTERCONNECTING WIRING BETWEEN HOOD, SHUNT TRIP, INLINE FAN AND CONTROLS PER MANUFACTURERS REQUIREMENTS.
11. TAP INTO LINE SIDE OF MAIN POWER FEED SERVING RESPECTIVE ROOFTOP UNIT AND EXTEND TO SERVE EXHAUST KIT.

FOR BIDS
NOT FOR CONSTRUCTION

PRELIMINARY
NOT FOR CONSTRUCTION
2019-06-06

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MANAWA

MANAWA ELEMENTARY SCHOOL - ALTERATIONS
MANAWA MIDDLE/HIGH SCHOOL - ADDITIONS & ALTERATIONS
PART 2 - MANAWA MIDDLE / HIGH SCHOOL
515 E. 4th STREET
MANAWA, WI 54949

MARK	DATE
ISSUED:	June 6, 2019
PROJECT NO:	18268
CAD DWG FILE:	
DRAWN BY:	Author
CHECKED BY:	IMR

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SHEET TITLE:
SCHEDULES

SHEET NUMBER:
2-EE-604

Panel AD

Panelboard: Panel AD

Bus Ampacity	400	Volts	208Y/120	Panel Source:	PC
Branch Brkr Space	54 Poles	Phase	3	Feed-Thru Lugs	None
Main Type	MCB	Wires	4		
MCB Amps	250	Delta/Wye	Wye	Sub-Feed Lugs	None
		Mounting	Surface		
		Enclosure	NEMA 4X	Sub-Feed Brkr #1	None
		SCCR	10 kA		
		SE Rated	No	Sub-Feed Brkr #2	None
		Pnl MCA	198 A		

Comments: MAIN BREAKER SHALL BE EQUIPPED WITH SHUNT TRIP

SPD
Iso Grd

Key Note	Load Description	Cct No	Brkr A/P	Left Side A	Left Side B	Left Side C	Right Side A	Right Side B	Right Side C	Brkr A/P	Cct No	Load Description	Key Note
	DISHWASHER	1	20/1	1,200			1,500			20/1	2	EXHAUST HOOD	
	EXHAUST HOOD	3	20/1		1,500			1,500		20/1	4	RECEPTACLE	
	RECEPTACLE	5	20/1			1,500			1,500	20/1	6	RECEPTACLE	
	RECEPTACLE	7	20/1	1,500			1,500			20/1	8	RECEPTACLE	
	RECEPTACLE	9	20/1		1,500			5,500		50/2	10	ELECTRIC RANGE	
	ELECTRIC RANGE	11	50/2			5,500			5,500	|	12	|	
	|	13	|	5,500			1,200			20/1	14	CORD REEL	
	EXHAUST HOOD	15	20/1		1,500			1,200		20/1	16	CORD REEL	
	RECEPTACLE	17	20/1			1,500			1,200	20/1	18	CORD REEL	
	RECEPTACLE	19	20/1	1,500			1,200			20/1	20	CORD REEL	G
	RECEPTACLE	21	20/1		1,500			1,200		20/1	22	CORD REEL	G
	ELECTRIC RANGE	23	50/2			5,500			720	20/1	24	RECEPTACLE	
	|	25	|	5,500			720			20/1	26	RECEPTACLE	
	EXHAUST HOOD	27	20/1		1,500			720		20/1	28	RECEPTACLE	
	RECEPTACLE	29	20/1			1,500			720	20/1	30	RECEPTACLE	
	RECEPTACLE	31	20/1	1,500			720			20/1	32	RECEPTACLE	
	RECEPTACLE	33	20/1		1,500			0			34		
	ELECTRIC RANGE	35	50/2			5,500			0		36		
	|	37	|	5,500			0				38		
	RECEPTACLE	39	20/1		720			0			40		
	RECEPTACLE	41	20/1			360			0		42		
	UH	43	20/1	500			0				44		
		45			0			0			46		
		47				0			0		48		
		49		0			0				50		
		51			0			0			52		
	RTU-REC	53	20/1			360			0		54		

Key Notes:A=HACR G=GFI H=HANDLE LOCK C=THRU CONTACTOR I=ISOLATED GRD S=SHUNT TRIP P=PADLOCK HASP D=HID LIGHTING E=EXISTING

Panel CB

Panelboard: Panel CB

Bus Ampacity	225	Volts	208Y/120	Panel Source:	C
Branch Brkr Space	84 Poles	Phase	3	Feed-Thru Lugs	None
Main Type	MCB	Wires	4		
MCB Amps	150	Delta/Wye	Wye	Sub-Feed Lugs	None
		Mounting	Surface		
		Enclosure	NEMA 1	Sub-Feed Brkr #1	None
		SCCR	10 kA		
		SE Rated	No	Sub-Feed Brkr #2	None
		Pnl MCA	81 A		

Comments:

SPD
Iso Grd

Key Note	Load Description	Cct No	Brkr A/P	Left Side A	Left Side B	Left Side C	Right Side A	Right Side B	Right Side C	Brkr A/P	Cct No	Load Description	Key Note
	EXISTING CIRCUIT	1	20/1	1,080			0			20/2	2	EXISTING CIRCUIT	
	EXISTING CIRCUIT	3	20/1		1,080			0		|	4	|	
	EXISTING CIRCUIT	5	20/1			1,080			0	20/2	6	EXISTING CIRCUIT	
	EXISTING CIRCUIT	7	20/1	1,080			0			|	8	|	
	EXISTING CIRCUIT	9	20/1		1,080			0		30/2	10	EXISTING CIRCUIT	
	EXISTING CIRCUIT	11	20/1			1,080			0	|	12	|	
	EXISTING CIRCUIT	13	20/1	1,080			0			30/2	14	EXISTING CIRCUIT	
	EXISTING CIRCUIT	15	20/1		1,080			0		|	16	|	
	EXISTING CIRCUIT	17	20/1			1,080			0	20/2	18	EXISTING CIRCUIT	
	EXISTING CIRCUIT	19	20/1	1,080			0			|	20	|	
	EXISTING CIRCUIT	21	20/1		1,080			0		20/2	22	EXISTING CIRCUIT	
	EXISTING CIRCUIT	23	20/1			1,080			0	|	24	|	
	EXISTING CIRCUIT	25	20/1	1,080			0			20/1	26	EXISTING CIRCUIT	
	EXISTING CIRCUIT	27	20/1		1,080			0		20/1	28	EXISTING CIRCUIT	
	RECEPTACLES	29	20/1			360			0	30/1	30	EXISTING CIRCUIT	
	FUME HOOD	31	20/1	1,200			0			20/1	32	EXISTING CIRCUIT	
	RECEPTACLES	33	20/1		540			0		20/1	34	EXISTING CIRCUIT	
	RECEPTACLES	35	20/1			1,080			0	20/1	36	EXISTING CIRCUIT	
	COPIER	37	20/1	1,200			0			20/1	38		
	RECEPTACLES	39	20/1		720			0			40		
	RECEPTACLES	41	20/1			360			0		42		
	RECEPTACLES	43	20/1	900			0				44		
	RECEPTACLES	45	20/1		1,080			0			46		
	RECEPTACLES	47	20/1			1,080			0		48		
	RECEPTACLES	49	20/1	1,080			0				50		
	RECEPTACLES	51	20/1		720			0			52		
	RECEPTACLES	53	20/1			900			0		54		
	RECEPTACLES	55	20/1	360			0				56		
	RECEPTACLES	57	20/1		540			0			58		
	RECEPTACLES	59	20/1			900			0		60		
	RECEPTACLES	61	20/1	720			0				62		
	RECEPTACLES	63	20/1		540			0			64		
	RECEPTACLES	65	20/1			1,200			0		66		
	RECEPTACLES	67	20/1	1,200			1,000			20/1	68	ADO VEST	
	RECEPTACLES	69	20/1		1,200			540		20/1	70	RTU-REC	
	RECEPTACLES	71	20/1			900			1,000	20/1	72	FW	
	RECEPTACLES	73	20/1	540			360			20/1	74	RECEPTACLES	
	RECEPTACLES	75	20/1		900			900		20/1	76	RECEPTACLES	
	RECEPTACLES	77	20/1			900			500	20/1	78	ADO OFFICE	
	RECEPTACLES	79	20/1	900			1,000			20/1	80	ADO VEST	
	RECEPTACLES	81	20/1		900			1,000		20/1	82	OFFICE SOUTH RECEPT	
	SPARE	83	20/1			0			540	20/1	84	VEST. AND OFFICE DISPLAY	

Key Notes:A=HACR G=GFI H=HANDLE LOCK C=THRU CONTACTOR I=ISOLATED GRD S=SHUNT TRIP P=PADLOCK HASP D=HID LIGHTING E=EXISTING

Panel AB

Panelboard: Panel AB

Bus Ampacity	225	Volts	240	Panel Source:	PC
Branch Brkr Space	42 Poles	Phase	3	Feed-Thru Lugs	None
Main Type	MCB	Wires	3		
MCB Amps	150	Delta/Wye	Delta	Sub-Feed Lugs	None
		Mounting	Surface		
		Enclosure	NEMA 4X	Sub-Feed Brkr #1	None
		SCCR	10 kA		
		SE Rated	No	Sub-Feed Brkr #2	None
		Pnl MCA	48 A		

Comments: MAIN BREAKER SHALL BE EQUIPPED WITH SHUNT TRIP

SPD
Iso Grd

Key Note	Load Description	Cct No	Brkr A/P	Left Side A	Left Side B	Left Side C	Right Side A	Right Side B	Right Side C	Brkr A/P	Cct No	Load Description	Key Note
	PANEL SAW	1	15/3	300			900			15/3	2	DATO SAW	
	|	3	|		300			900	|	4	|	
	|	5	|			300			900	|	6	|	
	LATHE	7	15/3	300			2,000			30/3	8	PLANER	
	|	9	|		300			2,000		|	10	|	
	|	11	|			300			2,000	|	12	|	
	LATHE	13	15/3	300			200			15/3	14	JOINTER	
	|	15	|		300			200		|	16	|	
	|	17	|			300			200	|	18	|	
	GRINDER	19	15/3	600			1,300			20/3	20	RADIAL ARM SAW	
	|	21	|		600			1,300		|	22	|	
	|	23	|			600			1,300	|	24	|	
	DRILL PRESS	25	15/3	200			0				26		
	|	27	|		200			0			28		
	|	29	|			200			0		30		
	DRILL PRESS	31	20/3	200			0				32		
	|	33	|		200			0			34		
	|	35	|			200			0		36		
	BELT/SPINDLE SANDER	37	15/3	300			0				38		
	|	39	|		300			0			40		
	|	41	|			300			0		42		

Key Notes:A=HACR G=GFI H=HANDLE LOCK C=THRU CONTACTOR I=ISOLATED GRD S=SHUNT TRIP P=PADLOCK HASP D=HID LIGHTING E=EXISTING

Panel AC

Panelboard: Panel AC

Bus Ampacity	225	Volts	240	Panel Source:	PC
Branch Brkr Space	84 Poles	Phase	3	Feed-Thru Lugs	None
Main Type	MCB	Wires	3		
MCB Amps	150	Delta/Wye	Delta	Sub-Feed Lugs	None
		Mounting	Surface		
		Enclosure	NEMA 4X	Sub-Feed Brkr #1	None
		SCCR	10 kA		
		SE Rated	No	Sub-Feed Brkr #2	None
		Pnl MCA	306 A		

Comments: MAIN BREAKER SHALL BE EQUIPPED WITH SHUNT TRIP

SPD
Iso Grd

Key Note	Load Description	Cct No	Brkr A/P	Left Side A	Left Side B	Left Side C	Right Side A	Right Side B	Right Side C	Brkr A/P	Cct No	Load Description	Key Note
	WELDER (XFERRED)	1	40/2	3,840			1,333			20/2	2	WALL RECEPTACLE	
	|	3	|		3,840			1,333	|	4	|	
	WELDER (XFERRED)	5	40/2			3,840			1,333	20/2	6	WALL RECEPTACLE	
	|	7	|	3,840			1,333			|	8	|	
	WELDER (XFERRED)	9	40/2		3,840			1,333		20/2	10	SPARE	
	|	11	|			3,840			1,333	|	12	|	
	WELDER (XFERRED)	13	40/2	3,840			3,000			30/3	14	L15-30R	
	|	15	|		3,840			3,000		|	16	|	
	WELDER (XFERRED)	17	40/2			3,840			3,000	|	18	|	
	|	19	|	3,840			3,000			30/3	20	LATHE (L15-30R)	
	WELDER (XFERRED)	21	40/2		3,840			3,000		|	22	|	
	|	23	|			3,840			3,000	|	24	|	
	WELDER (XFERRED)	25	40/2	3,840			3,000			30/3	26	L15-30R	
	|	27	|		3,840			3,000		|	28	|	
	WELDER (XFERRED)	29	40/2			3,840			3,000	|	30	|	
	|	31	|	3,840			0				32		
	WELDER (XFERRED)	33	40/2		3,840			0			34		
	|	35	|			3,840			0		36		
	WELDER (XFERRED)	37	40/2	3,840			0				38		
	|	39	|		3,840			0			40		
	WELDER (XFERRED)	41	40/2			3,840			0		42		
	|	43	|	3,840			0				44		
	WELDER (XFERRED)	45	40/2		3,840			0			46		
	|	47	|			3,840			0		48		
	CORD DROP (XFERRED)	49	20/3	0			0				50		
	|	51	|		0			0			52		
	|	53	|			0			0		54		
	LATHE (XFERRED)	55	20/3	0			0				56		
	|	57	|		0			0			58		
	|	59	|			0			0		60		
	DRILL PRESS (XFERRED)	61	20/3	0			0				62		
	|	63	|		0			0			64		
	|	65	|			0			0		66		
	DRILL PRESS (XFERRED)	67	20/3	0			0				68		
	|	69	|		0			0			70		
	|	71	|			0			0		72		
	BAND SAW (XFERRED)	73	20/3	0			0				74		
	|	75	|		0			0			76		
	|	77	|			0			0		78		
	LATHE (XFERRED)	79	20/3	0			0				80		
	|	81	|		0			0			82		
	|	83	|			0			0		84		

Key Notes:A=HACR G=GFI H=HANDLE LOCK C=THRU CONTACTOR I=ISOLATED GRD S=SHUNT TRIP P=PADLOCK HASP D=HID LIGHTING E=EXISTING

Panel PC

Panelboard: Panel PC

Bus Ampacity	400	Volts	480Y/277	Panel Source:	MSB
Branch Brkr Space	99 Inches	Phase	3	Feed-Thru Lugs	None
Main Type	MLO	Wires	4		
MCB Amps	-	Delta/Wye	Wye	Sub-Feed Lugs	None
		Mounting	Surface		
		Enclosure	NEMA 1	Sub-Feed Brkr #1	None
		SCCR	42 kA		
		SE Rated	No	Sub-Feed Brkr #2	None
		Pnl MCA	156 A		

Comments:

SPD
Iso Grd

Key Note	Load Description	Cct No	Brkr A/P	Left Side A	Left Side B	Left Side C	Right Side A	Right Side B	Right Side C	Brkr A/P	Cct No	Load Description	Key Note
	DC-1	1	20/3	3,050			0			30/3	12	EXISTING RTU	
	|	|	|	3,050			0		|	|	|	
	|	|	|		3,050			0	|	|	|	
	EXISTING RTU	2	30/3	0			0			30/3	13	EXISTING	
	|	|	|	0			0		|	|	|	
	|	|	|		0			0	|	|	|	
	PANEL AB	3	125/3	6,600			29,540			125/3	14	PANEL AD	
	|	|	|		6,600			19,840	|	|	|	
	|	|	|			6,600			31,360	|	|	
	EXISTING GRINDER	4	30/3	0			0				15	3-POLE SPACE	
	|	|	|	0			0			|	|		
	|	|	|		0			0		|	|		
	EXISTING IF-2	5	30/3	0			3,300			15/3	16	RTU-22	
	|	|	|	0			3,300		|	|	|	
	|	|	|		0			3,300	|	|	|	
	EXISTING RTU	6	30/3	0			6,650			30/3	17	RTU-23	
	|	|	|	0			6,650		|	|	|	
	|	|	|		0			6,650	|	|	|	
	EXIST WEL BOOTH VENT	7	30/3	0			0				18	3-POLE SPACE	
	|	|	|	0			0			|	|		
	|	|	|		0			0		|	|		
	EXISTING RTU	8	30/3	0			0				19	3-POLE SPACE	
	|	|	|	0			0			|	|		
	|	|	|		0			0		|	|		
	EXISTING IF-1	9	30/3	0			0				20	3-POLE SPACE	
	|	|	|	0			0			|	|		
	|	|	|		0			0		|	|		
	EXISTING WOOD SHOP	10	30/3	0			0				21	3-POLE SPACE	
	|	|	|	0			0			|	|		
	|	|	|		0			0		|	|		
	EXISTING RTU	11	30/3	0			0				22	3-POLE SPACE	
	|	|	|	0			0			|	|		
	|	|	|		0			0		|	|		

Key Notes:A=HACR G=GFI H=HANDLE LOCK C=THRU CONTACTOR I=ISOLATED GRD S=SHUNT TRIP P=PADLOCK HASP D=HID LIGHTING E=EXISTING

Panel PBB

Panelboard: Panel PBB

Bus Ampacity	225	Volts	480Y/277	Panel Source:	PB
Branch Brkr Space	42 Poles	Phase	3	Feed-Thru Lugs	None
Main Type	MLO	Wires	4		
MCB Amps	-	Delta/Wye	Wye	Sub-Feed Lugs	None
		Mounting	Surface		
		Enclosure	NEMA 1	Sub-Feed Brkr #1	None
		SCCR	42 kA		
		SE Rated	No	Sub-Feed Brkr #2	None
		Pnl MCA	90 A		

Comments:

SPD
Iso Grd

Key Note	Load Description	Cct No	Brkr A/P	Left Side A	Left Side B	Left Side C	Right Side A	Right Side B	Right Side C	Brkr A/P	Cct No	Load Description	Key Note
	RTU-17	1	30/3	6,650			0				2		
	|	3	|		6,650			0			4		
	|	5	|			6,650			0		6		
	RTU-18	7	50/3	11,000			0				8		
	|	9	|		11,000			0			10		
	|	11	|			11,000			0		12		
	RTU-19	13	30/3	6,650			0				14		
	|	15	|		6,650			0			16		
	|	17	|			6,650			0		18		
	REF-2	19	15/3	580			0				20		
	|	21	|		580			0			22		
	|	23	|			580			0		24		
		25		0			0				26		
		27			0			0			28		
		29				0			0		30		
		31		0			0				32		
		33			0			0			34		
		35				0			0		36		
		37		0			0				38		
		39			0			0			40		
		41				0			0		42		

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Panel AA

Panelboard: Panel AA

Bus Ampacity	225	Volts	208Y/120	Panel Source:	A
Branch Brkr Space	84 Poles	Phase	3	Feed-Thru Lugs	None
Main Type	MCB	Wires	4		
MCB Amps	150	Delta/Wye	Wye	Sub-Feed Lugs	None
		Mounting	Surface		
		Enclosure	NEMA 1	Sub-Feed Brkr #1	None
		SCCR	10 kA		
		SE Rated	No	Sub-Feed Brkr #2	None
		Pnl MCA	187 A		

Comments:

SPD
Iso Grd

Key Note	Load Description	Cct No	Brkr A/P	Left Side A	Left Side B	Left Side C	Right Side A	Right Side B	Right Side C	Brkr A/P	Cct No	Load Description	Key Note
	EXISTING CIRCUIT	1	20/1	1,200			1,200			20/1	2	EXISTING CIRCUIT	
	EXISTING CIRCUIT	3	20/1		1,200			1,200		20/1	4	EXISTING CIRCUIT	
	EXISTING CIRCUIT	5	20/1			1,200			1,200	20/1	6	EXISTING CIRCUIT	
	EXISTING CIRCUIT	7	20/1	1,200			1,200			20/1	8	EXISTING CIRCUIT	
	EXISTING CIRCUIT	9	20/1		1,200			1,200		20/1	10	EXISTING CIRCUIT	
	EXISTING CIRCUIT	11	20/1			1,200			1,200	20/1	12	EXISTING CIRCUIT	
	EXISTING CIRCUIT	13	20/1	1,200			1,200			20/1	14	EXISTING CIRCUIT	
	EXISTING CIRCUIT	15	20/1		1,200			4,000		60/2	16	SUB-PANEL	
	EXISTING CIRCUIT	17	20/1			1,200			4,000	|	18	|	
	EXISTING CIRCUIT	19	20/1	1,200			1,200			20/1	20	EXISTING CIRCUIT	
	EXISTING CIRCUIT	21	20/1		1,200			2,400		40/2	22	EXISTING CIRCUIT	
	EXISTING CIRCUIT	23	20/1			1,200			2,400	|	24	|	
	RECEPTACLES	25	20/1	1,200			1,200			20/1	26	RECEPTACLES	
	RECEPTACLES	27	20/1		1,200			1,200		20/1	28	RECEPTACLES	
	RECEPTACLES	29	20/1			1,200			1,200	20/1	30	RECEPTACLES	
	RECEPTACLES	31	20/1	1,200			1,200			20/1	32	RECEPTACLES	
	RECEPTACLES	33	20/1		1,200			1,200		20/1	34	RECEPTACLES	
	RECEPTACLES	35	20/1			1,200			1,200	20/1	36	RECEPTACLES	
	CORD REEL	37	20/1	1,200			1,200			20/1	38	RECEPTACLES	
	CORD REEL	39	20/1		1,200			1,200		20/1	40	RECEPTACLES	
	CORD REEL	41	20/1			1,200			1,200	20/1	42	RECEPTACLES	
	CORD REEL	43	20/1	1,200			1,200			20/1	44	RECEPTACLES	
	CORD REEL	45	20/1		1,200			1,200		20/1	46	RECEPTACLES	
	CORD REEL	47	20/1			1,200			1,200	20/1	48	RECEPTACLES	
	CORD REEL	49	20/1	1,200			1,200			20/1	50	RECEPTACLES	
	CORD REEL	51	20/1		1,200			1,200		20/1	52	RECEPTACLES	
	RECEPTACLES	53	20/1			360			1,200	20/1	54	RECEPTACLES	
	RECEPTACLES	55	20/1	360			1,000			20/1	56	UH	
	RECEPTACLES	57	20/1		360			1,200		20/1	58	RECEPTACLES	
	RECEPTACLES	59	20/1			180			1,200	20/1	60	RECEPTACLES	
	RECEPTACLES	61	20/1	1,200			1,200			20/1	62	RECEPTACLES	
	RECEPTACLES	63	20/1		1,200			1,200		20/1	64	CCTV	
	EF-12	65	20/1			1,176			0		66		
	EF-15	67	15/1	700			0				68		
	EF-14	69	15/1		700			0			70		
	EF-13	71	15/1			700			0		72		
		73		0			0				74		
		75			0			0			76		
		77				0			0		78		
		79		0			0				80		
		81			0			0			82		
		83				0			0		84		

Key Notes:A=HACR G=GFI H=HANDLE LOCK C=THRU CONTACTOR I=ISOLATED GRD S=SHUNT TRIP P=PADLOCK HASP D=HID LIGHTING E=EXISTING

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MANAWA

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MANAWA MIDDLE/HIGH SCHOOL - ADDITIONS & ALTERATIONS
PART 2 - MANAWA MIDDLE / HIGH SCHOOL
515 E. 4th STREET
MANAWA, WI 54949

MARK	DATE
ISSUED:	June 6, 2019
PROJECT NO:	18268
CAD DWG FILE:	
DRAWN BY:	Author
CHECKED BY:	IMR

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SHEET TITLE:
SCHEDULES

SHEET NUMBER:
2-EE-605

Panel LG

Panelboard:		Volts	208Y/120	Panel Source:	HG
Bus Ampacity	225	Phase	3	Feed-Thru Lugs	None
Branch Brkr Space	84 Poles	Wires	4		
Main Type	MCB	Delta/Wye	Wye	Sub-Feed Lugs	None
MCB Amps	225	Mounting	Surface		
		Enclosure	NEMA 1	Sub-Feed Brkr #1	None
		SCCR	10 kA		
		SE Rated	No	Sub-Feed Brkr #2	None
		Pnl MCA	70 A		
Comments:				SPD	
				Iso Grd	

Key Note	Load Description	Cct No	Brkr A/P	Left Side A	Left Side B	Left Side C	Right Side A	Right Side B	Right Side C	Brkr A/P	Cct No	Load Description	Key Note
	RECEPTACLES	1	20/1	360			1,200			20/1	2	RECEPTACLES	
	RECEPTACLES	3	20/1		540			540		20/1	4	RECEPTACLES	
	RECEPTACLES	5	20/1			600			860	20/1	6	RECEPTACLES/CUH	
	RECEPTACLES	7	20/1	1,200			860			20/1	8	RECEPTACLES/CUH	
	RECEPTACLES	9	20/1		1,380			720		20/1	10	RECPTACLES	
	RECEPTACLES	11	20/1			1,200			720	20/1	12	RECPTACLES	
	RECEPTACLES	13	20/1	1,380			540			20/1	14	RECPTACLES	
	RECEPTACLES	15	20/1		720			540		20/1	16	RECPTACLES	
	RECEPTACLES	17	20/1			1,200			540	20/1	18	RECPTACLES	
	RECEPTACLES	19	20/1	360			360			20/1	20	RTU-REC	
	RECEPTACLES	21	20/1		540			1,176		20/1	22	EF-11	
	RECEPTACLES	23	20/1			1,200			500	20/1	24	ADO	
	RECEPTACLES	25	20/1	1,200			1,000			20/1	26	ADO	
	RECEPTACLES	27	20/1		1,200			1,000		20/1	28	TCP	
	RECEPTACLES	29	20/1			1,200			0		30		
	RECEPTACLES	31	20/1	1,200			0				32		
	RECEPTACLES	33	20/1		1,200			0			34		
	RECEPTACLES	35	20/1			1,200			0		36		
	RECEPTACLES	37	20/1	540			0				38		
		39	20/1		0			0			40		
		41	20/1			0			0		42		
	PANEL ELEV	43	60/3	1,720			0				44		
	|	45	|		1,890			0			46		
	|	47	|			500			0		48		
		49		0			0				50		
		51			0			0			52		
		53				0			0		54		
		55		0			0				56		
		57			0			0			58		
		59				0			0		60		
		61		0			0				62		
		63			0			0			64		
		65				0			0		66		
		67		0			0				68		
		69			0			0			70		
		71				0			0		72		
		73		0			0				74		
		75			0			0			76		
		77				0			0		78		
		79		0			0				80		
		81			0			0			82		
		83				0			0		84		

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Panel ELEV

Panelboard:		Volts	208Y/120	Panel Source:	LG
Bus Ampacity	100	Phase	3	Feed-Thru Lugs	None
Branch Brkr Space	18 Poles	Wires	4		
Main Type	MCB	Delta/Wye	Wye	Sub-Feed Lugs	None
MCB Amps	30	Mounting	Surface		
		Enclosure	NEMA 1	Sub-Feed Brkr #1	None
		SCCR	10 kA		
		SE Rated	No	Sub-Feed Brkr #2	None
		Pnl MCA	12 A		
Comments:				SPD	
				Iso Grd	

Key Note	Load Description	Cct No	Brkr A/P	Left Side A	Left Side B	Left Side C	Right Side A	Right Side B	Right Side C	Brkr A/P	Cct No	Load Description	Key Note
	LIGHTS	1	20/1	360			10			20/1	2	SHUNT TRIP PWR	
	RECEPTACLE	3	20/1		360			180		20/1	4	PIT RECEPTACLE	
	CAB LIGHTS	5	20/1			500			0		6		
	ACCU-1/ACU-1	7	20/2	1,350			0				8		
	|	9	|		1,350			0			10		
		11				0			0		12		
		13		0			0				14		
		15			0			0			16		
		17				0			0		18		

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Panel DA

Panelboard:		Volts	208Y/120	Panel Source:	D
Bus Ampacity	225	Phase	3	Feed-Thru Lugs	None
Branch Brkr Space	84 Poles	Wires	4		
Main Type	MCB	Delta/Wye	Wye	Sub-Feed Lugs	None
MCB Amps	150	Mounting	Surface		
		Enclosure	NEMA 1	Sub-Feed Brkr #1	None
		SCCR	10 kA		
		SE Rated	No	Sub-Feed Brkr #2	None
		Pnl MCA	33 A		
Comments:				SPD	
				Iso Grd	

Key Note	Load Description	Cct No	Brkr A/P	Left Side A	Left Side B	Left Side C	Right Side A	Right Side B	Right Side C	Brkr A/P	Cct No	Load Description	Key Note
	RECEPTACLES	1	20/1	720			0				2		
	RECEPTACLES	3	20/1		720			0			4		
	RECEPTACLES	5	20/1			720			0		6		
	RECEPTACLES	7	20/1	720			0				8		
	RECEPTACLES	9	20/1		720			0			10		
	RECEPTACLES	11	20/1			720			0		12		
	RECEPTACLES	13	20/1	720			0				14		
	RECEPTACLES	15	20/1		720			0			16		
	RECEPTACLES	17	20/1			720			0		18		
	RECEPTACLES	19	20/1	720			0				20		
	RECEPTACLES	21	20/1		720			0			22		
	RECEPTACLES	23	20/1			720			0		24		
	RECEPTACLES	25	20/1	720			0				26		
	RECEPTACLES	27	20/1		720			0			28		
	RECEPTACLES	29	20/1			720			0		30		
	RECEPTACLES	31	20/1	720			0				32		
	RECEPTACLES	33	20/1		720			0			34		
	RECEPTACLES	35	20/1			720			0		36		
	RECEPTACLES	37	20/1	720			0				38		
		39			0			0			40		
		41				0			0		42		
		43		0			0				44		
		45			0			0			46		
		47				0			0		48		
		49		0			0				50		
		51			0			0			52		
		53				0			0		54		
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		69			0			0			70		
		71				0			0		72		
		73		0			0				74		
		75			0			0			76		
		77				0			0		78		
		79		0			0				80		
		81			0			0			82		
		83				0			0		84		

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Panel HG

Panelboard:		Volts	480Y/277	Panel Source:	MSB
Bus Ampacity	225	Phase	3	Feed-Thru Lugs	None
Branch Brkr Space	42 Poles	Wires	4		
Main Type	MLO	Delta/Wye	Wye	Sub-Feed Lugs	None
MCB Amps	-	Mounting	Surface		
		Enclosure	NEMA 1	Sub-Feed Brkr #1	None
		SCCR	42 kA		
		SE Rated	No	Sub-Feed Brkr #2	None
		Pnl MCA	107 A		
Comments:				SPD	
				Iso Grd	

Key Note	Load Description	Cct No	Brkr A/P	Left Side A	Left Side B	Left Side C	Right Side A	Right Side B	Right Side C	Brkr A/P	Cct No	Load Description	Key Note
	PANEL LG	1	70/3	11,920			1,900			20/1	2	LIGHTING	
	|	3	|		11,446			1,100		20/1	4	LIGHTING	
	|	5	|			9,720			250	20/1	6	EXTERIOR LIGHTING	
	DF-1	7	15/3	443			3,000			20/1	8	INV/A	
	|	9	|		443			0			10		
	|	11	|			443			0		12		
	DF-2	13	15/3	443			0				14		
	|	15	|		443			0			16		
	|	17	|			443			0		18		
	RTU-20	19	30/3	6,650			0				20		
	|	21	|		6,650			0			22		
	|	23	|			6,650			0		24		
	RTU-21	25	50/3	11,000			0				26		
	|	27	|		11,000			0			28		
	|	29	|			11,000			0		30		
		31		0			0				32		
		33			0			0			34		
		35				0			0		36		
		37		0			0				38		
		39			0			0			40		
		41				0			0		42		

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MANAWA

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515 E. 4th STREET
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MARK	DATE
ISSUED:	June 6, 2019
PROJECT NO:	18268
CAD DWG FILE:	
DRAWN BY:	Author
CHECKED BY:	IMR

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SHEET TITLE:
SCHEDULES

SHEET NUMBER:
2-EE-606

TRANSFORMER TAG	SIZE	PRIMARY VOLTAGE	SECONDARY VOLTAGE	MOUNTING
TAA	45KVA	480V, 3PH	208Y/120V, 3PH, 4W	WALL/CLNG
TAB	75KVA	480V, 3PH	240V, 3PH, 3W	FLOOR
TAD	75KVA	480V, 3PH	208Y/120V, 3PH, 4W	FLOOR
TDM (RELOCATED)	75KVA	480V, 3PH	208Y/120V, 3PH, 4W	WALL
TLG	45KVA	480V, 3PH	208Y/120V, 3PH, 4W	WALL
TDC (EXISTING)	30KVA	480V, 3PH	208Y/120V, 3PH, 4W	WALL
TBA (EXISTING)	15KVA	480V, 3PH	208Y/120V, 3PH, 4W	WALL
TBB (EXISTING)	37.5KVA	480V, 3PH	208Y/120V, 3PH, 4W	WALL
TCA (EXISTING)	30KVA	480V, 3PH	208Y/120V, 3PH, 4W	WALL
TCB (EXISTING)	45KVA	480V, 3PH	208Y/120V, 3PH, 4W	WALL
TDA (EXISTING)	30KVA	480V, 3PH	208Y/120V, 3PH, 4W	WALL
TFA (EXISTING)	45KVA	480V, 3PH	208Y/120V, 3PH, 4W	WALL
TFB (EXISTING)	20KVA	480V, 3PH	208Y/120V, 3PH, 4W	WALL
TDB (EXISTING)	90KVA	480V, 3PH	240V/120V, 1PH, 3W	FLOOR
TLB (EXISTING)	75KVA	480V, 3PH	208Y/120V, 3PH, 4W	FLOOR
TLF (EXISTING)	112.5KVA	480V, 3PH	208Y/120V, 3PH, 4W	FLOOR
TEA (EXISTING)	10KVA	480V, 1PH	240V/120V, 1PH, 3W	WALL
TEX (EXISTING)	30KVA	480V, 3PH	208Y/120V, 3PH, 4W	FLOOR

KEYED NOTES

9.335 PROVIDE NEW 100A, 3-POLE FUSE SWITCH (SIEMENS) IN EXISTING ITE SWITCHBOARD.

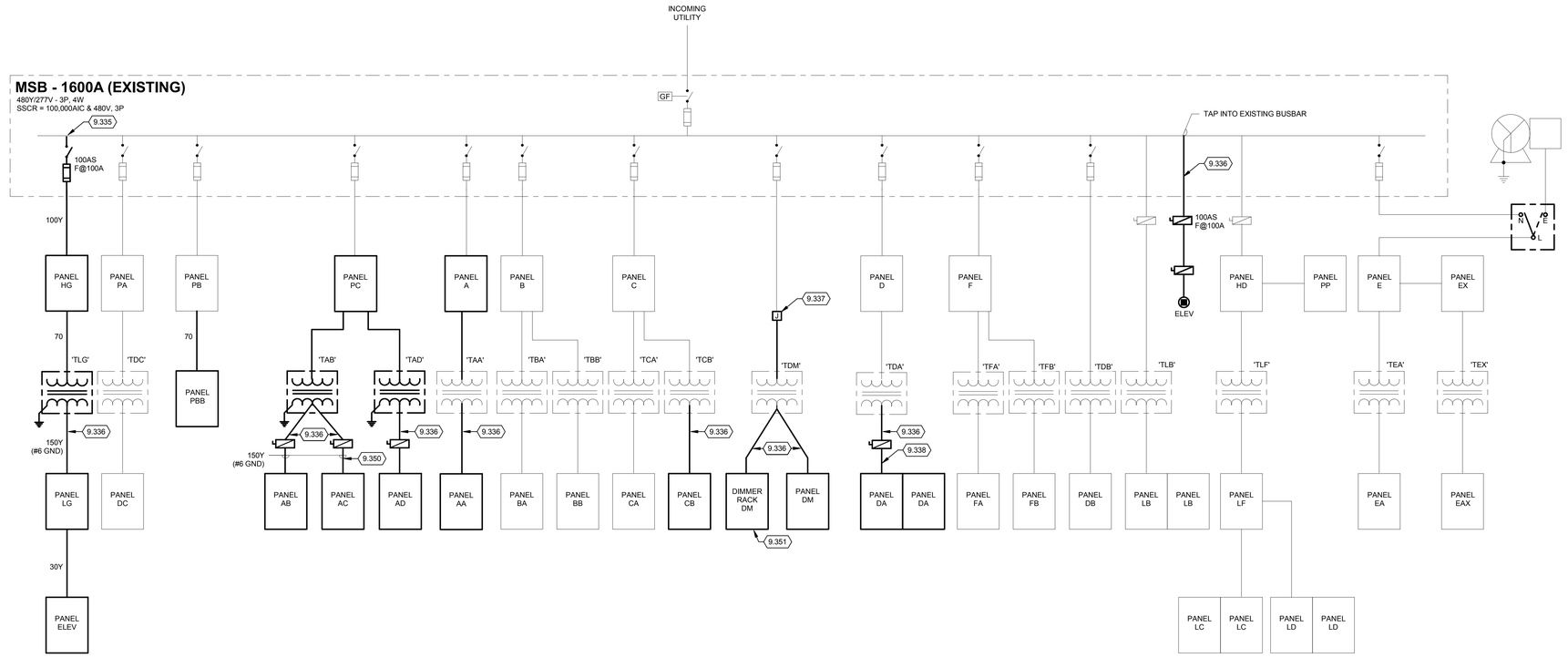
9.336 CONDUCTORS SHALL BE LESS THAT 10' IN LENGTH.

9.337 PROVIDE JUNCTION BOX, BELOW STAGE FLOOR TO INTERCEPT EXISTING TRANSFORMER PRIMARY CONDUCTORS AND EXTEND NEW CONDUCTORS TO RELOCATED TRANSFORMER LOCATION.

9.338 PULL NEW CONDUCTORS, AS INDICATED, THROUGH EXISTING RACEWAY.

9.350 RE-USE EXISTING CONDUIT TO PULL NEW FEEDER CONDUCTORS.

9.351 SEE THEATRICAL POWER CONTROL EQUIPMENT SCHEDULE ON SHEET 2-EE-603 FOR MORE INFORMATION.



1 **ONE-LINE POWER DIAGRAM**
NO SCALE

ONE-LINE SYMBOLS

- AUTOMATIC TRANSFER SWITCH
- LOW VOLTAGE CIRCUIT BREAKER
- LOW VOLTAGE FUSE
- FUSED DISCONNECT SWITCH
- GENERATOR
- GROUND FAULT SHUNT TRIP BREAKER
- GROUND FAULT SHUNT TRIP SWITCH
- EARTH GROUND
- METER
- NEUTRAL BOND
- NON-FUSED DISCONNECT SWITCH
- NORMALLY CLOSED CONTACT
- NORMALLY OPEN CONTACT
- PANELBOARD (ELEVATION VIEW)
- SURGE PROTECTIVE DEVICE
- TRANSFORMER

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ISSUED: June 6, 2019
PROJECT NO: 18268
CAD DWG FILE:
DRAWN BY: MRF
CHECKED BY: IMR

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SHEET TITLE:
ONE-LINE DIAGRAM

SHEET NUMBER:
2-EE-901

TECHSYS ABBREVIATIONS

&	AND
3R	NEMA 3R RATED
4X	NEMA 4X RATED
@	AT
A/E	ARCHITECT / ENGINEER
ACS	ACCESS CONTROL SYSTEM
AFF	ABOVE FINISHED FLOOR
AFG	ABOVE FINISH GRADE
ALT	ALTERNACE
ANT	ANTENNA
AP	(WIRELESS) ACCESS POINT
AV	AUDIO VISUAL
BET	BUILDING ENTRANCE TERMINAL
BLDG	BUILDING
C	CONDUIT
CAB	CABINET
CATV	COMMUNITY ANTENNA TELEVISION
CL	CENTERLINE
CLG	CEILING
COAX	COAXIAL
COMM	COMMUNICATIONS
DO	DOOR OPERATOR
DSS	DIGITAL SATELLITE SERVICE
DWG	DRAWING
EC	ELECTRICAL CONTRACTOR
EMT	ELECTRICAL METALLIC TUBING
ETR	EXISTING TO REMAIN
FA	FIRE ALARM
FAAP	FIRE ALARM ANNUNCIATOR PANEL
FACP	FIRE ALARM CONTROL PANEL
FO	FIBER OPTIC
FPD	FLAT-PANEL DISPLAY
GC	GENERAL CONTRACTOR
GND	GROUND
GRC	GALVINIZED RIGID CONDUIT
GRS	GALVANIZED RIGID STEEL
HH	HAND HOLE
HPC	HIGH PAIR COUNT
HVAC	HEATING, VENTILATION, AIR CONDITIONING
IDF	INTERMEDIATE DISTRIBUTION FRAME
IDS	INFORMATION DISPLAY SYSTEM x DENOTES SUBSYSTEM (F, B, T, G)
IDS	INTRUSION DETECTION SYSTEM
IMC	INTERMEDIATE METALLIC CONDUIT
IT	INFORMATION TECHNOLOGY
ITS	INFORMATION TRANSPORT SYSTEMS
JB	JUNCTION BOX
MAX	MAXIMUM
MDF	MAIN DISTRIBUTION FRAME
MH	MAN HOLE
MIN	MINIMUM
MMFO	MULTIMODE FIBER OPTIC
MNS	MASS NOTIFICATION SYSTEM
MON	MONITOR
MTD	MOUNTED
NIC	NOT IN CONTRACT
NTS	NOT TO SCALE
NTWK	NETWORK (DATA)
OC	ON CENTER
PA	PUBLIC ADDRESS
PROJ	PROJECTOR
PTZ	PAN - TILT - ZOOM
PVC	POLYVINYL CHLORIDE
RCV	RECEIVER
REQD	REQUIRED
SCHED	SCHEDULE
SE	SERVICE ENTRANCE
SMFO	SINGLEMODE FIBER OPTIC
SS	STAINLESS STEEL
SYS	SYSTEM
TBR	TO BE REMOVED
TC	TECHNOLOGY CONTRACTOR
TGB	TELECOMMUNICATIONS GROUNDING BUSBAR
TMGB	TELECOMMUNICATIONS MAIN GROUNDING BUSBAR
TO	TELECOMMUNICATIONS OUTLET
TSE	TELEPHONE SERVICE EQUIPMENT
TV	TELEVISION
TYP	TYPICAL
UF	UNDER FLOOR
UG	UNDERGOUND
UNO	UNLESS NOTED OTHERWISE
UTP	UNSHIELDED TWISTED PAIR
VSS	VIDEO SURVEILLANCE SYSTEM
WL	WET LOCATION LISTED
WP	WEATHERPROOF
WS	WORKSTATION

DEMOLITION GENERAL NOTES

1. THE INFORMATION SHOWN IS BASED ON EXISTING DRAWINGS AND SITE OBSERVATIONS TO ASSIST THE CONTRACTOR IN BIDDING. THE CONTRACTOR SHOULD VISIT THE SITE TO VERIFY EXISTING CONDITIONS. THE TECHNOLOGY SYSTEMS DRAWINGS INDICATE EXISTING TECHNOLOGY SYSTEMS ITEMS TO BE REMOVED. THE DRAWINGS ARE INTENDED TO INDICATE THE SCOPE OF WORK REQUIRED AND DO NOT INDICATE EVERY DEVICE, BOX, CONDUIT, WIRE OR CABLE THAT MUST BE REMOVED.
2. DASHED WALLS ON THE FLOOR PLANS INDICATE EXISTING WALLS BEING DEMOLISHED. REFER TO THE ARCHITECTURAL DEMOLITION PLANS FOR THE EXACT EXTENT OF WORK REQUIRED BY THIS PROJECT. REMOVE ALL DEVICES ON DASHED WALLS NOT SHOWN ON THE CONTRACT DRAWINGS. REFER TO DEMOLITION DRAWINGS OF OTHER TRADES. WHERE CONTROL PANELS AND APPURTENANCES THAT HAVE TECHNOLOGY SYSTEMS CONNECTIONS ARE BEING REMOVED, INCLUDE DISCONNECTION AND REMOVAL OF ALL ASSOCIATED CONDUIT, WIRING AND CABLING.
3. TECHNOLOGY SYSTEMS ITEMS (E.G. TELECOMMUNICATIONS OUTLETS, SECURITY SYSTEMS DEVICES, AUDIO DEVICES) THAT ARE REMOVED AND NOT RELOCATED SHALL REMAIN THE PROPERTY OF THE OWNER. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE DISPOSAL OF MATERIAL THE OWNER DOES NOT WANT TO REUSE OR RETAIN FOR MAINTENANCE PURPOSES.
4. THE CONTRACTOR SHALL OBTAIN APPROVAL FROM THE OWNER BEFORE TURNING OFF POWER TO TECHNOLOGY SYSTEMS EQUIPMENT OR DEVICES. COORDINATE ALL OUTAGES WITH THE OWNER. CONDUIT CONCEALED IN WALL CONSTRUCTION MAY BE ABANDONED IN PLACE IF NOT AFFECTED BY OTHER CONSTRUCTION.
5. ALL BOXES THAT REMAIN IN PLACE IN EXISTING MASONRY WALLS THAT ARE TO REMAIN SHALL BE PROVIDED WITH A BLANK COVER PLATE. REFER TO SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS ASSOCIATED WITH TYPE AND ATTACHMENT.
6. ALL CONDUIT SHALL BE REMOVED WHERE WALLS ARE BEING REMOVED. WHERE CONDUIT IS IN THE CONCRETE SLAB, CUT OFF FLUSH, PULL OUT WIRE OR CABLE AND PLUG. WHERE CONDUIT IS RUN EXPOSED, ALL ASSOCIATED CLAMPS, SUPPORTS, HANGERS, ETC. SHALL ALSO BE REMOVED.
7. THIS CONTRACTOR SHALL COORDINATE ALL HIS WORK WITH OTHER CONTRACTORS AT THE JOB SITE BEFORE REMOVING EXISTING TECHNOLOGY SYSTEMS ITEMS AND INSTALLING NEW ITEMS.
8. EXISTING CONDUIT IN GOOD CONDITION, MAY BE REUSED IN PLACE. RELOCATED EXISTING CONDUIT SHALL NOT BE ALLOWED.

GENERAL NOTES

1. WORK PERFORMED INCLUDES ALL LABOR, MATERIAL AND EQUIPMENT REQUIRED TO INSTALL COMPLETE TECHNOLOGY SYSTEMS AS INDICATED ON THESE DRAWINGS AND AS SPECIFIED.
2. ALL TELECOMMUNICATIONS OUTLETS SHALL BE MOUNTED AT HEIGHTS ABOVE FINISHED FLOOR AS SHOWN IN THE DEVICE MOUNTING HEIGHT DETAIL U.N.O.
3. SEE ELECTRICAL SPECIFICATIONS FOR LOCATIONS WHERE GRS CONDUIT SHALL BE USED, OR WHERE IMC, EMT, OR PVC CONDUIT MAY BE USED.
4. BOXES LOCATED ON OPPOSITE SIDES OF NON-RATED WALLS SHALL BE OFFSET A MINIMUM OF 6" HORIZONTALLY. BOXES ON OPPOSITE SIDES OF FIRE-RATED WALLS SHALL BE OFFSET A MINIMUM OF 24" HORIZONTALLY. 'THRU-THE-WALL' BOXES SHALL NOT BE ALLOWED WITHOUT THE WRITTEN APPROVAL OF THE ARCHITECT/ENGINEER.
5. CONTRACTOR SHALL VERIFY ALL EQUIPMENT SIZES AND POWER REQUIREMENTS FOR EQUIPMENT SUPPLIED BY OTHERS PRIOR TO INSTALLATION OF CONDUIT.
6. TECHNOLOGY SYSTEMS EQUIPMENT/DEVICES SHALL BE MOUNTED SO AS TO ALLOW ACCESS TO ELECTRICAL AND MECHANICAL EQUIPMENT. ALL MOUNTING OF TECHNOLOGY SYSTEMS EQUIPMENT/DEVICES ON EQUIPMENT SUPPLIED BY ANOTHER CONTRACTOR SHALL BE COORDINATED WITH AND APPROVED BY THAT CONTRACTOR IN ADVANCE OF INSTALLATION.
7. ALL ELECTRICAL CONDUITS AND JUNCTION BOXES SHALL BE CONCEALED. CONTRACTOR SHALL COORDINATE WITH THE OTHER TRADES AND USE CHASES AND CEILING SPACES PROVIDED. WHERE BOXES AND CONDUIT ARE NOTED TO BE INSTALLED EXPOSED, THEY SHALL BE PAINTED TO MATCH THE SURFACE.
8. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL OPENINGS REQUIRED IN WALLS. ALL OPENINGS SHALL BE REPAIRED TO MATCH EXISTING BY A QUALIFIED CONTRACTOR AT THE EXPENSE OF THIS CONTRACTOR. ALL CONDUITS THROUGH WALLS SHALL BE GROUTED OR SEALED INTO OPENINGS. PENETRATIONS THROUGH FLOORS AND FIRE-RATED WALLS SHALL BE FIRESTOPPED IN A MANNER THAT MAINTAINS THE RATING OF THE FLOOR OR WALL PENETRATED.
9. ALL TELEPHONE AND DATA JACKS SHALL BE TERMINATED WITH ALL 4 PAIRS TO ALLOW FOR INTERCHANGEABILITY.
10. ALL TELEPHONE AND DATA CABLES SHALL BE INSTALLED IN CONDUIT OR CABLE TRAY.
11. ALL CONDUIT STUBS SHALL HAVE PLASTIC OR NYLON BUSHINGS INSTALLED PRIOR TO THE INSTALLATION OF CABLES.

TECHNOLOGY SCOPE RESPONSIBILITY MATRIX

ITEM	SHOWN ON	FURNISHED BY	INSTALLED BY	NOTES
FLOOR BOX ROUGH-IN, INCLUDING FLOOR BOXES AND CONDUITS	E AND T-SERIES	EC	EC	2
TECHNOLOGY SYSTEMS ROUGH-IN, INCLUDING BACKBOXES, TRIM RINGS, CONDUIT AND SLEEVES	T-SERIES	EC	EC	3
EQUIPMENT ROOM FITTINGS (PER SPECIFICATION SECTION 271100)	T-SERIES	TC	TC	
EQUIPMENT ROOM POWER RECEPTACLES	E-SERIES (PWR)	EC	EC	
GROUND BARS (TMGB, TGB) AND ELECTRICAL SERVICE BONDING	T-SERIES	EC	EC	
GROUNDING OF CABLE TRAY AND EQUIPMENT ROOM COMPONENTS	T-SERIES	TC	TC	
PATCH PANELS	T-SERIES	TC	TC	
TELECOMMUNICATIONS OUTLET (TO) FACEPLATES AND JACKS	T-SERIES	TC	TC	
HORIZONTAL CABLING, TERMINATIONS, TESTING AND LABELING	T-SERIES	TC	TC	
FLOOR BOX AND TELECOMMUNICATION OUTLET (TO) ASSOCIATED POWER RECEPTACLES	E-SERIES (PWR)	EC	EC	5
PA SYSTEM ROUGH-IN, INCLUDING BACKBOXES, TRIM RINGS AND CONDUIT	T-SERIES	EC	EC	
PA SYSTEM COMPONENTS (HEAD-END, MICROPHONES, SPEAKERS/HORNS, VOLUME CONTROLS) AND CABLING	T-SERIES	TC	TC	
INFORMATION DISPLAY SYSTEM AND TV ROUGH-IN, INCLUDING BACKBOXES, TRIM RINGS AND CONDUIT	T-SERIES	EC	EC	
INFORMATION DISPLAY AND TV LOCATION BLOCKING FOR DISPLAY MOUNT ATTACHMENT/SUPPORT	T-SERIES	GC	GC	8
INFORMATION DISPLAY SYSTEM AND TV OUTLETS, MOUNTS, DISPLAYS AND CABLING	T-SERIES	TC	TC	
INFORMATION DISPLAY SYSTEM HEAD-END COMPONENTS AND MONITOR INTERFACES	T-SERIES	OWNER	OWNER	
TV SERVICE, DISTRIBUTION EQUIPMENT AND RECEIVERS	N/A	OWNER	OWNER	
SECURITY SYSTEMS (ACS, VSS) ROUGH-IN, INCLUDING BACKBOXES, TRIM RINGS AND CONDUIT	T-SERIES	EC	EC	
ACS FIELD DEVICES (e.g. CARD READERS, STATUS SENSORS, REX) AND CABLING	T-SERIES	TC	TC	
ACS DOOR HARDWARE INCLUDING ELECTRIC STRIKES, MAGNETIC LOCKS AND ASSOCIATED POWER SUPPLIES	T-SERIES	GC	GC / EC / TC	9

TECHNOLOGY SYSTEMS RESPONSIBILITY MATRIX NOTES:
1. NOT USED.
2. FLOOR BOX LOCATIONS SHALL BE COORDINATED WITH THE LOCATION(S) OF ASSOCIATED MILLWORK AND FURNITURE.
3. PENETRATIONS THROUGH FLOORS AND FIRE-RATED WALLS WHERE APPLICABLE SHALL BE FIRESTOPPED IN A MANNER THAT MAINTAINS THE RATING OF THE FLOOR OR WALL PENETRATED. REFER TO ARCHITECTURAL SPECIFICATIONS.
4. NOT USED.
5. LOCATIONS OF TECHNOLOGY SYSTEMS ROUGH-IN SHALL BE COORDINATED WITH ASSOCIATED POWER RECEPTACLES.
6. NOT USED.
7. NOT USED.
8. BLOCKING FOR ALL TV AND IDS (FPD) LOCATIONS SHALL BE AS SPECIFIED IN ARCHITECTURAL SPECIFICATIONS OR AS INDICATED ON ARCHITECTURAL DRAWINGS.
9. CONTRACTOR SHALL COORDINATE THE INSTALLATION OF ALL ACCESS CONTROL SYSTEM COMPONENTS WITH DOOR AND DOOR HARDWARE VENDOR.
10. ALL DEVICES TO BE INSTALLED IN LOCATIONS APPROVED BY AUTHORITY HAVING JURISDICTION (AHJ).

SECURITY SYSTEM SYMBOLS

- C — CARDREADER
- N — CARDREADER-PINPAD
- K — KEY PAD
- M — MOTION DETECTOR
- S — STATUS SENSOR / MONITOR
- A — AUDIBLE ALARM
- L — MAGNETIC LOCK
- E — ELECTRIC STRIKE
- DL — DELAY EGRESS SYSTEM
- I — INTERCOM STATION
- ACS — ACCESS CONTROL SYSTEM
- ACP — COMMUNICATION CABINET
- DC — DOOR CONTACT
- REX — REQUEST TO EXIT

VIDEO SURVEILLANCE SYMBOLS

VIDEO SURVEILLANCE CAMERA

DIRECTION OF VIEW.
= APPROX. ANGLE OF VIEW

SITE SYMBOLS

- HH — HANDHOLE, GENERIC
- C — CABLE MARKER
- CTV — CTV PEDISTAL BOX
- FO — FIBER OPTIC MANHOLE

LINE TYPE KEY

- NEW WORK BY THIS CONTRACTOR (DARK SOLID LINE)
- EXISTING TO BE REMOVED BY THIS CONTRACTOR (DARK DASHED LINE)
- EXISTING TO REMAIN WORK (THIN SOLID LINE)
- NEW WORK UNDER FLOOR BY THIS CONTRACTOR
- T — SITE UNDERGROUND TELEPHONE

GENERAL SYMBOLS

- #/T-### — DETAIL NUMBER / SHEET NUMBER
- 9.### — KEYED NOTE, USED TO DESCRIBE ADDITIONAL INFORMATION OF WORK REQUIRED, SPECIFIC TO THE SHEET AND/OR DETAIL IT IS SHOWN WITH.

TELECOMMUNICATION OUTLET SYMBOLS

- # — VOICE OUTLET (# = QTY. CONNECTORS IF OTHER THAN 1)
- # — DATA OUTLET (# = QTY. CONNECTORS IF OTHER THAN 1)
- WAP — DATA OUTLET FOR WIRELESS ACCESS POINT (WAP) (# = QTY. CONNECTORS IF OTHER THAN 1). WAP BY OWNER UNO.
- TV — DATA OUTLET FOR TELEVISION. PROVIDE 1 CAT6 AND 1 RG6 UNDER SINGLE FACEPLATE. TV BY OWNER, UNO. REFER TO DETAIL 5/T-501.
- #/## — VOICE/DATA OUTLET (##/# = QTY. V/D CONNECTORS IF OTHER THAN 1)
- V — VOICE OUTLET FOR WALL MOUNTED TELEPHONE
- PT — PAY PHONE OUTLET
- # — FLOOR MOUNTED VOICE OUTLET (# = QTY. CONNECTORS IF OTHER THAN 1)
- # — FLOOR MOUNTED DATA OUTLET (# = QTY. CONNECTORS IF OTHER THAN 1)
- #/## — FLOOR MOUNTED VOICE/DATA OUTLET (##/# = QTY. V/D CONNECTORS IF OTHER THAN 1)
- PB — COMMUNICATIONS PUNCH BLOCK
- PP — COMMUNICATIONS PATCH PANEL
- COM — COMMUNICATIONS CABINET
- TGB — COMMUNICATIONS GROUND BUS BAR
- CLOCK
- EQUIPMENT RACK

AUDIO VISUAL SYMBOLS

- TV — TELEVISION DISPLAY.
- PROJ — PROJECTOR.
- S — CEILING MOUNTED SPEAKER
- KS — WALL MOUNTED SPEAKER
- S — PENDANT MOUNTED SPEAKER
- SP — SOUND AND PAGING CABINET
- PS — PAGING STATION
- ID — INTERCOM - DOOR STATION
- IM — INTERCOM - MASTER STATION
- IC — INTERCOM - CONTROLLER

PRELIMINARY
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2019-06-06

FOR BIDS
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MANAWA

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MANAWA MIDDLE/HIGH SCHOOL - ADDITIONS & ALTERATIONS
PART 2 - MANAWA MIDDLE / HIGH SCHOOL
515 E. 4th STREET
MANAWA, WI 54949

MARK	DATE

ISSUED: June 6, 2019
PROJECT NO: 18268
CAD DWG FILE:
DRAWN BY: JRH
CHECKED BY: Checker

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SHEET TITLE:
NOTES, SYMBOLS & ABBREVIATIONS

SHEET NUMBER:
2-TE-001

COMM DEMOLITION NOTES:

1. WIRELESS ACCESS POINTS TO BE REMOVED AND STORED BY OWNER. LOCATIONS LABELED ETR ARE EXISTING TO REMAIN, HOWEVER CABLE SHALL BE COILED UP AND PROTECTED FOR DURATION OF PROJECT TO BE RE-USED. WIRELESS ACCESS POINTS TO BE REINSTALLED BY OWNER AT CONCLUSION OF PROJECT.
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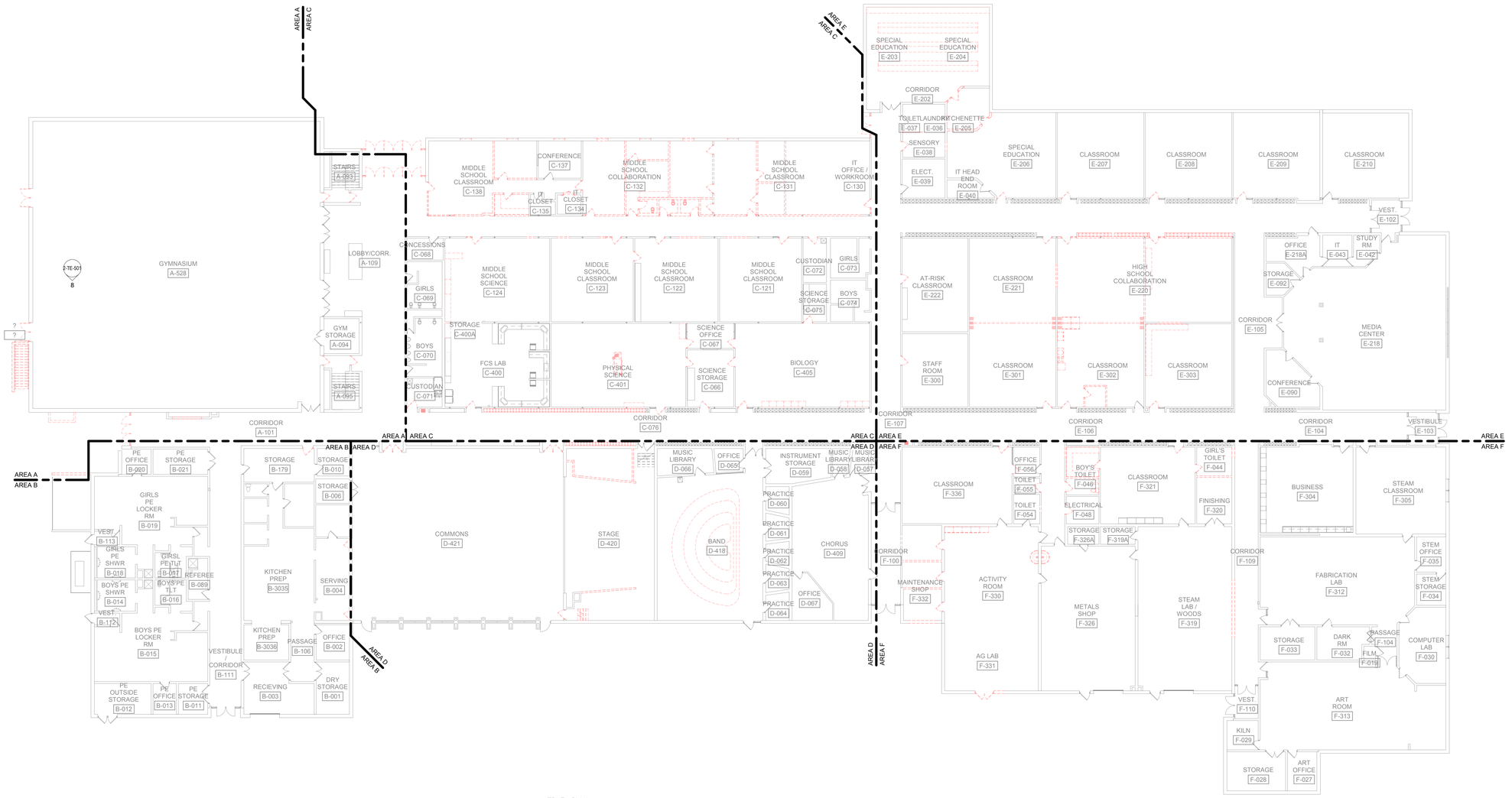
5. DEVICES LABELED FOR DEMO SHALL BE REMOVED AND GIVEN TO OWNER. CABLES TO BE REMOVED BACK TO SOURCE.

KEYED NOTES



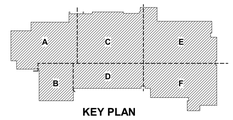
TRUE NORTH N PLAN NORTH N

1 **OVERALL FIRST FLOOR COMM DEMOLITION PLAN**

1/16" = 1'-0"

PRELIMINARY
NOT FOR CONSTRUCTION
2019-06-06

FOR BIDS
NOT FOR CONSTRUCTION



KEY PLAN

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MANAWA

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MANAWA MIDDLE/HIGH SCHOOL - ADDITIONS & ALTERATIONS
PART 2 - MANAWA MIDDLE / HIGH SCHOOL
515 E. 4th STREET
MANAWA, WI 54949

MARK	DATE
ISSUED:	June 6, 2019
PROJECT NO:	18268
CAD DWG FILE:	
DRAWN BY:	JRH
CHECKED BY:	Checker

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SHEET TITLE:
OVERALL FIRST FLOOR COMM DEMOLITION PLAN

SHEET NUMBER:
2-TD-100

COMM DEMOLITION NOTES:

1. WIRELESS ACCESS POINTS TO BE REMOVED AND STORED BY OWNER. LOCATIONS LABELED ETR ARE EXISTING TO REMAIN, HOWEVER CABLE SHALL BE COILED UP AND PROTECTED FOR DURATION OF PROJECT TO BE RE-USED. WIRELESS ACCESS POINTS TO BE REINSTALLED BY OWNER AT CONCLUSION OF PROJECT.
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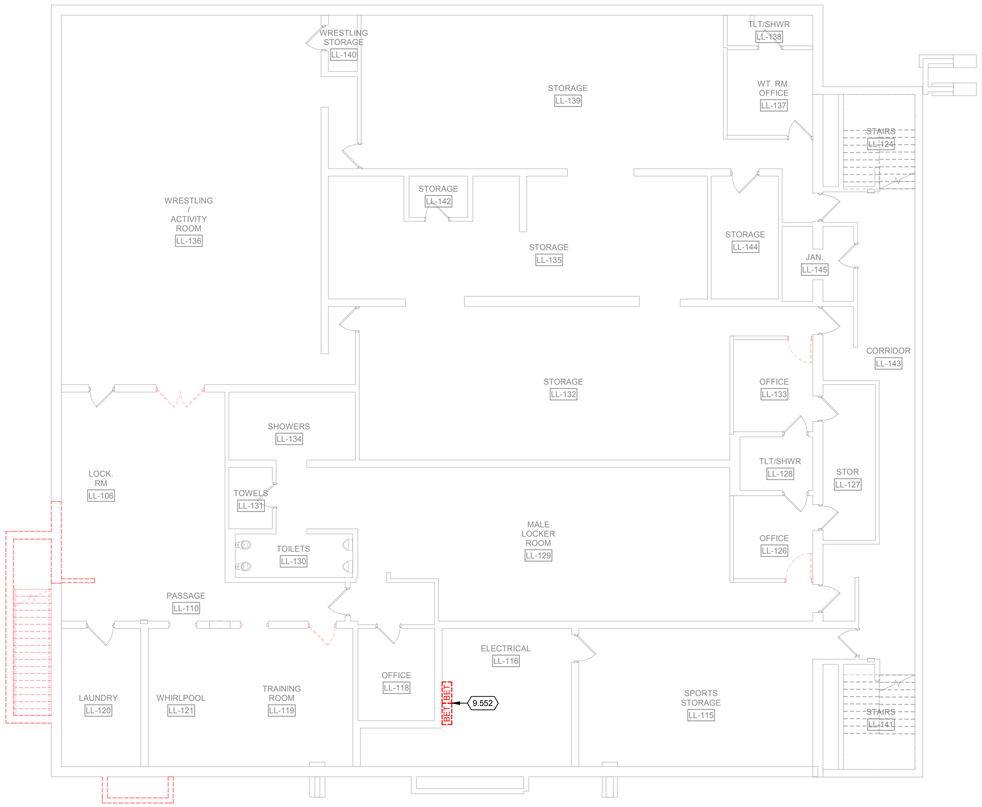
5. DEVICES LABELED FOR DEMO SHALL BE REMOVED AND GIVEN TO OWNER. CABLES TO BE REMOVED BACK TO SOURCE.

KEYED NOTES

9.552 EXISTING INCOMING UTILITY COPPER FEED TO BE REMOVED TO SOURCE.



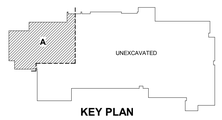
TRUE NORTH PLAN NORTH

1 **LOWER LEVEL COMM DEMOLITION PLAN**

1/8" = 1'-0"

PRELIMINARY
NOT FOR CONSTRUCTION
2019-06-06

FOR BIDS
NOT FOR CONSTRUCTION



KEY PLAN

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MARK	DATE
ISSUED:	June 6, 2019
PROJECT NO:	18268
CAD DWG FILE:	
DRAWN BY:	JRH
CHECKED BY:	Checker

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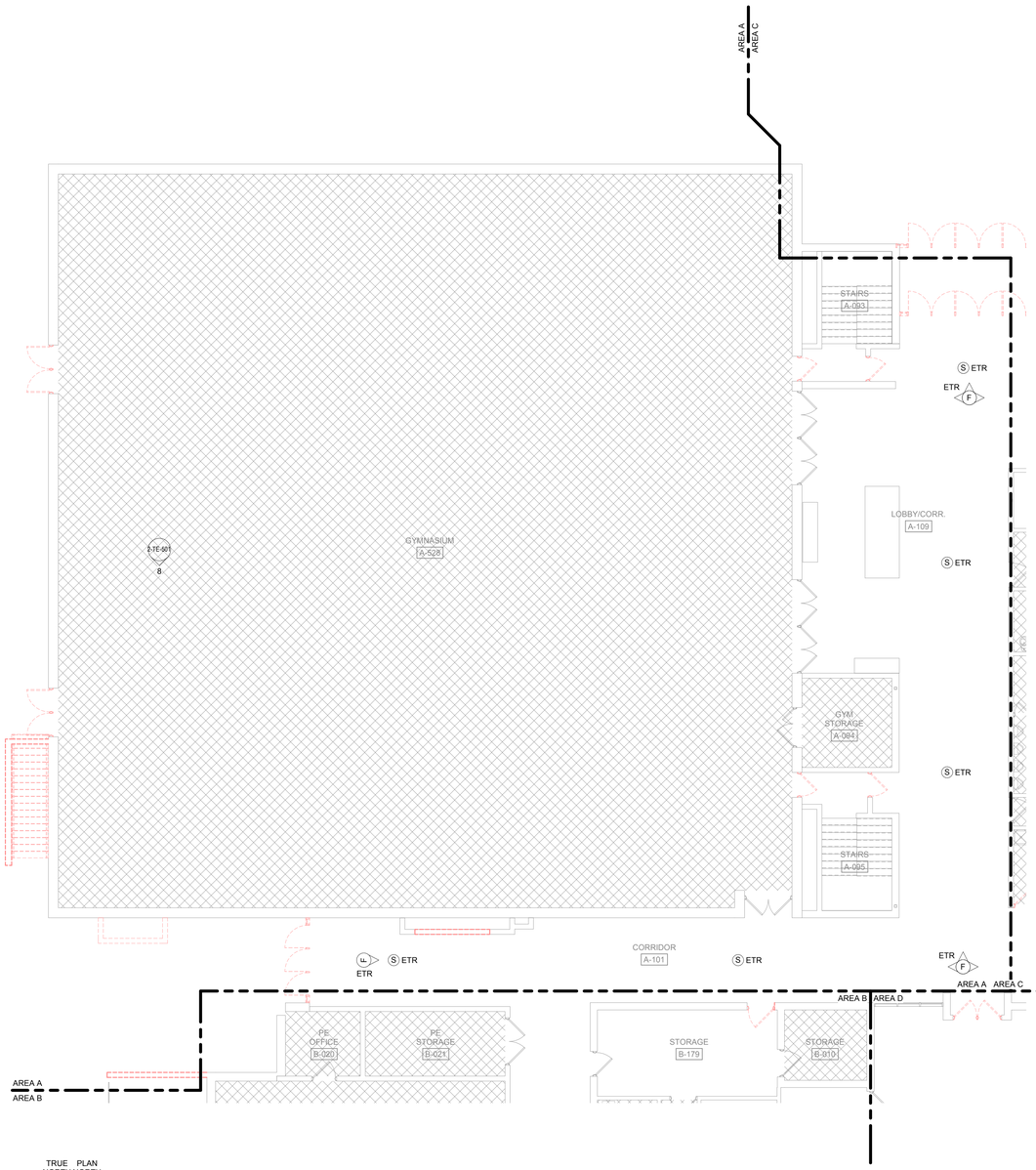
SHEET TITLE:
LOWER LEVEL COMM DEMOLITION PLAN

SHEET NUMBER:
2-TD-101



TRUE NORTH PLAN NORTH

FIRST FLOOR COMM DEMOLITION PLAN - AREA A

1/8" = 1'-0"

COMM DEMOLITION NOTES:

1. WIRELESS ACCESS POINTS TO BE REMOVED AND STORED BY OWNER. LOCATIONS LABELED ETR ARE EXISTING TO REMAIN, HOWEVER CABLE SHALL BE COILED UP AND PROTECTED FOR DURATION OF PROJECT TO BE RE-USED. WIRELESS ACCESS POINTS TO BE REINSTALLED BY OWNER AT CONCLUSION OF PROJECT.
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KEYED NOTES

PRELIMINARY
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2019-06-06

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KEY PLAN

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MARK	DATE

ISSUED: June 6, 2019
PROJECT NO: 18268
CAD DWG FILE:
DRAWN BY: JRH
CHECKED BY: Checker

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SHEET TITLE:
FIRST FLOOR COMM DEMOLITION PLAN - AREA A

SHEET NUMBER:
2-TD-102

COMM DEMOLITION NOTES:

1. WIRELESS ACCESS POINTS TO BE REMOVED AND STORED BY OWNER. LOCATIONS LABELED ETR ARE EXISTING TO REMAIN, HOWEVER CABLE SHALL BE COILED UP AND PROTECTED FOR DURATION OF PROJECT TO BE RE-USED. WIRELESS ACCESS POINTS TO BE REINSTALLED BY OWNER AT CONCLUSION OF PROJECT.
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5. DEVICES LABELED FOR DEMO SHALL BE REMOVED AND GIVEN TO OWNER. CABLES TO BE REMOVED BACK TO SOURCE.

KEYED NOTES

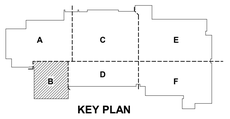
TRUE NORTH PLAN NORTH

1 **FIRST FLOOR COMM DEMOLITION PLAN - AREA B**

1/8" = 1'-0"

PRELIMINARY
NOT FOR CONSTRUCTION
2019-06-06

FOR BIDS
NOT FOR CONSTRUCTION



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MANAWA

MANAWA ELEMENTARY SCHOOL - ALTERATIONS
MANAWA MIDDLE/HIGH SCHOOL - ADDITIONS & ALTERATIONS
PART 2 - MANAWA MIDDLE / HIGH SCHOOL
515 E. 4th STREET
MANAWA, WI 54949

MARK	DATE

ISSUED: June 6, 2019
PROJECT NO: 18268
CAD DWG FILE:
DRAWN BY: JRH
CHECKED BY: Checker

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SHEET TITLE:
FIRST FLOOR COMM DEMOLITION PLAN - AREA B

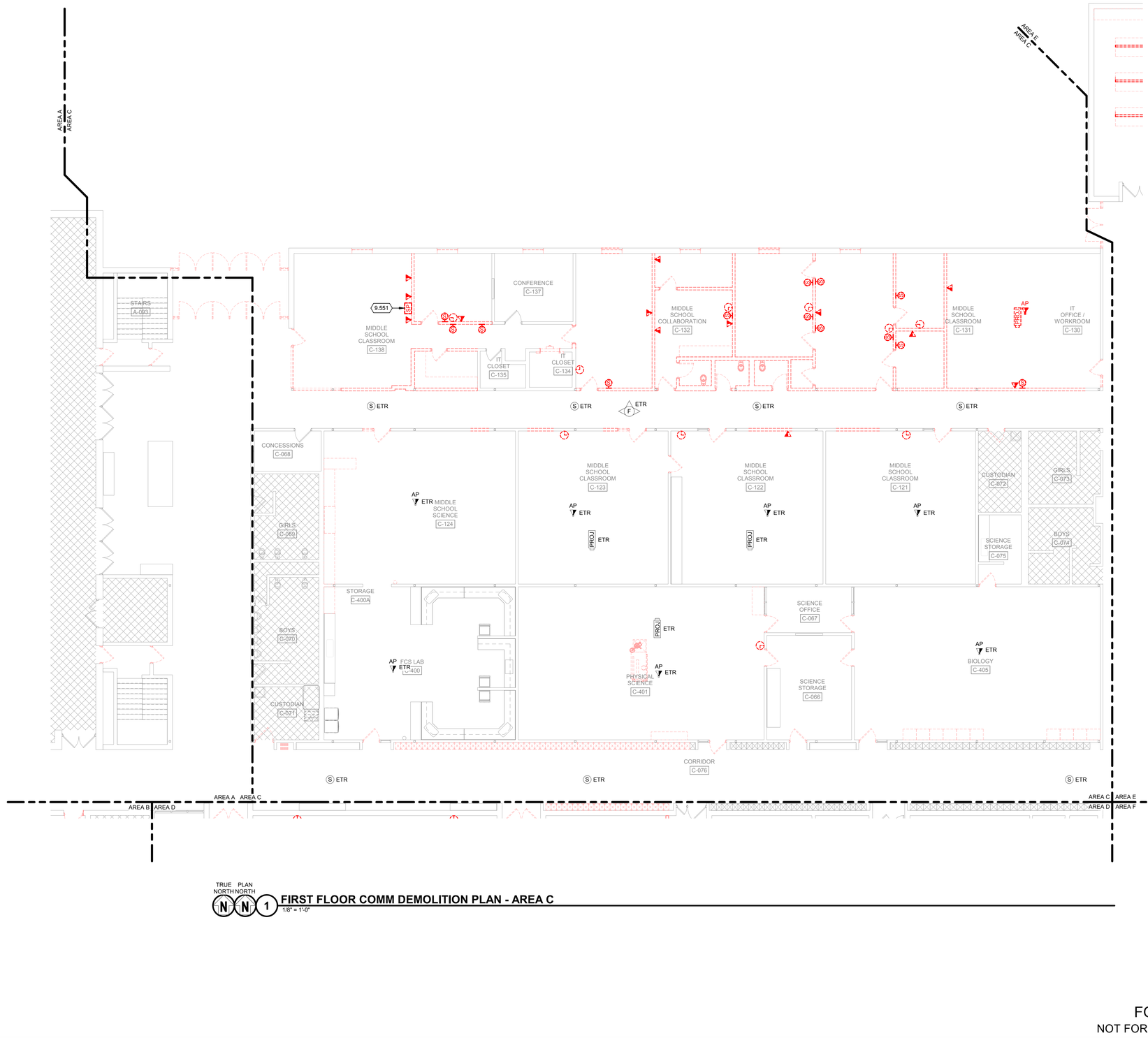
SHEET NUMBER:
2-TD-103

COMM DEMOLITION NOTES:

1. WIRELESS ACCESS POINTS TO BE REMOVED AND STORED BY OWNER. LOCATIONS LABELED ETR ARE EXISTING TO REMAIN, HOWEVER CABLE SHALL BE COILED UP AND PROTECTED FOR DURATION OF PROJECT TO BE RE-USED. WIRELESS ACCESS POINTS TO BE REINSTALLED BY OWNER AT CONCLUSION OF PROJECT.
2. PROJECTORS TO BE REMOVED AND STORED BY OWNER. LOCATIONS LABELED ETR ARE EXISTING TO REMAIN, HOWEVER CABLE SHALL BE COILED UP AND PROTECTED FOR DURATION OF PROJECT TO BE RE-USED. PROJECTORS TO BE REINSTALLED BY OWNER AT CONCLUSION OF PROJECT.
3. SPEAKERS TO BE REMOVED AND STORED BY CONTRACTOR. LOCATIONS LABELED ETR ARE EXISTING TO REMAIN, HOWEVER CABLE SHALL BE COILED UP AND PROTECTED FOR DURATION OF PROJECT TO BE RE-USED. SPEAKERS TO BE REINSTALLED BY CONTRACTOR.
4. CAMERAS TO BE REMOVED BY CONTRACTOR AND GIVEN TO OWNER TO STORE. LOCATIONS LABELED ETR ARE EXISTING TO REMAIN, HOWEVER CABLE SHALL BE COILED UP AND PROTECTED FOR DURATION OF PROJECT TO BE RE-USED. CAMERAS TO BE REINSTALLED BY OWNER AT CONCLUSION OF PROJECT.
5. DEVICES LABELED FOR DEMO SHALL BE REMOVED AND GIVEN TO OWNER. CABLES TO BE REMOVED BACK TO SOURCE.

KEYED NOTES

9.551 EXISTING PAGING CABINET. CABINET AND EQUIPMENT TO BE RELOCATED TO ROOM C-134. CABLES TO BE PULLED BACK TO ROOM C-134 AND RECONNECTED TO EXISTING SYSTEM.



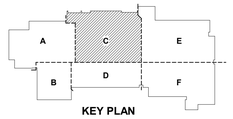
TRUE NORTH PLAN NORTH

FIRST FLOOR COMM DEMOLITION PLAN - AREA C

1/8" = 1'-0"

PRELIMINARY
NOT FOR CONSTRUCTION
2019-06-06

FOR BIDS
NOT FOR CONSTRUCTION



KEY PLAN

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800.236.2370 | hoffman.net

CONSULTANT:
Mead & Hunt, Inc.
2440 Deming Way
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MANAWA

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515 E. 4th STREET
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PROJECT NO:	18268
CAD DWG FILE:	
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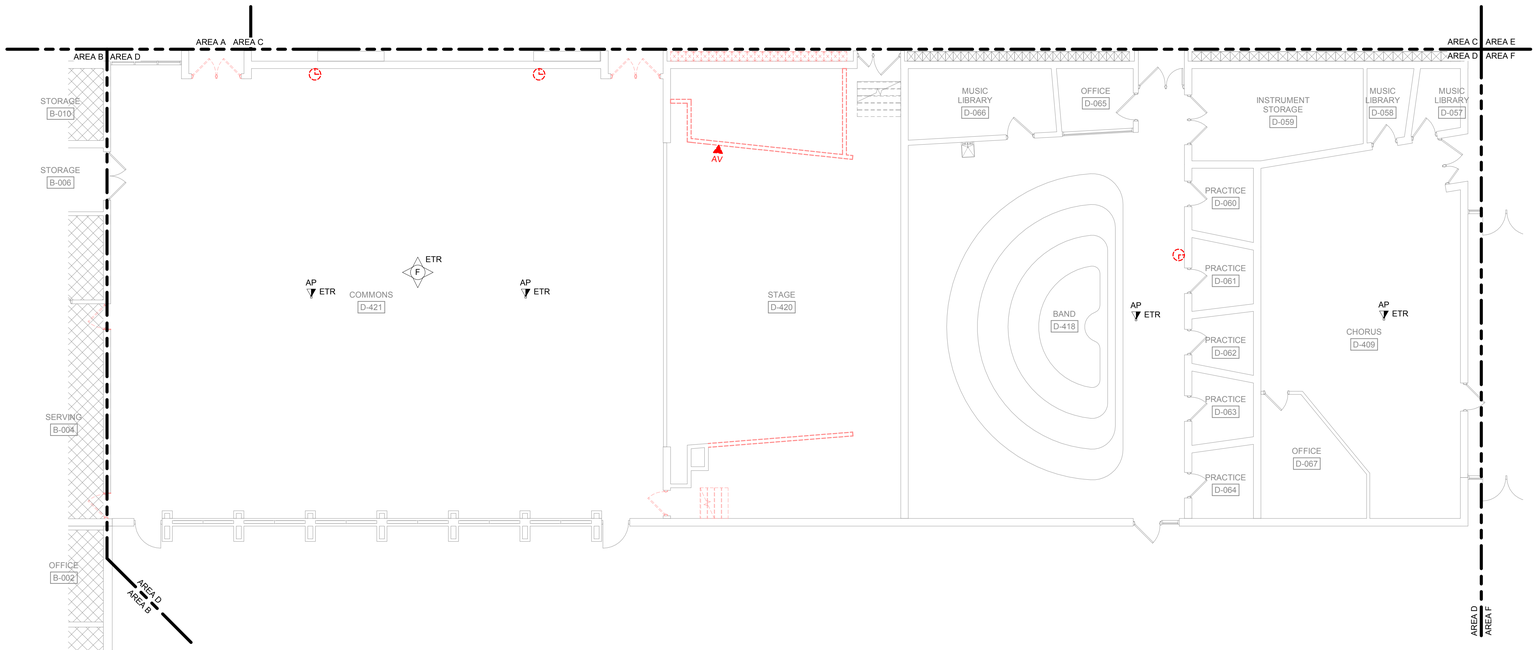
SHEET TITLE:
FIRST FLOOR COMM DEMOLITION PLAN - AREA C

SHEET NUMBER:
2-TD-104



TRUE NORTH PLAN NORTH

N N 1 **FIRST FLOOR COMM DEMOLITION PLAN - AREA D**

1/8" = 1'-0"

COMM DEMOLITION NOTES:

1. WIRELESS ACCESS POINTS TO BE REMOVED AND STORED BY OWNER. LOCATIONS LABELED ETR ARE EXISTING TO REMAIN, HOWEVER CABLE SHALL BE COILED UP AND PROTECTED FOR DURATION OF PROJECT TO BE RE-USED. WIRELESS ACCESS POINTS TO BE REINSTALLED BY OWNER AT CONCLUSION OF PROJECT.
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5. DEVICES LABELED FOR DEMO SHALL BE REMOVED AND GIVEN TO OWNER. CABLES TO BE REMOVED BACK TO SOURCE.

KEYED NOTES

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ISSUED: June 6, 2019
PROJECT NO: 18268
CAD DWG FILE:
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CHECKED BY: Checker

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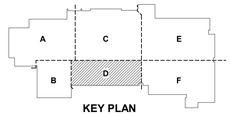
SHEET TITLE:
FIRST FLOOR COMM DEMOLITION PLAN - AREA D

SHEET NUMBER:
2-TD-105

PRELIMINARY
NOT FOR CONSTRUCTION
2019-06-06



KEY PLAN

FOR BIDS
NOT FOR CONSTRUCTION

COMM DEMOLITION NOTES:

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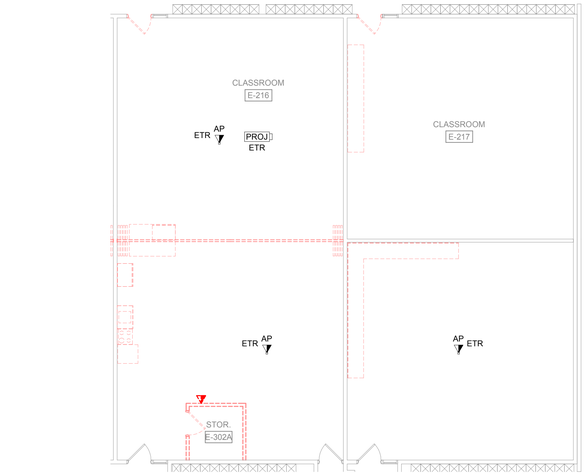
5. DEVICES LABELED FOR DEMO SHALL BE REMOVED AND GIVEN TO OWNER. CABLES TO BE REMOVED BACK TO SOURCE.

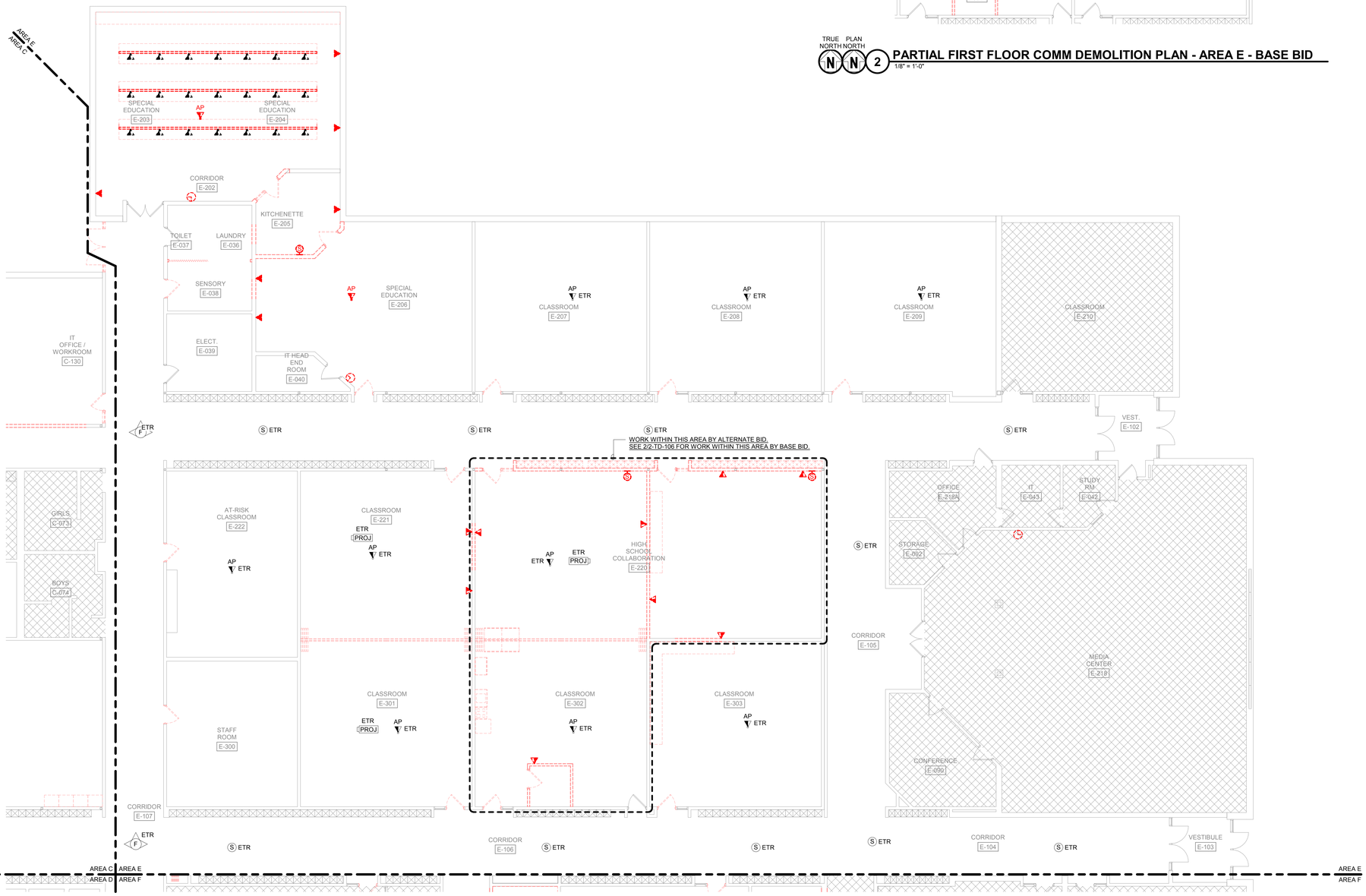
KEYED NOTES



TRUE NORTH PLAN NORTH

2 PARTIAL FIRST FLOOR COMM DEMOLITION PLAN - AREA E - BASE BID

1/8" = 1'-0"



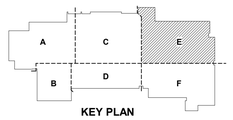
TRUE NORTH PLAN NORTH

1 FIRST FLOOR COMM DEMOLITION PLAN - AREA E

1/8" = 1'-0"

FOR BIDS
NOT FOR CONSTRUCTION

PRELIMINARY
NOT FOR CONSTRUCTION
2019-06-06



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515 E. 4th STREET
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PROJECT NO:	18268
CAD DWG FILE:	
DRAWN BY:	JRH
CHECKED BY:	Checker

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SHEET TITLE:
FIRST FLOOR COMM DEMOLITION PLAN - AREA E

SHEET NUMBER:
2-TD-106

COMM DEMOLITION NOTES:

1. WIRELESS ACCESS POINTS TO BE REMOVED AND STORED BY OWNER. LOCATIONS LABELED ETR ARE EXISTING TO REMAIN, HOWEVER CABLE SHALL BE COILED UP AND PROTECTED FOR DURATION OF PROJECT TO BE RE-USED. WIRELESS ACCESS POINTS TO BE REINSTALLED BY OWNER AT CONCLUSION OF PROJECT.
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5. DEVICES LABELED FOR DEMO SHALL BE REMOVED AND GIVEN TO OWNER. CABLES TO BE REMOVED BACK TO SOURCE.

KEYED NOTES

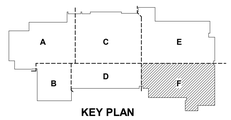
TRUE NORTH PLAN NORTH

1 **FIRST FLOOR COMM DEMOLITION PLAN - AREA F**

1/8" = 1'-0"

PRELIMINARY
NOT FOR CONSTRUCTION
2019-06-06

FOR BIDS
NOT FOR CONSTRUCTION



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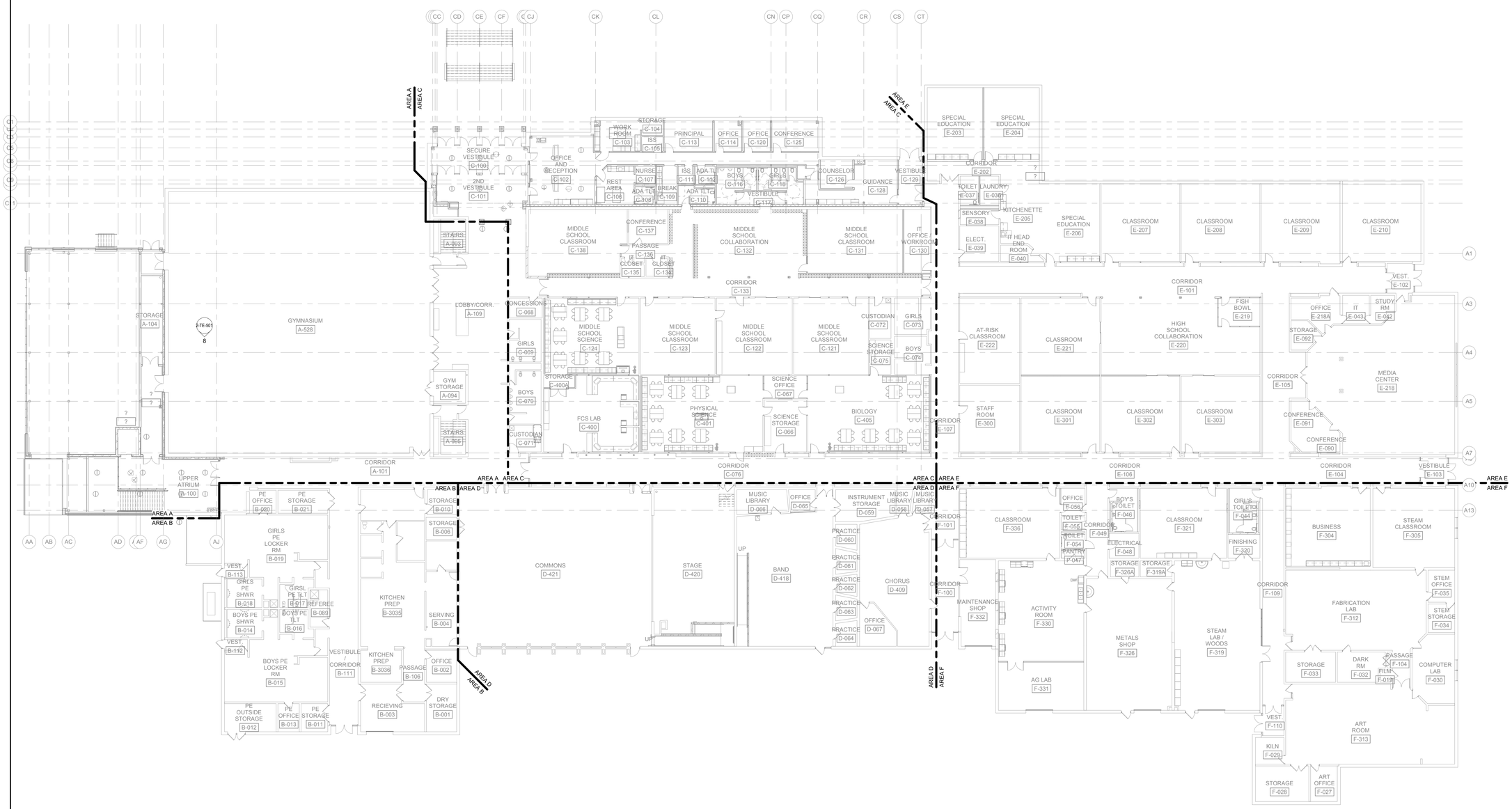
SHEET TITLE:
FIRST FLOOR COMM DEMOLITION PLAN - AREA F

SHEET NUMBER:
2-TD-107

KEYED NOTES



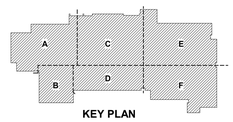
TRUE NORTH PLAN NORTH

1 OVERALL FIRST FLOOR COMM PLAN

1/16" = 1'-0"

PRELIMINARY
NOT FOR CONSTRUCTION
2019-06-06

FOR BIDS
NOT FOR CONSTRUCTION



KEY PLAN

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SHEET TITLE:
OVERALL FIRST FLOOR COMM PLAN

SHEET NUMBER:
2-TA-100

6/6/2019 4:21:47 PM C:\Revit Local\4531800-190225.01-E-HS-Central-2018_Kyle.Schommer.rvt

COMM GENERAL NOTES:

1. WIRELESS ACCESS POINTS TO BE REINSTALLED BY OWNER. EXISTING CABLE PROTECTED DURING CONSTRUCTION SHALL BE UNCOILED AND PREPARED FOR OWNER CONNECTION AND RE-INSTALLATION PRIOR TO SUBSTATIONAL COMPLETION.
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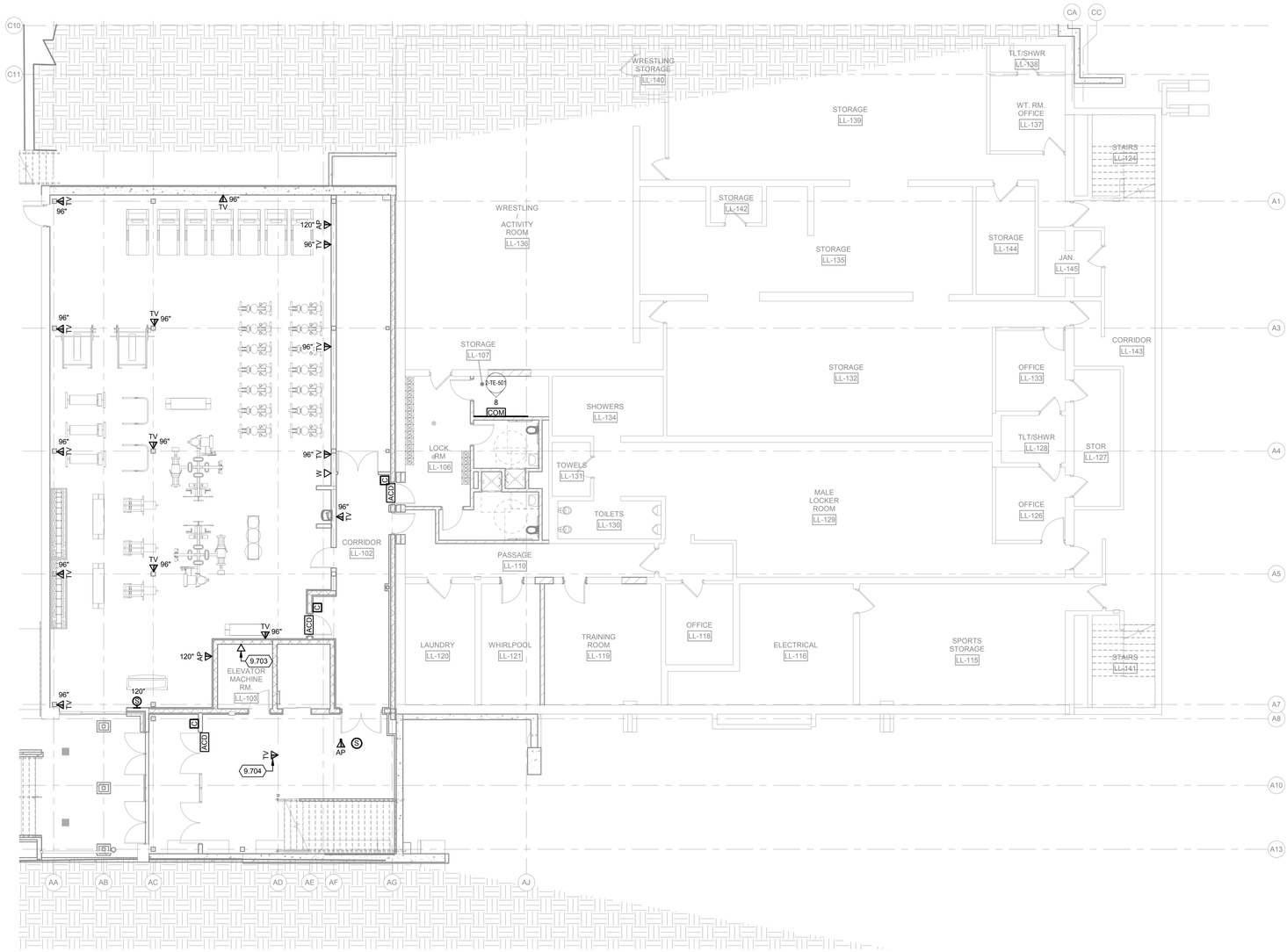
5. ALL CABLE RUNNING THROUGH AN AREA WITH OPEN CEILING SHALL BE INSTALLED IN CONDUIT. CABLE RUN THROUGH AN AREA WITH AN ACCESSIBLE CEILING TYPE TO BE FREE AIR.
6. ALL CATEGORY 6 CABLES IN THIS AREA TO BE FED FROM TR-LL-107. PAGING CABLE WILL BE FED FROM EXISTING PAGING AMPLIFIER LOCATED IN ROOM C-134.

KEYED NOTES

9.703 COORDINATE LOCATION WITH ELEVATOR EQUIPMENT CONTRACTOR.

9.704 DATA DEVICE TO SERVE DISPLAY. MOUNT DEVICE TO FACE OF SOFFIT BETWEEN CEILING OF LOWER LEVEL AND FLOOR OF FIRST LEVEL. COORDINATE EXACT LOCATION WITH DISPLAY AND DISPLAY MOUNTING BRACKET.



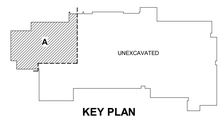
TRUE NORTH PLAN NORTH

1 LOWER LEVEL COMM PLAN

1/8" = 1'-0"

PRELIMINARY
NOT FOR CONSTRUCTION
2019-06-06

FOR BIDS
NOT FOR CONSTRUCTION



KEY PLAN

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MANAWA SCHOOL

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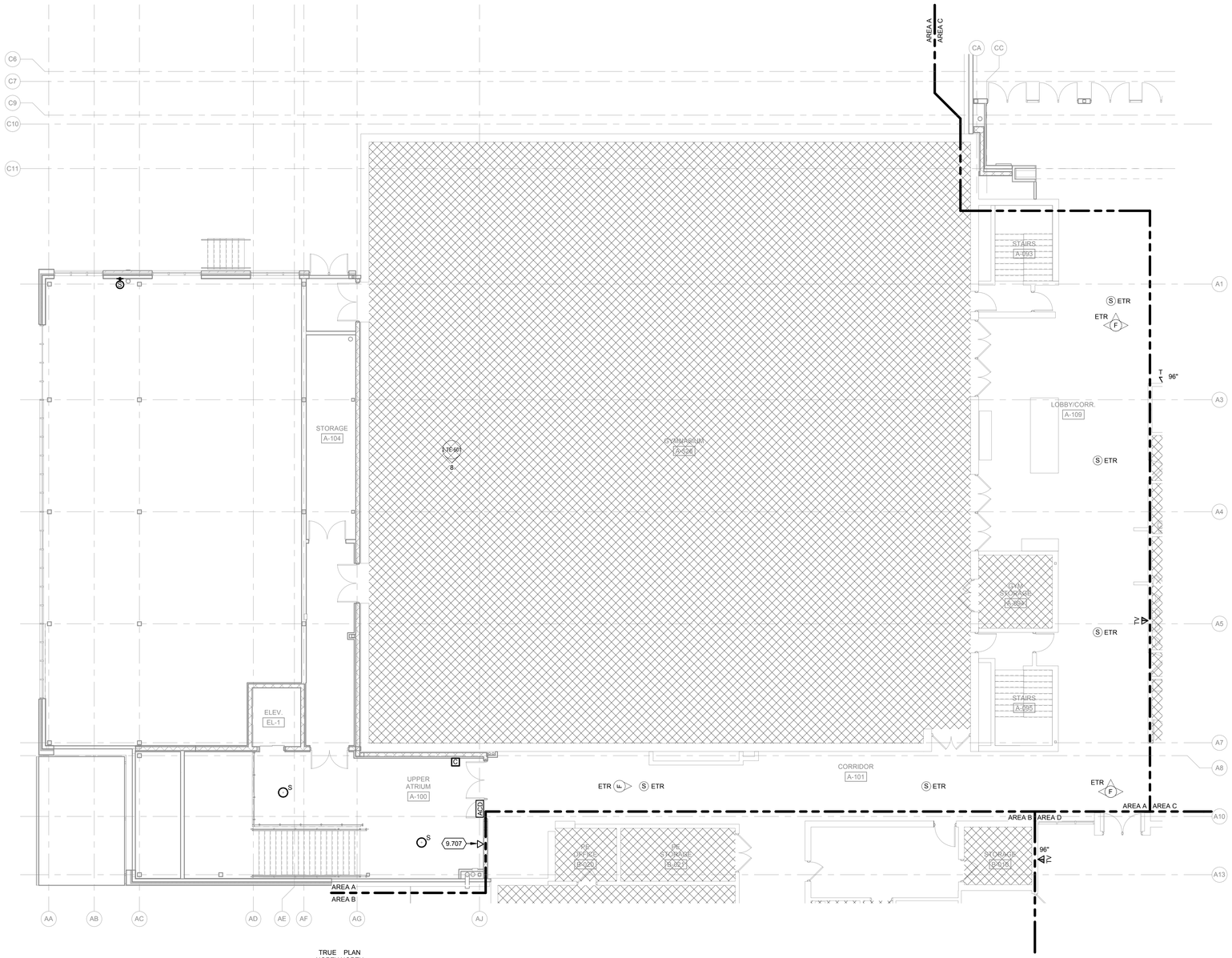
SHEET TITLE:
LOWER LEVEL COMM PLAN

SHEET NUMBER:
2-TA-101



TRUE NORTH PLAN NORTH

1 FIRST FLOOR COMM PLAN - AREA A

1/8" = 1'-0"

COMM GENERAL NOTES:

1. WIRELESS ACCESS POINTS TO BE REINSTALLED BY OWNER. EXISTING CABLE PROTECTED DURING CONSTRUCTION SHALL BE UNCOILED AND PREPARED FOR OWNER CONNECTION AND RE-INSTALLATION PRIOR TO SUBSTATIONAL COMPLETION.
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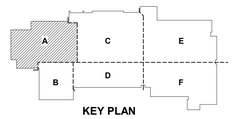
6. ALL CATEGORY 6 CABLES IN THIS AREA TO BE FED FROM TR-LL-107. PAGING CABLE WILL BE FED FROM EXISTING PAGING AMPLIFIER LOCATED IN ROOM C-134.

KEYED NOTES

9.707 AREA OF RESCUE ASSISTANCE DATA CONNECTION. SEE ELECTRICAL PLANS FOR EXACT LOCATION.

PRELIMINARY
NOT FOR CONSTRUCTION
2019-06-06

FOR BIDS
NOT FOR CONSTRUCTION



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CHECKED BY:	Checker

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SHEET TITLE:
FIRST FLOOR COMM PLAN - AREA A

SHEET NUMBER:
2-TA-102

COMM GENERAL NOTES:

1. WIRELESS ACCESS POINTS TO BE REINSTALLED BY OWNER. EXISTING CABLE PROTECTED DURING CONSTRUCTION SHALL BE UNCOILED AND PREPARED FOR OWNER CONNECTION AND RE-INSTALLATION PRIOR TO SUBSTATIONAL COMPLETION.
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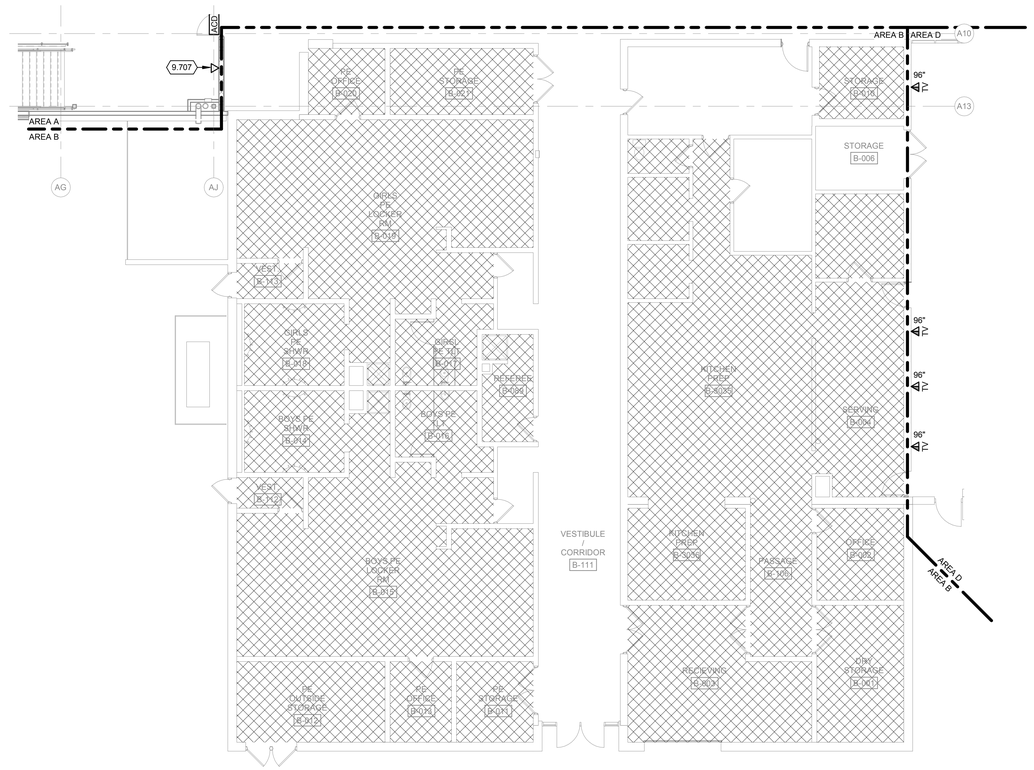
KEYED NOTES

9.707 AREA OF RESCUE ASSISTANCE DATA CONNECTION. SEE ELECTRICAL PLANS FOR EXACT LOCATION.



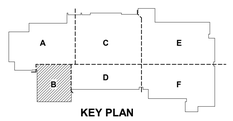
TRUE NORTH PLAN NORTH

FIRST FLOOR COMM PLAN - AREA B

1/8" = 1'-0"

PRELIMINARY
NOT FOR CONSTRUCTION
2019-06-06

FOR BIDS
NOT FOR CONSTRUCTION



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CHECKED BY:	Checker

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SHEET TITLE:
FIRST FLOOR COMM PLAN - AREA B

SHEET NUMBER:
2-TA-103

COMM GENERAL NOTES:

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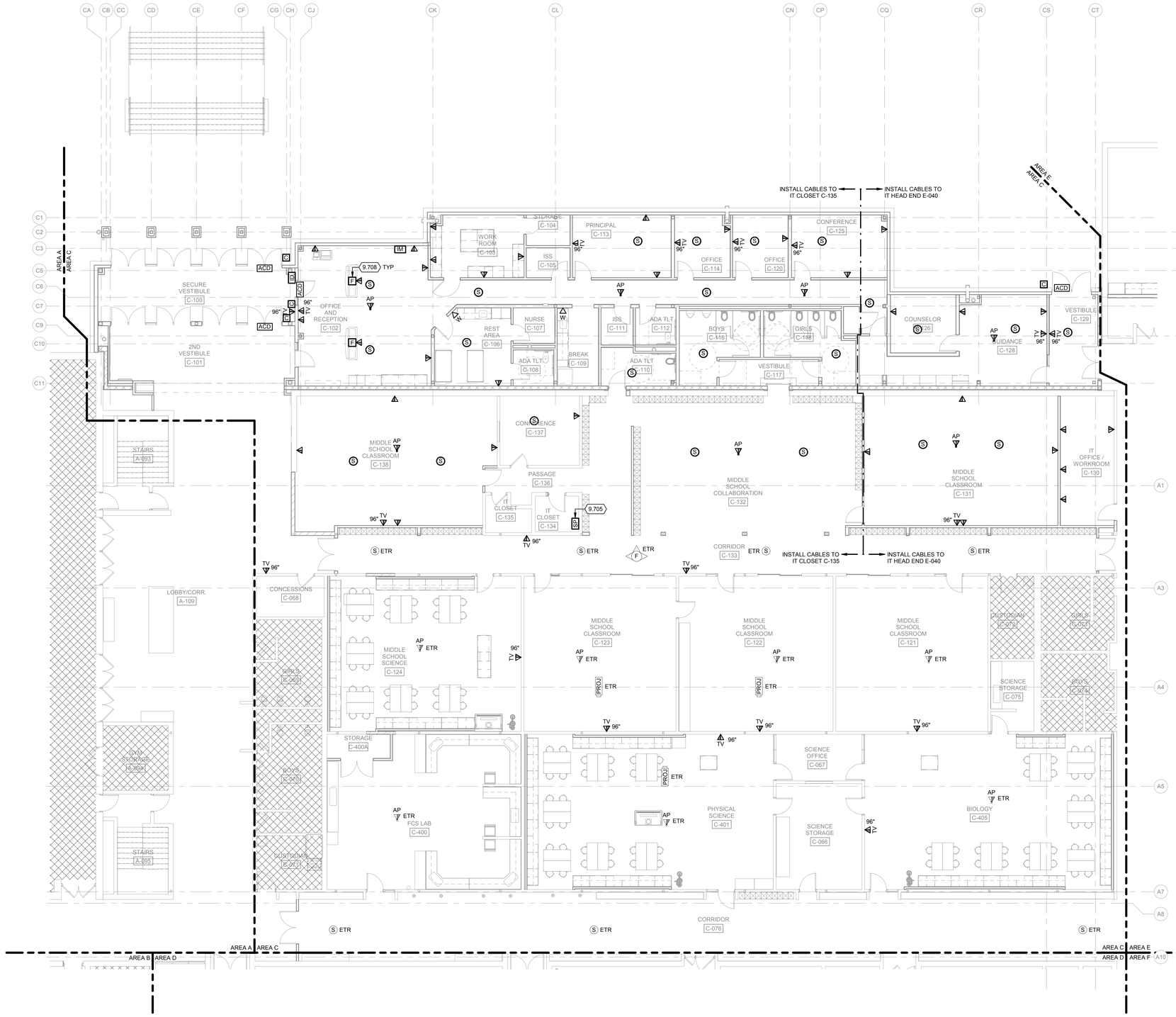
KEYED NOTES

9.705 RELOCATED PAGING SPEAKER HEAD END EQUIPMENT FROM ADMIN AREA.

9.708 REFER TO ELECTRICAL PLANS FOR FLOOR BOX REQUIREMENTS.



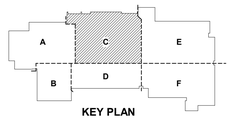
TRUE NORTH PLAN NORTH

1 **FIRST FLOOR COMM PLAN - AREA C**

1/8" = 1'-0"

PRELIMINARY
NOT FOR CONSTRUCTION
2019-06-06

FOR BIDS
NOT FOR CONSTRUCTION



KEY PLAN

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Planning, Design & Construction, Inc.
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phone: 608-273-6380
meadhunt.com

MANAWA

MANAWA ELEMENTARY SCHOOL - ALTERATIONS
MANAWA MIDDLE/HIGH SCHOOL - ADDITIONS & ALTERATIONS
PART 2 - MANAWA MIDDLE / HIGH SCHOOL
515 E. 4th STREET
MANAWA, WI 54949

MARK	DATE
ISSUED:	June 6, 2019
PROJECT NO:	18268
CAD DWG FILE:	
DRAWN BY:	JRH
CHECKED BY:	Checker

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SHEET TITLE:
FIRST FLOOR COMM PLAN - AREA C

SHEET NUMBER:
2-TA-104

COMM GENERAL NOTES:

1. WIRELESS ACCESS POINTS TO BE REINSTALLED BY OWNER. EXISTING CABLE PROTECTED DURING CONSTRUCTION SHALL BE UNCOILED AND PREPARED FOR OWNER CONNECTION AND RE-INSTALLATION PRIOR TO SUBSTATIONAL COMPLETION.
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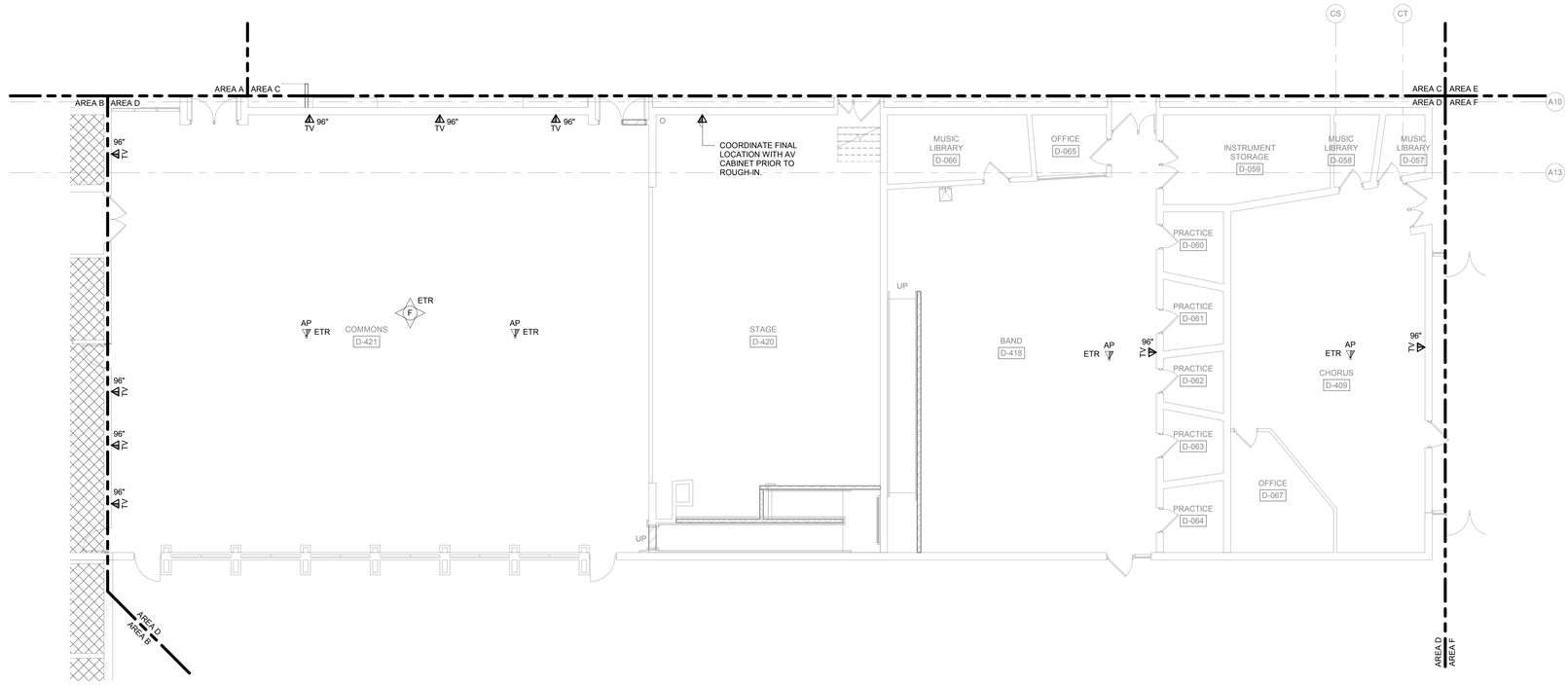
KEYED NOTES



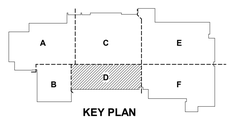
TRUE NORTH PLAN NORTH

1 **FIRST FLOOR COMM PLAN - AREA D**

1/8" = 1'-0"

PRELIMINARY
NOT FOR CONSTRUCTION
2019-06-06

FOR BIDS
NOT FOR CONSTRUCTION



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CHECKED BY: Checker

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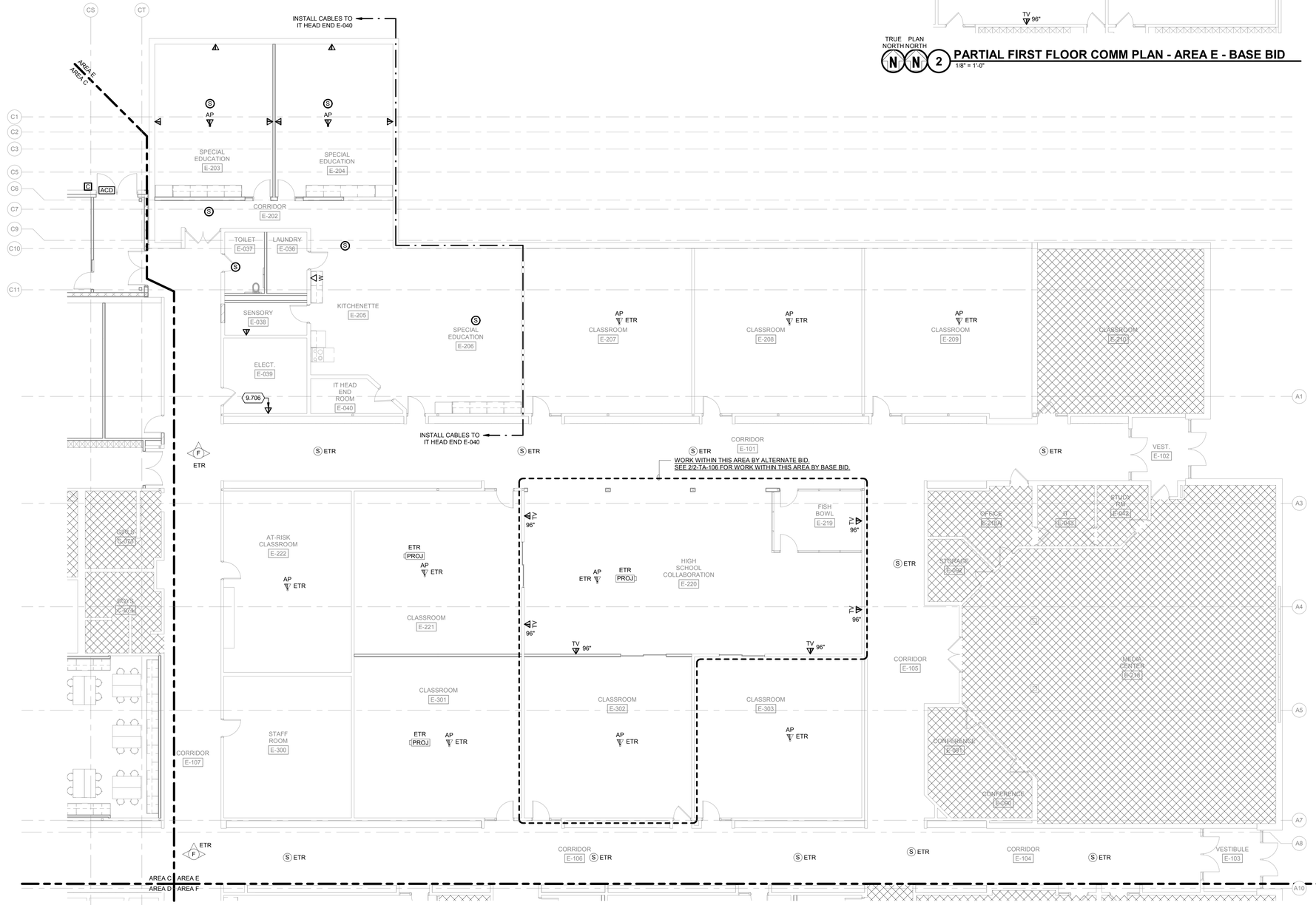
SHEET TITLE:
FIRST FLOOR COMM PLAN - AREA D

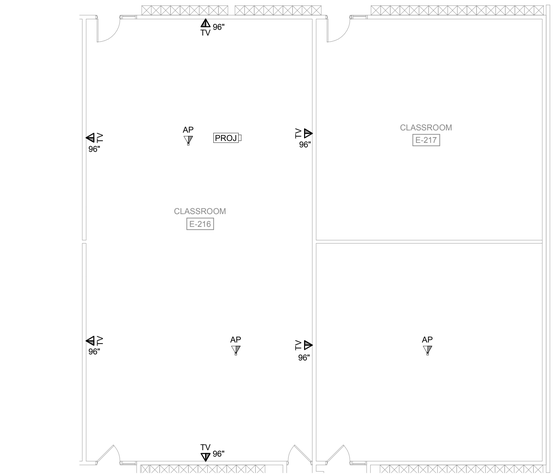
SHEET NUMBER:
2-TA-105



TRUE NORTH N PLAN NORTH N

1 FIRST FLOOR COMM PLAN - AREA E

1/8" = 1'-0"



TRUE NORTH N PLAN NORTH N

2 PARTIAL FIRST FLOOR COMM PLAN - AREA E - BASE BID

1/8" = 1'-0"

COMM GENERAL NOTES:

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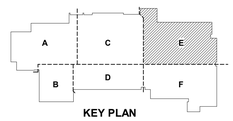
KEYED NOTES

9.706 COORDINATE LOCATION WITH FIRE ALARM CONTROL PANEL.

PRELIMINARY
NOT FOR CONSTRUCTION
2019-06-06

FOR BIDS
NOT FOR CONSTRUCTION



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CAD DWG FILE:	
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CHECKED BY:	Checker

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SHEET TITLE:
FIRST FLOOR COMM PLAN - AREA E

SHEET NUMBER:
2-TA-106

COMM GENERAL NOTES:

1. WIRELESS ACCESS POINTS TO BE REINSTALLED BY OWNER. EXISTING CABLE PROTECTED DURING CONSTRUCTION SHALL BE UNCOILED AND PREPARED FOR OWNER CONNECTION AND RE-INSTALLATION PRIOR TO SUBSTATIONAL COMPLETION.
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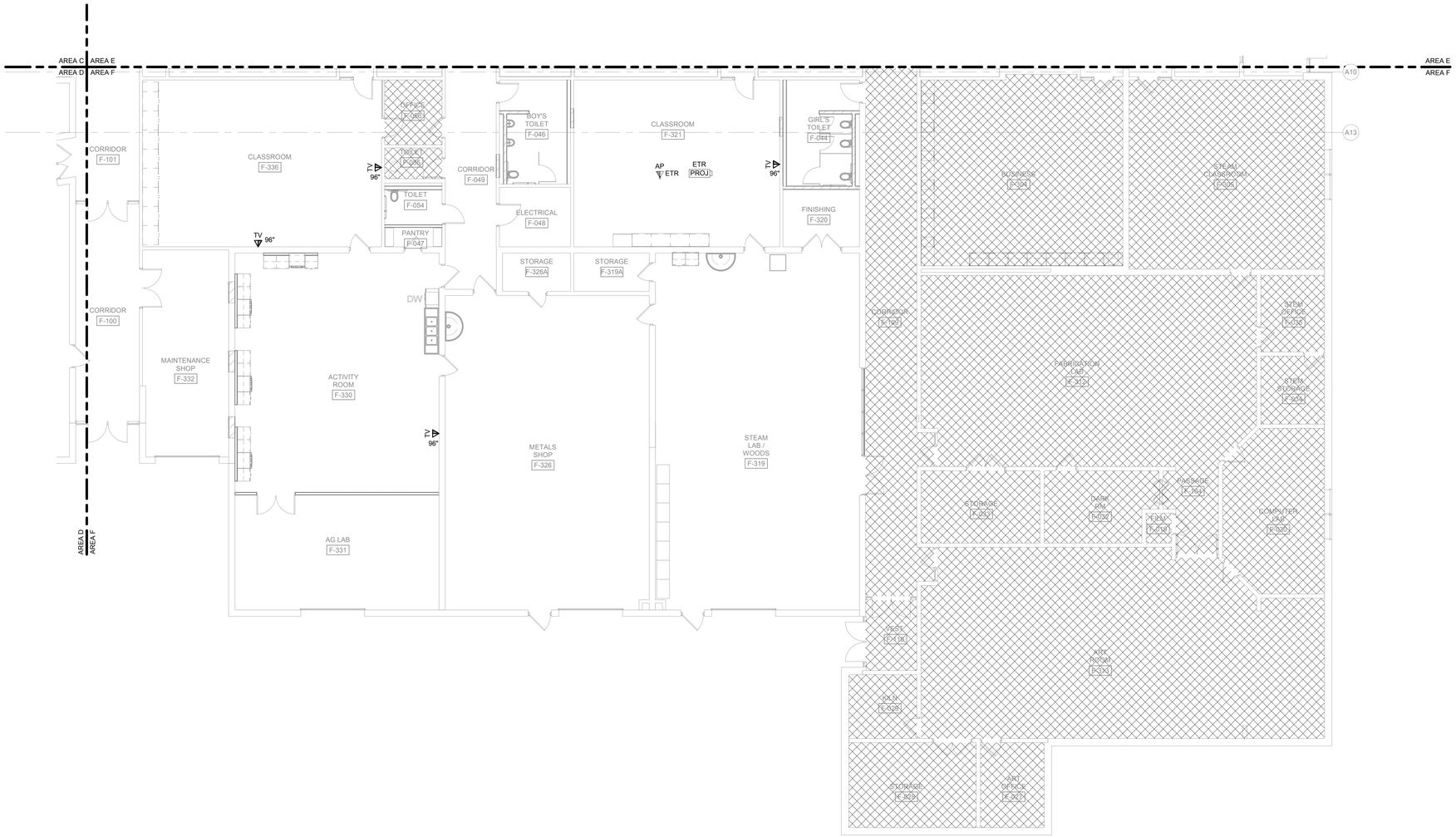
KEYED NOTES



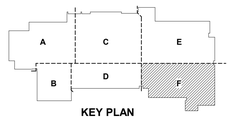
TRUE NORTH PLAN NORTH

FIRST FLOOR COMM PLAN - AREA F

1/8" = 1'-0"

PRELIMINARY
NOT FOR CONSTRUCTION
2019-06-06

FOR BIDS
NOT FOR CONSTRUCTION



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CAD DWG FILE:
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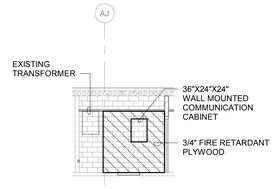
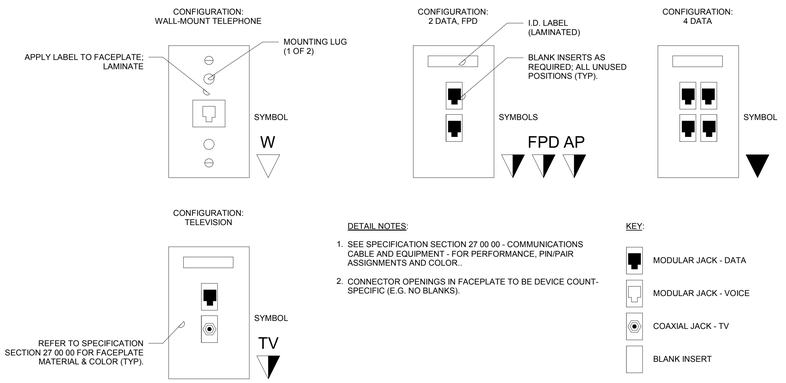
SHEET TITLE:
FIRST FLOOR COMM PLAN - AREA F

SHEET NUMBER:
2-TA-107



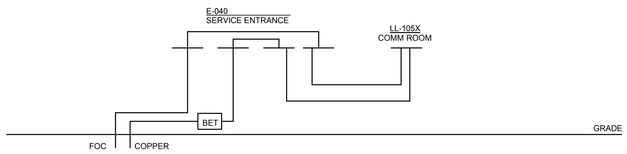
8 ROOM LL-107 SOUTH ELEVATION
1/8" = 1'-0"



1 TELECOMMUNICATIONS OUTLET LAYOUTS
NO SCALE

STUCTURED CABLING SYSTEM NOTES:

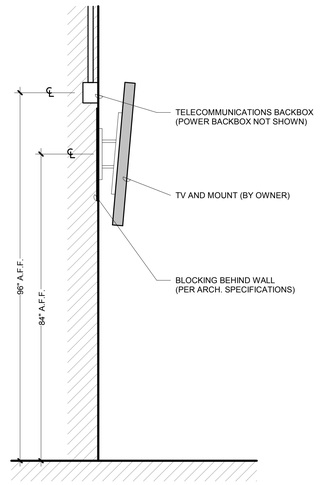
1. TERMINATE ALL BACKBONE COPPER CABLE IN 110-TYPE BLOCKS.



INTRA-BUILDING, & INTER BUILDING BACKBONE CABLING.
SEE CABLE SCHEDULE.

BACKBONE CABLE SCHEDULE				
CROSS-SECTION	COPPER PAIRS	MULTI-MODE FOC		REMARKS
E-040 TO NEW TR	25	12 - STRAND OM3		

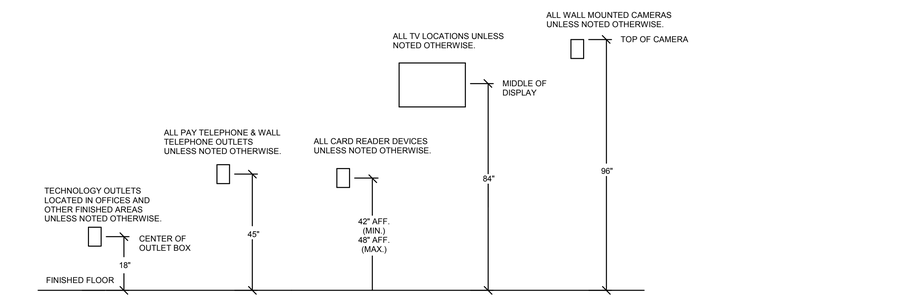
6 BACKBONE
NO SCALE



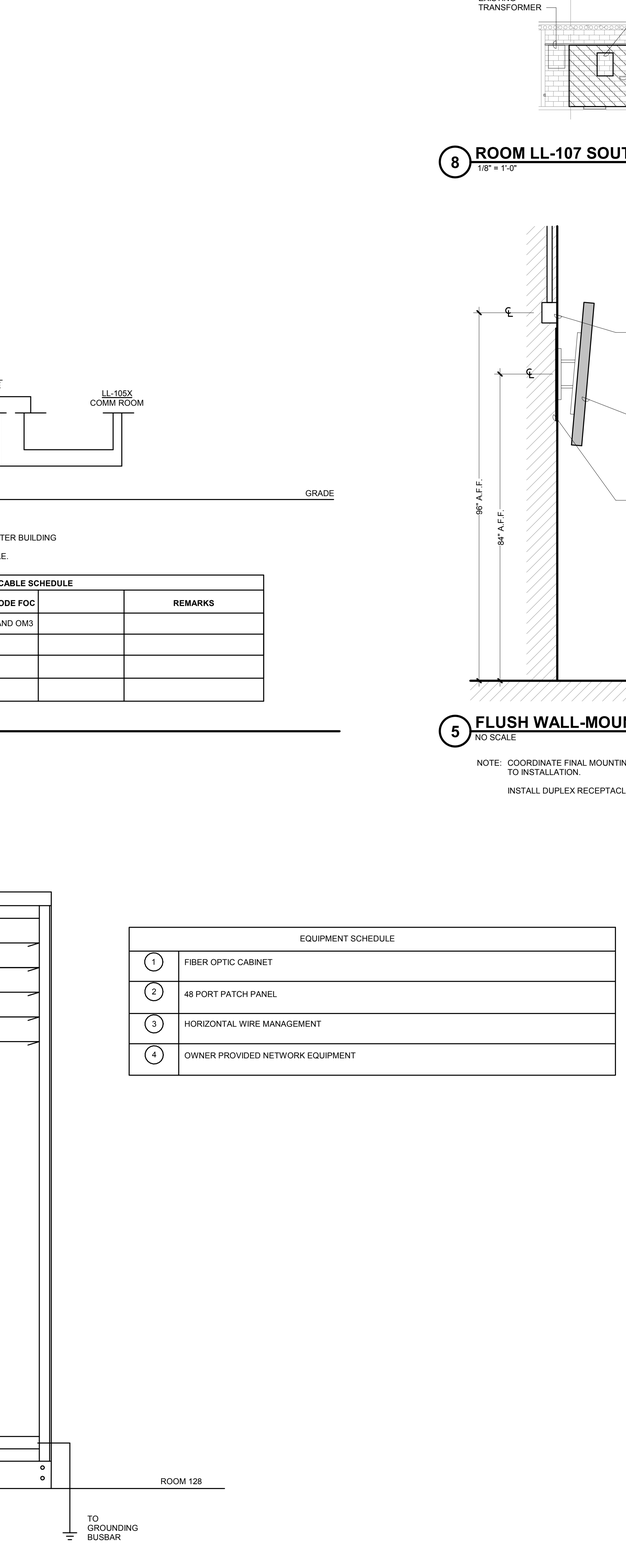
5 FLUSH WALL-MOUNTED DISPLAY DETAIL
NO SCALE

NOTE: COORDINATE FINAL MOUNTING HEIGHT OF EACH TV WITH OWNER PRIOR TO INSTALLATION.

INSTALL DUPLEX RECEPTACLE ADJACENT TO COMMUNICATION DEVICE.

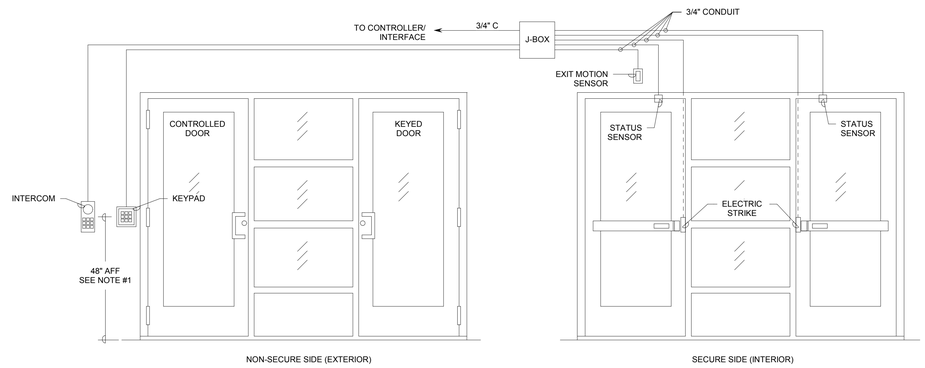


2 DEVICE MOUNTING HEIGHTS DETAIL
NO SCALE



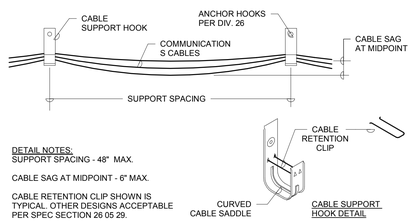
EQUIPMENT SCHEDULE	
1	FIBER OPTIC CABINET
2	48 PORT PATCH PANEL
3	HORIZONTAL WIRE MANAGEMENT
4	OWNER PROVIDED NETWORK EQUIPMENT

7 CABINET
NO SCALE



NOTES:
1. POSITION KEYPAD IN STUD-WALL ADJACENT TO DOOR. CONFIRM BEST LOCATION WITH OWNER.
2. SYSTEM TO FAIL "SECURE" IN THE EVENT OF LOSS-OF-POWER.
3. REPAIR ALL SURFACES AFFECTED BY INSTALLATION TO ORIGINAL CONDITIONS GROMMETS ON ALL PENETRATIONS TO PREVENT CABLE DAMAGE.
4. CABLE AS PER MANUFACTURER RECOMMENDATIONS.

3 DOOR ELEVATION - DOUBLE
NO SCALE



DETAIL NOTES:
SUPPORT SPACING - 48" MAX.

CABLE SAG AT MIDPOINT - 6" MAX.

CABLE RETENTION CLIP SHOWN IS TYPICAL. OTHER DESIGNS ACCEPTABLE PER SPEC SECTION 26 05 29.

4 TO PATHWAY - J-HOOKS
NO SCALE

PRELIMINARY
NOT FOR CONSTRUCTION
2019-06-06

FOR BIDS
NOT FOR CONSTRUCTION

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SHEET TITLE:
DETAILS

SHEET NUMBER:
2-TE-501

18268 -Manawa Middle/High School
Potential Alternate bids
LAST UPDATED 2019-06-25 - Dean Glatting

1. In lieu of base bid at AREA E (Collaboration) as shown on demolition and new plans, provide alternate bid as shown on demolition and new plans.
2. In lieu of no new wall cabinets, provide alternate to provide wall cabinets at the following rooms as shown on drawings:
   - C-405 BIOLOGY
   - C-401 PHYSICAL SCIENCE
   - C-124 MIDDLE SCHOOL SCIENCE
3. In lieu of no new windows at SPECIAL EDUCATION ROOMS E-203 AND E-204, provide alternate bid to provide wall demolition and new construction as required for (2) new windows as shown on drawings. See exterior elevations and wall sections of Area E.
4. In lieu of no demolition of slanted wall/soffits, provide alternate bid to provide demolition of slanted wall/soffits at:
   - East wall of BAND D-418.
   - East wall of CHORUS D-409.

   In lieu of ceilings as shown on reflected ceiling plan, provide alternate bid to provide / extend new ceiling at East end of BAND D-418 and new ceiling at East end of CHORUS D-409 in the area of the removed slanted wall/soffits, and extend those new ceilings to the existing East walls. See wall sections and interior elevations.
5. In lieu of new doors D-421C and D-421D per door schedule, provide alternate bid for the following:
   - Modify existing frame as required and provide/install removable mullion.
   - provide new doors as shown on door schedule.
   - reuse existing hardware???? **VERIFY WITH JODY. VERIFY DOOR SCHEDULE SHOWS SUCH**.
6. In lieu of no new Fire Alarm system at the Elementary School, provide alternate bid to provide a Fire Alarm system at the Elementary School as shown on drawings and specifications.
7. In lieu of base bid type EPX-1 floor finish, provide alternate bid for type LVT-1 floor finish. See Room Finish Schedule and Floor Pattern Plans for locations.
8. In lieu of base bid type EPX-1 floor finish, provide alternate bid for type CT-1 floor finish. See Room Finish Schedule and Floor Pattern Plans for locations.
9. In lieu of base bid type PC floor finish, provide alternate bid for type LVT-1 floor finish. See Room Finish Schedule and Floor Pattern Plans for locations.
10. Base bid is no new doors C-121, C-122 and C-133. In lieu of base bid, provide alternate bid to provide doors C-121, C-122 and C-123.
11. In lieu of base bid fully adhered EPDM roof membrane, provide ballasted EPDM roof membrane.

SECTION 00 01 10
TABLE OF CONTENTS

DIVISION 23 – HVAC
230500 COMMON WORK RESULTS FOR HVAC
230513 COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT
230514 VARIABLE FREQUENCY DRIVES
230516 EXPANSION FITTINGS AND LOOPS FOR HVAC PIPING
230519 METERS AND GAGES FOR HVAC PIPING
230523 GENERAL DUTY VALVES FOR HVAC PIPING
230529 HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT
230548.13 VIBRATION CONTROLS FOR HVAC
230553 IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT
230593 TESTING, ADJUSTING, AND BALANCING FOR HVAC
230713 DUCT INSULATION
230719 HVAC PIPING INSULATION
230800 COMMISSIONING OF HVAC
230900 INSTRUMENTATION AND CONTROL FOR HVAC (will be in final CD Set)
230915 DIRECT DIGITAL CONTROL INPUT/OUTPUT POINT SUMMARY TABLES
230993 SEQUENCE AND OPERATIONS FOR HVAC CONTROLS
231123 FACILITY NATURAL GAS PIPING
232113 HYDRONIC PIPING
232116 HYDRONIC PIPING SPECIALTIES
232300 REFRIGERANT PIPING
232513 WATER TREATMENT FOR CLOSED-LOOP HYDRONIC SYSTEMS
233113 METAL DUCTS
233300 AIR DUCT ACCESSORIES
233400 DUST COLLECTOR EQUIPMENT
233423 HVAC POWER VENTILATORS
233439 HIGH-VOLUME, LOW SPEED PROPELLER FANS
233600 AIR TERMINAL UNITS
233713 DIFFUSERS, REGISTERS AND GRILLES
234100 PARTICULATE AIR FILTRATION
236200 PACKAGED COMPRESSOR AND CONDENSER UNITS
237413 PACKAGED, OUTDOOR, CENTRAL-STATION AIR-HANDLING UNITS
238126 SPLIT-SYSTEM AIR CONDITIONERS
238216 AIR COILS
238233 CONVECTORS
238239.13 CABINET UNIT HEATERS
238239 UNIT HEATERS

DIVISION 25
250000 BUILDING AUTOMATION SYSTEM (BAS) INTEGRATION

DIVISION 26 – ELECTRICAL
260500 COMMON WORK REQUIREMENTS FOR ELECTRICAL
260502 ELECTRICAL DEMOLITION AND ALTERATIONS
260519 LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES
260526 GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS
260529 HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS
260533 RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

260544 SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING
260553 IDENTIFICATION FOR ELECTRICAL SYSTEMS
260574 OVERCURRENT PROTECTIVE DEVICE ARC-FLASH STUDY
260923 LIGHTING CONTROL DEVICES
262200 LOW-VOLTAGE TRANSFORMERS
262416 PANELBOARDS
262726 WIRING DEVICES
262813 FUSES
262816 ENCLOSED SWITCHES AND CIRCUIT BREAKERS
262913 ENCLOSED CONTROLLERS
263202 TWO WAY COMMUNICATION CALL SYSTEM
263323.11 CENTRAL BATTERY EQUIPMENT FOR EMERGENCY LIGHTING
264313 SURGE PROTECTION FOR LOW-VOLTAGE ELECTRICAL POWER CIRCUITS
265100 INTERIOR LIGHTING
265115 SIGNAL VOLTAGE LIGHTING CONTROL SYSTEM
265600 EXTERIOR LIGHTING

DIVISION 27 – COMMUNICATIONS
270526 GROUNDING AND BONDING FOR COMMUNICATIONS SYSTEMS
270528 PATHWAYS FOR COMMUNICATIONS SYSTEMS
270529 HANGERS AND SUPPORTS FOR COMMUNICATIONS SYSTEMS
270553 IDENTIFICATION FOR COMMUNICATIONS SYSTEMS
271100 COMMUNICATIONS EQUIPMENT ROOM FITTINGS
271116 COMMUNICATIONS RACKS, FRAMES, AND ENCLOSURES
271313 COMMUNICATIONS COPPER BACKBONE CABLING
271323 COMMUNICATIONS OPTICAL FIBER BACKBONE CABLING
271513 COMMUNICATIONS COPPER HORIZONTAL CABLING
271533 COMMUNICATIONS COAXIAL HORIZONTAL CABLING
275116 PUBLIC ADDRESS SYSTEMS
275313 CLOCK SYSTEMS

DIVISION 28 – ELECTRONIC SAFETY AND SECURITY
281300 ACCESS CONTROL SOFTWARE AND DATABASE MANAGEMENT
283100 DIGITAL, ADDRESSABLE FIRE ALARM SYSTEM

END OF SECTION 00 01 10

SECTION 23 05 00
COMMON WORK RESULTS FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 ACCURACY OF DATA AND CONTRACT DRAWINGS

A. The design drawings are diagrammatic and they may not show all physical arrangements, offsets, bends, or elbows which may be required for installation of various materials, equipment, piping, and ductwork systems in allotted spaces. The Contractor shall examine these and other available drawings to determine space limitations and interferences. The Contractor shall be responsible for making any minor changes in location of equipment, pipe and ductwork from that shown on drawings and for all physical details required for installation. Cost for adapting Contractor's work to jobsite conditions shall not be considered as basis of an extra cost to contract. The Contractor shall get approval before proceeding with any change.

B. Elevation of piping, ductwork and equipment indicated on drawings are to be used as guidelines to assist Contractor with installations. Minor changes to these elevations may be necessary to eliminate unforeseen interferences. The Contractor shall get approval before proceeding with any changes in elevations.

C. Information pertaining to new and existing conditions that are described in the specifications or appear on drawings are based on available records. While such data has been collected with reasonable care, there is no expressed or implied guarantee that conditions so indicated are entirely representative of those actually existing or that unlooked for developments may not occur. Such information is merely provided to assist the Contractor in his investigation of conditions.

D. The Contractor must carefully examine the drawings, specifications and project site, and verify all measurements, distances, levels, materials, equipment, etc. before starting work.

E. Drawings shall not be scaled for determining exact dimensions or location of equipment.

F. Check, verify, and coordinate work with drawings and specifications prepared for other trades. Include modifications, relocations, or adjustments necessary to complete work or to avoid interference with other trades.

G. Contractor may install additional piping, fittings, and valves, not shown on drawings, for testing purposes or for convenience of installation or start-up. Where such materials are installed, they shall comply with specifications and shall be sized to be compatible with system design. Remove such installed materials when they interfere with design conditions or as directed by Architect.

H. Except as otherwise specified herein or indicated on drawings, furnish and install all piping, tubing, valves, specialties and supports to connect fixtures and equipment into their respective systems as required for or incidental to the proper operation of the indicated systems. This shall include the following systems:

1. All miscellaneous piping called for on piping and instrument diagrams, regardless of whether or not indicated in the specifications or on the drawings. Reference shall be made to piping and instrument diagrams, control air piping drawings, and manufacturer's equipment drawings to determine full extent or required piping.

1.3 SUMMARY

A. This Section includes the following:

1. Piping materials and installation instructions common to most piping systems.
2. Transition fittings.
3. Dielectric fittings.
4. Sleeves.
5. Escutcheons.
6. HVAC demolition.
7. Equipment installation requirements common to equipment sections.
8. Painting and finishing.
9. Supports and anchorages.

1.4 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and chases.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

F. Except as otherwise defined in greater detail, terms “provide”, “furnish”, and “install” as used in these Contract Documents shall have the following meanings:

1. “Provide” or “provided” shall mean “furnish and install.”
2. “Furnish” or “furnished” does not include installation.
3. “Install” or “installed” does not include furnishing.

G. The following are industry abbreviations for rubber materials:

1. EPDM: Ethylene-propylene-diene terpolymer rubber.
2. NBR: Acrylonitrile-butadiene rubber.

1.5 SUBMITTALS

A. Product Data: None.

1.6 QUALITY ASSURANCE

A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."

B. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

C. Electrical Characteristics for HVAC Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

D. Where equipment or accessories are used which differ in arrangement, configuration, dimensions, ratings, or engineering parameters from those indicated on the contract documents, the contractor is responsible for all costs involved in integrating the equipment or accessories into the system and for obtaining the performance from the system into which these items are placed. This may include changes found necessary during the testing, adjusting, and balancing phase of the project.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

B. The Contractor or the Contractor’s authorized representative must be present to accept delivery of all equipment and materials furnished by him. The Owner’s personnel will not knowingly accept, unload or store anything delivered to the site for the Contractor’s use. Inadvertent acceptance of delivered items by a representative of the Owner shall not constitute acceptance or responsibility for any of the materials or equipment. It shall be the Contractor’s responsibility to assume all liability for any equipment or materials furnished by him which are delivered to the job site.

C. Storage of materials on the grounds and within the building shall be in strict accordance with instructions of the Owner. Storage of materials within building shall at no time exceed design carrying capacity of the structural system.

D. The Owner assumes no responsibility for materials stored in building or on the site. Each Contractor shall assume full responsibility for all losses or damage due to the storing of his materials.

E. Handle items carefully to avoid damage to components, enclosures and finishes. Follow the manufacturer's rigging instructions when handling and moving equipment.

1.8 COORDINATION

A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for HVAC installations.

B. Coordinate requirements for access panels and doors for HVAC items requiring access that are concealed behind finished surfaces. Access panels and doors are specified in Division 08.

1.9 RELATED WORK – UTILITY SERVICES

A. Determine utility connection requirements and include in BASE BID all costs to Owner's Project Representative or Architect for utility service.

B. Include costs for temporary service, temporary routing of piping or any other requirements of a temporary nature associated with utility service.

1.10 CODES AND REGULATIONS

A. All codes and regulations of Federal, State, and Local Authorities and utility companies shall become part of this specification and must be adhered to where they exceed requirements as shown on the drawings or stated in the specifications, without additional cost to the Contract.

1.11 CONTINUITY OF EXISTING SERVICES

A. Do not interrupt or change existing services without prior written approval. When interruption is required, coordinate length of service time with Owner's Project Representative or Architect to minimize disruption of occupant activities.

1.12 OPERATING AND MAINTENANCE INSTRUCTIONS

A. The Contractor shall provide operating and maintenance instruction manuals covering each and every item of equipment and devices furnished or erected by the Contractor prior to "Substantial Completion" as required by Division 01.

B. Each separate manual shall consist of the following:

1. Neatly typewritten table of contents including contractor's name, address and telephone number; list of each product referenced in manual; and name, address and telephone number of installing contractor and maintenance contractor for each product.
2. Tabbed sections of catalog data and literature for each product including model number, description and component parts; operating procedures; maintenance

procedures; servicing and lubrication schedules; description of sequence of operations; parts lists; illustrations, assembly drawings and diagrams required for maintenance; any additional drawings, diagrams, charts or written text which may be required to supplement product data for particular installation; certified test and balance report; list of control point labels, and wiring diagrams.

3. Copy of warranty, bond and/or service contract issued for each product including an information sheet for operations personnel with proper procedures in event of a product failure and instances which might affect validity of warranties or bonds.
4. Full size sheets, if required, shall be folded into special holding pockets. Faxed, handwritten, or illegible materials are not acceptable.

C. Prior to final inspection or acceptance, fully instruct designated facility operating and maintenance personnel on operation, adjustment and maintenance of products, equipment and systems. Review contents of operating and maintenance manual with personnel in full detail to explain all aspects of operations and maintenance.

1.13 POSTED OPERATIONS INSTRUCTIONS (POIs)

A. Provide comprehensive posted operations instructions for all equipment and systems. Instructions shall be developed as CADD schematics, files, or plans and include printed text. Information shall include but not be limited to air system schematics, water system schematics, equipment schedules, valve charts, controls points list, sequence of operations, and building plan showing equipment locations.

1. POIs shall be incorporated into the graphics package of the base central Building Automation System (BAS).

1.14 PROTECTION OF ROOF

A. Contractors are cautioned that they must exercise extreme care in any activity involving contact with any installed roof membrane.

B. Construct protective plywood (3/4 in. thick) runways across the roof for moving, setting, and installing equipment and piping systems. No activity on the roof will be permitted without this protection. Start runways at the point of origin of any equipment placed on roof and terminate at the point of installation on curb or base. At completion of work, or when directed by the Owner's Project Representative, completely remove, neatly and cleanly, without damage to roofing system, these protective items and runways.

C. Any and all repairs necessary to bring the roofing system to its original condition shall be made by an approved Roofing Contractor and paid for by the Contractor responsible for the damage.

1.15 WORK COORDINATION

A. All Trades shall work in cooperation with each other and fit their work into the structure as job conditions may demand. All final decisions as to right-of-way and run of pipes and ducts, etc. shall be made by the Owner's Project Representative. In general, priority shall be arranged as follows: (in order of preference)

1. Recessed lighting fixtures

2. Piping which must be drainable
3. Sheet metal ductwork
4. Lighting fixtures
5. Plumbing waste lines, downspouts, vents and sprinkler piping
6. Gravity water lines
7. Heating hot and natural gas lines
8. Refrigerant lines
9. Plumbing water and gas and air lines
10. Electrical conduit
11. Control wiring conduit

1.16 INSPECTION

A. The Contractor shall verify the location of underground service, utilities, structures, etc., which may be encountered or be affected by his work and shall be responsible for any damage caused by neglect to provide proper precautions or protection.

B. Any work that is to be concealed, such as inside walls, above ceilings, soffits, shall be inspected by Owner's Project Representative prior to concealment.

1.17 TEMPORARY HVAC

A. Occupied Spaces: Provide temporary heating, ventilation, and air conditioning in occupied areas when HVAC cannot be provided from existing or new systems as designed. A minimum of 0.5 cfm/ft^2 ventilation air shall be provided. When heating, the system shall maintain the room temperature at 68°F or warmer. When cooling, the system shall maintain the room temperature at 78°F or cooler and maintain the relative humidity below 60%. Existing systems may be modified to meet these requirements. Direct-fired heaters are not permitted. All temporary HVAC provisions must be approved. Visible portions, such as diffusers, grilles, thermostats, and any exposed ductwork, must also be approved.

B. In normally unoccupied spaces that are only heated, provide temporary heating to maintain the temperature at 55°F or warmer. Use of direct-fired heaters is acceptable, provided ventilation is adequate and condensation is minimized. Any damage from condensation shall be repaired by this contractor at no additional cost to the Contract.

1.18 TRAINING OF OWNER PERSONNEL

A. Instruct user agency personnel in the proper operation and maintenance of systems and equipment provided as part of this project; video tape all training sessions. Include not less than 12 hours of instruction, using the Operating and Maintenance manuals during this instruction. Demonstrate startup and shutdown procedures for all equipment. All training to be during normal working hours.

1.19 RECORD DRAWINGS

A. Refer to Division 01, General Requirements, Record Drawings.

B. In addition to the data indicated in the General Requirements, maintain temperature control record drawings on originals prepared by the installing contractor/subcontractor. Include copies of these record drawings with the Operating and Maintenance manuals.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.

2.2 PIPE, TUBE, AND FITTINGS

A. Refer to individual Division 23 piping Sections for pipe, tube, and fitting materials and joining methods.

B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.3 JOINING MATERIALS

A. Refer to individual Division 23 piping Sections for special joining materials not listed below.

B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.

1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.

    a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
    b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.

2. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.

C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

D. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

E. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAg1, silver alloy for refrigerant piping, unless otherwise indicated.

F. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

2.4 DIELECTRIC FITTINGS

A. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.

B. Insulating Material: Suitable for system fluid, pressure, and temperature.

C. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig minimum working pressure at 180 deg F (82 deg C).

1. Available Manufacturers:

   a. Capitol Manufacturing Co.
   b. Central Plastics Company.
   c. Eclipse, Inc.
   d. Epco Sales, Inc.
   e. Hart Industries, International, Inc.
   f. Watts Industries, Inc.; Water Products Div.
   g. Zurn Industries, Inc.; Wilkins Div.

D. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150 psig minimum working pressure as required to suit system pressures.

1. Available Manufacturers:

   a. Capitol Manufacturing Co.
   b. Central Plastics Company.
   c. Epco Sales, Inc.
   d. Watts Industries, Inc.; Water Products Div.

E. Dielectric-Flange Kits: Companion-flange assembly for field assembly. Include flanges, full-face- or ring-type neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.

1. Available Manufacturers:

   a. Advance Products & Systems, Inc.
   b. Calpico, Inc.
   c. Central Plastics Company.
   d. Pipeline Seal and Insulator, Inc.

2. Separate companion flanges and steel bolts and nuts shall have 150 psig minimum working pressure where required to suit system pressures.

F. Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 300-psig minimum working pressure at 225 deg F.

1. Available Manufacturers:

    a. Calpico, Inc.
    b. Lochinvar Corp.

G. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 deg F.

1. Available Manufacturers:

    a. Perfection Corp.
    b. Precision Plumbing Products, Inc.
    c. Sioux Chief Manufacturing Co., Inc.
    d. Victaulic Co. of America.

2.5 SLEEVES

A. Galvanized-Steel Sheet: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.

2.6 ESCUTCHEONS

A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.

B. Split-Plate, Stamped-Steel Type: With concealed hinge, spring clips, and chrome-plated finish.

C. Split-Casting, Floor-Plate Type: Cast brass with concealed hinge and set screw.

2.7 GROUT

A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.

1. Characteristics: Post-hardening, volume-adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
2. Design Mix: 5000-psi, 28-day compressive strength.
3. Packaging: Premixed and factory packaged.

2.8 SEALANTS

A. Reference Division 07 specification for sealant requirements.

PART 3 - EXECUTION

3.1 GENERAL

A. Verify elevations and measurements prior to installation of materials.

3.2 HVAC DEMOLITION

A. Perform all demolition as indicated on the drawings to accomplish new work. Where demolition work is to be performed adjacent to existing work that remains in an occupied area, construct temporary dust partition to minimize the amount of contamination of the occupied space. Where pipe or duct is removed and not reconnected with new work, cap ends of existing services as if they were new work. Coordinate work with the Owner's Project Representative to minimize disruption to the existing building occupants.

B. Disconnect, demolish, and remove HVAC systems, equipment, and components indicated to be removed.

1. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
2. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material.
3. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
4. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material.
5. Equipment to Be Removed: Disconnect and cap services and remove equipment.
6. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
7. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.

C. If pipe, insulation, or equipment to remain is damaged in appearance or is unserviceable, remove damaged or unserviceable portions and replace with new products of equal capacity and quality.

D. All pipe, wiring and associated conduit, insulation, ductwork, and similar items demolished, abandoned, or deactivated are to be removed from the site by the Contractor. All piping and ductwork specialties are to be removed from the site by the Contractor.

E. Removed materials must not be reused unless otherwise specified or directed to be so.

F. Arrange and pay for disconnecting, removing and capping utility services within areas of demolition. Place markers to indicate location of disconnected services. Identify service lines and capping locations on the Project Record Documents.

G. Refrigerant shall be recovered from any refrigeration unit that will be removed or salvaged. Recovered refrigerants must be bottled in pressure containers suitable for shipping per DOT requirement and remain property of the Owner. Salvage or disposal by Contractor is not permitted.

H. For any existing equipment being relocated and re-installed, the contractor shall test functionality of existing unit and report in writing any functional deficiencies. Failure to submit this report shall imply that the unit is fully functional and will obligate the contractor to repair any discovered deficiencies prior to project closeout. If functionality test report identifies unit deficiencies, the contractor shall notify the Owner's Project Representative and Architect immediately.

3.3 PIPING SYSTEMS - COMMON REQUIREMENTS

A. Install piping according to the following requirements and Division 23 Sections specifying piping systems.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping to permit valve servicing.

G. Install piping at indicated slopes.

H. Install piping free of sags and bends.

I. Install fittings for changes in direction and branch connections.

J. Install piping to allow application of insulation.

K. Full lengths of pipe shall be used. Short lengths and couplings will not be permitted.

L. Where more than one pipe material specification or valve is allowed for particular service, the Contractor is required to use one and only one of the pipe materials specified throughout project. Two or more different piping materials or valves for same service will not be allowed unless indicated otherwise on drawings or specified herein.

M. Independently support piping so that its weight shall not be supported by the equipment to which it is connected.

N. Size reduction shall be made using reducing fittings; bushings are not acceptable.

O. Mitered ells, notched tees, and orange peel reducers are not acceptable. On threaded piping, bushings are not acceptable.

P. "Weldolets" and "Threadolets" may be used for branch takeoffs up to one-half (1/2) the diameter of the main.

Q. Cover ends of piping during installation to keep inside of piping clean.

R. Piping shall not be routed through electrical rooms or transformer vaults, or above transformers, panelboards, or switchboards, including the required service space for this equipment, unless the piping is serving this equipment.

S. Use only wrenches having square flat jaws, or non-metallic strap wrenches on brass specialties; wrench marks not permitted.

T. Select system components with pressure rating equal to or greater than system operating pressure.

U. New and Existing: Install escutcheons for penetrations of walls, ceilings, and floors according to the following:

1. New Piping:

    a. Insulated Piping: Split-plate, stamped-steel type with concealed hinge and spring clips.
    b. Bare Piping at Wall and Floor Penetrations in Finished Spaces: Split-plate, stamped-steel type with concealed hinge and spring clips.
    c. Bare Piping at Ceiling Penetrations in Finished Spaces: Split-plate, stamped-steel type with concealed hinge and set screw.
    d. Bare Piping in Unfinished Service Spaces: Split-plate, stamped-steel type with concealed hinge and set screw or spring clips.
    e. Bare Piping in Equipment Rooms: Split-plate, stamped-steel type with set screw or spring clips.
    f. Bare Piping at Floor Penetrations in Equipment Rooms: Split-casting, floor-plate type.

2. Existing Piping: Use the following:

    a. Insulated Piping: Split-plate, stamped-steel type with concealed hinge and spring clips.
    b. Bare Piping at Wall and Floor Penetrations in Finished Spaces: Split-plate, stamped-steel type with concealed hinge and spring clips.
    c. Bare Piping at Ceiling Penetrations in Finished Spaces: Split-plate, stamped-steel type with concealed hinge and set screw.
    d. Bare Piping in Unfinished Service Spaces: Split-plate, stamped-steel type with concealed hinge and set screw or spring clips.
    e. Bare Piping in Equipment Rooms: Split-plate, stamped-steel type with set screw or spring clips.
    f. Bare Piping at Floor Penetrations in Equipment Rooms: Split-casting, floor-plate type.

V. Sleeves are not required for core-drilled holes thru solid concrete walls.

W. Install sleeves for pipes passing through concrete and masonry walls and concrete floor and roof slabs.

X. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.

1. Cut sleeves to length for mounting flush with both surfaces.

a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.

2. Install sleeves in new walls and slabs as new walls and slabs are constructed.
3. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:

a. Steel Pipe Sleeves: For pipes smaller than NPS 6.
b. Stack Sleeve Fittings: For pipes penetrating floors with membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level. Refer to Division 07 for flashing.

1) Seal space outside of sleeve fittings with grout.

4. Seal annular space between sleeve and pipe or pipe insulation, using joint sealants appropriate for size, depth, and location of joint. Refer to Division 07 for materials and installation.

Y. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Install steel pipe for sleeves smaller than 6 inches in diameter.
2. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

Z. Fire-Barrier/Fire Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Refer to Division 07 for materials.

AA. Verify final equipment locations for roughing-in.

BB. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

CC. Unions and/or flanges shall be installed at a minimum of 100 feet intervals in piping runs and near each piece of equipment to facilitate removal of same for repair, replacement or inspection.

DD. Vent Piping (above ground):

1. Install vent and relief valve discharge lines as indicated on the drawings, as detailed, and as specified for each specific valve or piping specialty item. In no event is a termination to occur less than six feet above a roof line.

3.1 PIPING JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and Division 23 Sections specifying piping systems.

B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.

E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.

F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

G. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.

H. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

3.2 PIPING CONNECTIONS

A. Make connections according to the following, unless otherwise indicated:

1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.

2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.
3. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
4. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.3 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.

B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

C. Install HVAC equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.

D. Install equipment to allow right of way for piping installed at required slope.

3.4 CUTTING AND PATCHING

A. Refer to Division 1, General Requirements, Cutting and Patching.

3.5 PAINTING

A. Painting of HVAC systems, equipment, and components is specified in Division 09.

B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.6 ERECTION OF METAL SUPPORTS AND ANCHORAGES

A. Refer to Division 05 for structural steel.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor HVAC materials and equipment.

C. Field Welding: Comply with AWS D1.1.

END OF SECTION 23 05 00

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SECTION 23 05 13
COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 COORDINATION

A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:

1. Motor controllers.
2. Torque, speed, and horsepower requirements of the load.
3. Ratings and characteristics of supply circuit and required control sequence.
4. Ambient and environmental conditions of installation location.

PART 2 - PRODUCTS

2.1 GENERAL MOTOR REQUIREMENTS

A. Comply with NEMA MG 1 unless otherwise indicated.

2.2 MOTOR CHARACTERISTICS

A. Duty: Continuous duty at ambient temperature of 40 deg C and at altitude of 3300 feet above sea level.

B. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

2.3 POLYPHASE INDUCTION MOTORS

A. Description: NEMA MG 1, Design B, medium induction motor.

B. Efficiency: Energy efficient, as defined in NEMA MG 1.

C. Service Factor: 1.15.

D. Multispeed Motors: Separate winding for each speed.

E. Rotor: Random-wound, squirrel cage.

F. Bearings: Regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading.

G. Temperature Rise: Match insulation rating.

H. Insulation: Class F.

I. Code Letter Designation:

1. Motors 15 HP and Larger: NEMA starting Code F or Code G.
2. Motors Smaller than 15 HP: Manufacturer's standard starting characteristic.

2.4 POLYPHASE INDUCTION MOTORS WITH ADDITIONAL REQUIREMENTS

A. Motors Used with Variable Frequency Controllers: Ratings, characteristics, and features coordinated with and approved by controller manufacturer.

1. Windings: Copper magnet wire with moisture-resistant insulation varnish, designed and tested to resist transient spikes, high frequencies, and short time rise pulses produced by pulse-width modulated inverters.
2. Energy- and Premium-Efficient Motors: Class B temperature rise; Class F insulation.
3. Inverter-Duty Motors: Class F temperature rise; Class H insulation.
4. Thermal Protection: Comply with NEMA MG 1 requirements for thermally protected motors.
5. Shaft Grounding: Provide bearing protection grounding rings to bleed current from the motor shaft to the motor casing.

2.5 SINGLE-PHASE INDUCTION MOTORS

A. Motors larger than 1/20 HP shall be one of the following, to suit starting torque and requirements of specific motor application:

1. Permanent-split capacitor.
2. Split phase.
3. Capacitor start, inductor run.
4. Capacitor start, capacitor run.

B. Multispeed Motors: Variable-torque, permanent-split-capacitor type.

C. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.

D. Motors 1/20 HP and Smaller: Shaded-pole type.

E. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

2.6 ELECTRONICALLY COMMUTATED MOTOR (ECM)

A. Description: Electrically commutated, adjustable speed, brushless direct current (BLDC) motor.

B. Constant CFM, constant torque

C. Multi-Speed: Shall be speed controllable down to 20% of full speed using a 0-10 VDC signal.

D. Efficiency: Energy efficient, as defined in NEMA MG 1.

E. Service Factor: 1.00

PART 3 - EXECUTION (Not Used)

END OF SECTION 23 05 13

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SECTION 23 05 14
VARIABLE FREQUENCY DRIVES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 COORDINATION

A. Coordinate features of variable frequency drives, installed units, and accessory devices to be compatible with the following:

1. Torque, speed, and horsepower requirements of the load.
2. Ratings and characteristics of supply circuit and required control sequence.
3. Ambient and environmental conditions of installation location.

1.3 ACTION SUBMITTALS

A. Product Data: For each type and rating of VFD indicated.

1. Include dimensions and finishes for VFDs.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For VFDs to include in emergency, operation, and maintenance manuals.

1.5 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace VFDs that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five (5) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. ABB
2. Toshiba
3. Danfoss
4. Yaskawa

2.2 DESIGN AND CONSTRUCTION

A. The unit shall be variable torque, modular design for control of the motors as specified in Division 23 and rated at the motor full load nameplate amps.

B. The unit shall be U.L. listed, solid state, microprocessor-based with a pulse width modulated (PWM) output wave form (none others are acceptable).

C. The VFD shall employ a full wave bridge rectifier and capacitors to minimize the ripple of the rectified voltage to maintain near constant DC voltage. Insulated gate bipolar transistors (IGBT's) shall be employed as the output switching device.

D. The VFD package shall contain the equivalent of 5% impedance to reduce harmonic distortion. The 5% equivalent impedance shall be provided in the form of a DC bus choke, an input AC line reactor in each phase, or a combination of the two methods.

E. Control circuitry shall be plug-in, plug-out modular basis with a corrosion resistant coating on printed circuit boards.

F. Units to be suitable for an operating environment from 0°C to 40°C temperature and humidity up to 90% non-condensing.

G. Electrically and physically isolate control circuitry and conductors from power circuitry and power conductors. Control conductors and power conductors shall not be run in the same pathway.

H. The unit enclosure shall be NEMA 1 as required for the application minimum and all components shall be fully factory assembled and tested prior to leaving the manufacturing facility.

I. Include the following operating and monitoring devices mounted on the front cover:

1. A disconnect switch or circuit breaker to de-energize the drive circuit with door interlocked handle and lock-open padlocking provisions.
2. Operating mode selector switch marked "hand-off-auto".
3. Manual speed adjustment via keypad, mounted on the door.

2.3 PERFORMANCE REQUIREMENTS

A. Units shall be suitable for input power of electrical system as scheduled on the drawings ±10%, 3 phase, 60 Hertz nominal.

B. Use a current limiting control device to limit output current to 110% continuous for one minute; also refer to Protection Features in this section. Full load output current available from drive shall not be less than motor nameplate amperage. The full load amp rating of the VFD shall not be less than the values indicated in the NEC Table 430-150.

C. Output power shall be suitable for driving standard NEMA B design, three phase alternating current induction motors at full rated speed with capability of 6:1 turndown.

D. Additional performance capabilities to include the following:

1. Ride through a momentary power outage of 15 cycles,
2. Start into a rotating load without damage to drive components or motor,
3. Capable of automatic restart into a rotating load after a preset, adjustable time delay following a power outage
4. Input power factor: Min 0.95 throughout the speed range
5. Minimum efficiency: 95% at 100% speed, 85% at 50% speed

2.4 CONTROL FEATURES

A. Use control circuits compatible with input signal from temperature control system in the automatic mode and from manual speed control in the manual mode. Vary motor speed in response to the input control signal. Include components necessary to accept the signal from the temperature control system in the form that it is sent.

B. Include the following additional control features:

1. Hand-Off-Automatic (HOA) selector switch to select local or remote start/stop and speed control.
2. Analog input, selectable 0-10v or 4-20 mA, for automatic control from the temperature control system.
3. Local speed control at the VFD.
4. Adjustable acceleration and deceleration rate so that the time period from start to full speed and from full speed to stop can be field adjusted.
5. Adjustable minimum and maximum speed settings for both automatic and manual modes of operation.
6. Field adjustment of minimum and maximum output frequency.
7. Two (2) sets of programmable form “C” contacts for remote indication of variable frequency drive condition. Note: default programming to be set for “Drive Run & Fault”.
8. Illuminated display keypad.
9. External Fault indicator.
10. One (1) input for a N.O. dry contact type input for a 2-wire remote start/stop.
11. One (1) input for a N.C. dry contact type input for external faults: (freezestats, fire alarm, smokes, etc). This input shall be factory wired to prevent both the VFD when external fault is present.
12. One (1) N.O. dry contact output for proving motor status. This output shall be programmed to detect belt or coupling break that would remove the load from the motor. The dry contact will open on loss of load or VFD being off.
13. PID control loop capable of VFD control from an external device connected to a VFD analog input.

C. The VFD controller shall convert VFD information into the BACnet MSTP protocol that will be compatible with the building direct digital energy management system (EMS) supplied on the project. This output shall be through a serial interface port capable of two-way communication with the building EMS provided on this project. Final connection shall not require any additional intermediate gateway devices to provide throughput of data. The following data shall be provided at a minimum:

1. Fault condition
2. Speed
3. Amperage

4. Frequency
5. Voltage

2.5 PROTECTION FEATURES

A. Use electronic protection circuitry in the power circuits to provide an orderly shutdown of the drive without blowing fuses or tripping circuit breakers and prevent component loss under the following abnormal conditions:

1. Activation of any safety device;
2. Instantaneous overcurrent and/or over voltage of output;
3. Power line overvoltage and undervoltage protection;
4. Phase loss;
5. Single and three phase short circuiting;
6. Ground faults;
7. Control circuit malfunction;
8. Overtemperature; and
9. Output current over limit.

B. Provide the following additional protective features:

1. Input transient overvoltage protection up to 3000 volts per ANSI 37.90A;
2. DC bus fusing or other electronic controls which limit the rate of rise of the DC bus current and de-energizes the drive at a predetermined current level;
3. Fusing for the control circuit transformer;
4. Grounded control chassis; and
5. Devices and/or control circuitry to ensure that the variable frequency drive is not both energized and driving motor simultaneously.

2.6 DIAGNOSTICS

A. Provide an English character display (no error codes) with indicators for the following:

1. Phase loss
2. Ground fault
3. Overcurrent
4. Overvoltage
5. Undervoltage
6. Over temperature
7. Overload
8. DC bus status

2.7 QUALITY ASSURANCE TESTS

A. Use a factory heat stress test to verify proper operation of all functions and components under full load.

B. Field performance test of variable frequency drives to determine compliance with this specification will be performed at the Owner's discretion and may include any specified feature, including operation of protective devices through a simulated fault. Contractor will pay for initial testing. Should drive be found deficient by this testing, drive

manufacturer will be required to make any and all changes necessary to bring unit(s) into compliance with the specified performance and demonstrate this performance by retesting. Cost of changes and retest will be by this contractor.

C. Variable frequency drive manufacturer or designated representative to perform a field test of each drive, in the presence of the Owner's representative, for the following items:

1. Provide general inspection to verify proper installation;
2. Demonstrate drive reaction to simulated power interruptions of two seconds and sixty seconds;

2.8 AC INPUT LINE REACTORS

A. When needed to comply with the requirement for 5% equivalent impedance, furnish and factory install AC input line reactors.

B. Line reactors shall be installed in each phase of the AC input side of the VFD and mounted within a common enclosure with the VFD.

C. Line reactor shall be a three-phase inductor, iron core, 600V, Class H insulation, 115 degree C rise, copper windings with screw type terminal blocks.

PART 3 - EXECUTION

3.1 VARIABLE FREQUENCY DRIVES

A. Install where indicated on drawings and in accordance with approved submittals and manufacturer's published recommendations. Installation to be by the Division 26 - Electrical contractor.

B. Input power wiring shall be installed in a separate conduit, output power wiring shall be installed in a separate conduit and control wiring shall be installed in a separate conduit. Do not mix input power, output power, or control wiring in a common conduit. Separate conduits for input and output power wiring shall be provided for each motor. Input and output power wiring for more than one motor shall not share a common conduit. Power wiring shall be furnished and installed by the Div. 26 contractor. If provided, do not mount output line filter above the drive.

C. Control signal for drive will be provided under Division 23.

D. Temperature Control Contractor will furnish and install the required temperature control wiring in metal conduit and in accordance with Division 26 of this specification.

3.2 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

B. Acceptance Testing Preparation:

1. Test insulation resistance for each VFD element, bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

C. Tests and Inspections:

1. Inspect VFD, wiring, components, connections, and equipment installation.
2. Test insulation resistance for each VFD element, component, connecting motor supply, feeder, and control circuits.
3. Test continuity of each circuit.
4. Verify that voltages at VFD locations are within 10 percent of motor nameplate rated voltages. If outside this range for any motor, notify Architect before starting the motor(s).
5. Test each motor for proper phase rotation.
6. Perform tests according to the Inspection and Test Procedures for Adjustable Speed Drives stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
7. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

8. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

D. VFDs will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports, including a certified report that identifies the VFD and describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations made after remedial action.

3.3 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.

3.4 PROTECTION

A. Replace VFDs whose interiors have been exposed to water or other liquids prior to Substantial Completion.

END OF SECTION 23 05 14

SECTION 23 05 16
EXPANSION FITTINGS AND LOOPS FOR HVAC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 PERFORMANCE REQUIREMENTS

A. Compatibility: Products shall be suitable for piping service fluids, materials, working pressures, and temperatures.

B. Capability: Products to absorb 200 percent of maximum axial movement between anchors.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Delegated-Design Submittal: For each anchor and alignment guide indicated to comply with performance requirements and design criteria, including analysis data signed by manufacturer’s application engineers for their preparation.

1. Design Calculations: Calculate requirements for thermal expansion of piping systems and for selecting and designing expansion joints, loops, and swing connections.
2. Anchor Details: Detail fabrication of each anchor indicated. Show dimensions and methods of assembly and attachment to building structure.
3. Alignment Guide Details: Detail field assembly and attachment to building structure.
4. Schedule: Indicate type, manufacturer's number, size, material, pressure rating, end connections, and location for each expansion joint.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For expansion joints to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. ASME Boiler and Pressure Vessel Code: Section IX.

PART 2 - PRODUCTS

2.1 PACKLESS EXPANSION JOINTS

A. Flexible-Hose Packless Expansion Joints:

1. Basis-of-Design Product: The design is based on the following:

    a. Flex-Hose Co., Inc. (Tri-Flex Loop)

2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Mason Industries, Inc.
    b. Metraflex Company (The).

3. Description: Manufactured assembly with inlet and outlet elbow fittings and two flexible-metal-hose legs joined by long-radius, 180-degree return bend or center section of flexible hose.

    a. Product shall absorb and compensate multi-plane pipe movements.
    b. Designed for pressure testing to 1.5 times their maximum rated working pressure and a minimum 4:1 (burst to working) safety factor.
    c. Provide hanger assembly kit shall be used to support flexible-hose.
    d. Flexible pipe loop shall be capable for multi-plane movements (X, Y, and Z), plus rotation about those axes simultaneously as well as reduce piping stress.

4. Flexible Hose: Corrugated-metal inner hoses and braided outer sheaths.
5. Expansion Joints for Copper Tubing NPS 2 and Smaller: Copper-alloy fittings with solder-joint end connections.

    a. Bronze hoses and single-braid bronze sheaths with 450 psig at 70 deg F and 340 psig at 450 deg F ratings.

6. Expansion Joints for Steel Piping NPS 2-1/2 to NPS 6: Carbon-steel fittings with weld end connections.

    a. Stainless-steel hoses and single-braid, stainless-steel sheaths with 200 psig at 70 deg F and 145 psig at 600 deg F ratings.

2.2 ALIGNMENT GUIDES AND ANCHORS

A. Alignment Guides:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Hyspan Precision Products, Inc.
    b. Mason Industries, Inc.
    c. Metraflex Company (The).

2. Description: Steel, factory-fabricated alignment guide, with bolted two-section outer cylinder and base for attaching to structure; with two-section guiding spider for bolting to pipe.

B. Anchor Materials:

1. Steel Shapes and Plates: ASTM A 36/A 36M.
2. Bolts and Nuts: ASME B18.10 or ASTM A 183, steel hex head.
3. Washers: ASTM F 844, steel, plain, flat washers.
4. Mechanical Fasteners: Insert-wedge-type stud with expansion plug anchor for use in hardened portland cement concrete, with tension and shear capacities appropriate for application.

    a. Stud: Threaded, zinc-coated carbon steel.
    b. Expansion Plug: Zinc-coated steel.
    c. Washer and Nut: Zinc-coated steel.

PART 3 - EXECUTION

3.1 EXPANSION-JOINT INSTALLATION

A. Install flexible-hose packless pipe loop expansion joints of sizes matching sizes of piping in which they are installed.

B. Install flexible-hose packless pipe loop expansion joints per manufacturer's guidelines per delegated design submittal for anchors and guides installation requirements.

3.2 PIPE LOOP AND SWING CONNECTION INSTALLATION

A. Install pipe loops cold-sprung in tension or compression as required to partly absorb tension or compression produced during anticipated change in temperature.

B. Connect risers and branch connections to mains with at least five pipe fittings including tee in main.

C. Connect risers and branch connections to terminal units with at least four pipe fittings including tee in riser.

D. Connect mains and branch connections to terminal units with at least four pipe fittings including tee in main.

3.3 ALIGNMENT-GUIDE AND ANCHOR INSTALLATION

A. Install alignment guides to guide expansion and to avoid end-loading and torsional stress.

B. Install one guide(s) on each side of pipe expansion fittings and loops. Install guides nearest to expansion joint not more than four pipe diameters from expansion joint.

C. Attach guides to pipe and secure guides to building structure.

D. Install anchors at locations to prevent stresses from exceeding those permitted by ASME B31.9 and to prevent transfer of loading and stresses to connected equipment.

E. Anchor Attachments:

1. Anchor Attachment to Steel Pipe: Attach by welding. Comply with ASME B31.9 and ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
2. Anchor Attachment to Copper Tubing: Attach with pipe hangers. Use MSS SP-69, Type 24, U-bolts bolted to anchor.

F. Fabricate and install steel anchors by welding steel shapes, plates, and bars. Comply with ASME B31.9 and AWS D1.1/D1.1M.

1. Anchor Attachment to Steel Structural Members: Attach by welding.
2. Anchor Attachment to Concrete Structural Members: Attach by fasteners. Follow fastener manufacturer's written instructions.

G. Number and spacing of guides shall be per pipe guide manufacturer’s recommendations.

END OF SECTION 23 05 16

SECTION 23 05 19
METERS AND GAGES FOR HVAC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For meters and gages to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 LIQUID-IN-GLASS THERMOMETERS

A. Metal-Case, Compact-Style, Liquid-in-Glass Thermometers:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Trerice, H. O. Co.

2. Standard: ASME B40.200.
3. Case: Cast aluminum; 6-inch nominal size.
4. Case Form: Straight unless otherwise indicated.
5. Tube: Glass with magnifying lens and blue or red organic liquid.
6. Tube Background: Nonreflective aluminum with permanently etched scale markings graduated in deg F
7. Window: Glass or plastic.
8. Stem: Aluminum or brass and of length to suit installation.

    a. Design for Air-Duct Installation: With ventilated shroud.
    b. Design for Thermowell Installation: Bare stem.

9. Connector: 3/4 inch with ASME B1.1 screw threads.
10. Accuracy: Plus or minus 1 percent of scale range or one scale division, to a maximum of 1.5 percent of scale range.

2.2 DUCT-THERMOMETER MOUNTING BRACKETS

A. Description: Flanged bracket with screw holes, for attachment to air duct and made to hold thermometer stem.

2.3 THERMOWELLS

A. Thermowells:

1. Standard: ASME B40.200.
2. Description: Pressure-tight, socket-type fitting made for insertion into piping tee fitting.
3. Material for Use with Copper Tubing: CNR or CUNI.
4. Material for Use with Steel Piping: CRES.
5. Type: Stepped shank unless straight or tapered shank is indicated.
6. External Threads: NPS 1/2, NPS 3/4, or NPS 1, ASME B1.20.1 pipe threads.
7. Internal Threads: 1/2, 3/4, and 1 inch with ASME B1.1 screw threads.
8. Bore: Diameter required to match thermometer bulb or stem.
9. Insertion Length: Length required to match thermometer bulb or stem.
10. Lagging Extension: Include on thermowells for insulated piping and tubing.
11. Bushings: For converting size of thermowell's internal screw thread to size of thermometer connection.

B. Heat-Transfer Medium: Mixture of graphite and glycerin.

2.4 PRESSURE GAGES

A. Direct-Mounted, Metal-Case, Dial-Type Pressure Gages:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. AMETEK, Inc.; U.S. Gauge.
    b. Ashcroft Inc.
    c. Miljoco Corporation.
    d. Trerice, H. O. Co.
    e. Watts Regulator Co.; a div. of Watts Water Technologies, Inc.
    f. Weiss Instruments, Inc.

2. Standard: ASME B40.100.
3. Case: Sealed type(s); cast aluminum or drawn steel; 4-1/2-inch nominal diameter.
4. Pressure-Element Assembly: Bourdon tube unless otherwise indicated.
5. Pressure Connection: Brass, with NPS 1/4 or NPS 1, ASME B1.20.1 pipe threads and bottom-outlet type unless back-outlet type is indicated.
6. Movement: Mechanical, with link to pressure element and connection to pointer.
7. Dial: Nonreflective aluminum with permanently etched scale markings graduated in psi.
8. Pointer: Dark-colored metal.
9. Window: plastic.
10. Ring: Stainless steel.
11. Accuracy: Grade A, plus or minus 1 percent of middle half of scale range.

2.5 GAGE ATTACHMENTS

A. Snubbers: ASME B40.100, brass; with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads and piston-type surge-dampening device. Include extension for use on insulated piping.

B. Valves: Brass or stainless-steel needle, with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads.

2.6 TEST PLUGS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Flow Design, Inc.
2. Miljoco Corporation.
3. Trerice, H. O. Co.
4. Watts Regulator Co.; a div. of Watts Water Technologies, Inc.
5. Weiss Instruments, Inc.

B. Description: Test-station fitting made for insertion into piping tee fitting.

C. Body: Brass or stainless steel with core inserts and gasketed and threaded cap. Include extended stem on units to be installed in insulated piping.

D. Thread Size: NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe thread.

E. Minimum Pressure and Temperature Rating: 500 psig at 200 deg F.

F. Core Inserts: Chlorosulfonated polyethylene synthetic and EPDM self-sealing rubber.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install thermowells with socket extending to center of pipe and in vertical position in piping tees.

B. Install thermowells of sizes required to match thermometer connectors. Include bushings if required to match sizes.

C. Install thermowells with extension on insulated piping.

D. Fill thermowells with heat-transfer medium.

E. Install direct-mounted thermometers in thermowells and adjust vertical and tilted positions.

F. Install duct-thermometer mounting brackets in walls of ducts. Attach to duct with screws.

G. Install direct-mounted pressure gages in piping tees with pressure gage located on pipe at the most readable position.

H. Install valve and snubber in piping for each pressure gage for fluids.

I. Install test plugs in piping tees.

J. Install thermometers in the following locations:

1. Inlet and outlet of each hydronic zone.

K. Install pressure gages in the following locations:

1. Before and after gas service regulators.

3.2 CONNECTIONS

A. Install meters and gages adjacent to machines and equipment to allow service and maintenance of meters, gages, machines, and equipment.

3.3 ADJUSTING

A. After installation, calibrate meters according to manufacturer's written instructions.

B. Adjust faces of meters and gages to proper angle for best visibility.

3.4 THERMOMETER SCALE-RANGE SCHEDULE

A. Scale Range for Heating, Hot-Water Piping: 30 to 240 deg F.

3.5 PRESSURE-GAGE SCALE-RANGE SCHEDULE

A. Scale Range for Heating, Hot-Water Piping: 0 to 30 psi.

END OF SECTION 23 05 19

SECTION 23 05 23
GENERAL-DUTY VALVES FOR HVAC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 DEFINITIONS

A. CWP: Cold working pressure.

B. EPDM: Ethylene propylene copolymer rubber.

C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.

D. NRS: Nonrising stem.

E. OS&Y: Outside screw and yoke.

F. RS: Rising stem.

G. SWP: Steam working pressure.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of valve indicated.

1.4 QUALITY ASSURANCE

A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.

B. ASME Compliance:

1. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
2. ASME B31.1 for power piping valves.
3. ASME B31.9 for building services piping valves.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:

1. Protect internal parts against rust and corrosion.
2. Protect threads, flange faces, grooves, and weld ends.
3. Set angle, gate, and globe valves closed to prevent rattling.
4. Set ball and plug valves open to minimize exposure of functional surfaces.
5. Set flange ball valves closed or slightly open.

6. Block check valves in either closed or open position.

B. Use the following precautions during storage:

1. Maintain valve end protection.
2. Store valves indoors and maintain at higher than ambient dew point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

1.6 EXTRA MATERIALS

A. Provide two repacking kits for each size and valve type.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

A. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

B. Valve Sizes: Same as upstream piping unless otherwise indicated.

C. Valve Actuator Types:

1. Gear Actuator: For quarter-turn valves NPS 6 and larger.
2. Handwheel: For valves other than quarter-turn types.
3. Handlever: For quarter-turn valves NPS 5 and smaller**.**

D. Valves in Insulated Piping: With 2-inch stem extensions and the following features:

1. Gate Valves: With rising stem.
2. Ball Valves: With extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.
3. Flanged Ball Valves: With extended neck.

E. Valve-End Connections:

1. Flanged: With flanges according to ASME B16.1 for iron valves.
2. Grooved: With grooves according to AWWA C606.
3. Threaded: With threads according to ASME B1.20.1.

F. Valve Bypass and Drain Connections: MSS SP-45.

G. The manufacturer's name and valve pressure rating shall appear on the outside of the valve body.

2.2 BRONZE BALL VALVES

A. 2" and smaller: Two-piece bronze body; threaded or soldered ends, as appropriate to the pipe material; stainless steel or chrome plated brass/bronze ball; conventional port;

glass filled teflon seat; threaded packing gland follower; blowout-proof stem; 600 psig WOG.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Apollo 70-100/200 series
    b. Hammond 8301/8311
    c. Milwaukee BA100/150
    d. Nibco T/S 585-70
    e. Stockham S206/216.

2. Description:

    a. Standard: MSS SP-110.
    b. SWP Rating: 150 psig
    c. CWP Rating: 600 psig
    d. Body Design: Two piece.
    e. Body Material: Bronze.
    f. Ends: Threaded.
    g. Seats: PTFE or TFE.
    h. Stem: Bronze.
    i. Ball: Chrome-plated brass.
    j. Port: Full.

3. 2½" and over: The above manufacturers of ball valves will not be accepted in sizes over 2 inch. American Valve is only accepted ball valves as noted below.

2.3 CAST IRON, FLANGED BALL VALVES

A. Class 125, Iron Ball Valves: 2½" and larger: Use American Valve ball valves for flanged connections in lieu of butterfly valves at all branch services lines.

1. Basis-of-Design Product: Subject to compliance with requirements, provide the following as City of Madison's preferred ball valve manufacturer supplier for 2½" and larger.

    a. American Valve: 4000 Flanged ball valve.

2. Cast iron body; stainless steel shaft; flanged ball valve with Cast Iron/PFA fused ball, blow-out proof stem, full port with Lockable in Full Open or Closed Positions lockable in full open or closed positions. Rated for 150 WSP 300 WOG.

3. Description:

   a. Standard: MSS SP-72.
   b. CWP Rating: 200 psig
   c. Body Design: Split body.
   d. Body Material: ASTM A 126, gray iron.
   e. Ends: Flanged.
   f. Seats: PTFE or TFE.
   g. Stem: Stainless steel.
   h. Ball: Stainless steel.
   i. Port: Full.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.

C. Examine threads on valve and mating pipe for form and cleanliness.

D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.

E. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE INSTALLATION

A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

B. Locate valves for easy access and provide separate support where necessary.

C. Install valves in horizontal piping with stem at or above center of pipe.

D. Install valves in position to allow full stem movement.

E. Install shutoff valves in all branch lines at or near header and at each automatic valve location.

F. Vents and Drains: All required vents and drains may not be shown on the Contract Drawings. Install 3/4-inch nominal size vent and drain valves in piping systems 1-inch and larger. Install line size vent and drain valves in piping systems 3/4 inch and smaller. Locate vents at high points of each line and/or branch connection. Locate drains at low points. Use piping materials specified for each service. Cap all vents and drains.

1. Use gate or ball valve with threaded hose adapter and chained cap. Strainer blowdown valves shall be same size as strainer blowdown connection.

3.3 ADJUSTING

A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.4 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

A. If valve applications are not indicated, use the following:

1. Shutoff Service: Ball, or flanged ball valves.

B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP classes or CWP ratings may be substituted.

C. See drawing valve schedule for valve application requirements.

D. Select valves with the following end connections:

1. For Copper Tubing, NPS 2 and Smaller: Threaded ends except where solder-joint valve-end option is indicated.
2. For Steel Piping, NPS 2 and Smaller: Threaded ends.
3. For Steel Piping, NPS 2-1/2 to NPS 4 Flanged ends except where threaded valve-end option is indicated in valve schedules below.

END OF SECTION 23 05 23

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SECTION 23 05 29
HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 DEFINITIONS

A. MSS: Manufacturers Standardization Society of The Valve and Fittings Industry Inc.

1.3 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design trapeze pipe hangers and equipment supports, including comprehensive engineering analysis by a manufacturer's application engineer, using performance requirements and design criteria indicated.

1.4 ACTION SUBMITTALS

A. Product Data: None.

B. Delegated-Design Submittal: For trapeze hangers indicated to comply with performance requirements and design criteria, including analysis data by manufacturer's application engineer responsible for their preparation.

1. Detail fabrication and assembly of trapeze hangers.
2. Design Calculations: Calculate requirements for designing trapeze hangers.

1.5 QUALITY ASSURANCE

A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 METAL PIPE HANGERS AND SUPPORTS

A. Carbon-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Galvanized Metallic Coatings: Pregalvanized or hot dipped.
3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
4. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.

2.2 TRAPEZE PIPE HANGERS

A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

2.3 METAL FRAMING SYSTEMS

A. MFMA Manufacturer Metal Framing Systems:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Allied Tube & Conduit.
    b. Cooper B-Line, Inc.
    c. Flex-Strut Inc.
    d. GS Metals Corp.
    e. Thomas & Betts Corporation.
    f. Unistrut Corporation; Tyco International, Ltd.
    g. Wesanco, Inc.

2. Description: Shop- or field-fabricated pipe-support assembly for supporting multiple parallel pipes.
3. Standard: MFMA-4.
4. Channels: Continuous slotted steel channel with inturned lips.
5. Channel Nuts: Formed or stamped steel nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
6. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.
7. Metallic Coating: Hot-dipped galvanized.

2.4 FASTENER SYSTEMS

A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

B. Mechanical-Expansion Anchors: Insert-wedge-type, stainless- steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.5 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2.6 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.

B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Nonstaining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT INSTALLATION

A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.

B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.

C. Metal Framing System Installation: Arrange for grouping of parallel runs of piping, and support together on field-assembled metal framing systems.

D. Fastener System Installation:

1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

E. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

F. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

G. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

H. Install lateral bracing with pipe hangers and supports to prevent swaying.

I. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

J. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

K. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

L. Insulated Piping:

1. Attach clamps and spacers to piping.

    a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
    b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
    c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.

2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.

3. Shield Dimensions for Pipe: Not less than the following:

    a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
    b. NPS 4: 12 inches long and 0.06 inch thick.

3.2 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Grouting: Place grout under supports for equipment and make bearing surface smooth.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.3 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.4 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.5 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.

B. Touchup: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Division 09.

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.6 HANGER AND SUPPORT SCHEDULE

A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.

B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use carbon-steel pipe hangers and supports metal trapeze pipe hangers and metal framing systems and attachments for general service applications.

F. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30.
2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of up to 1050 deg F, pipes NPS 4 to NPS 24, requiring up to 4 inches of insulation.

3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36, requiring clamp flexibility and up to 4 inches of insulation.
4. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes NPS 1/2 to NPS 24 if little or no insulation is required.
5. Pipe Hangers (MSS Type 5): For suspension of pipes NPS 1/2 to NPS 4, to allow off-center closure for hanger installation before pipe erection.
6. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of noninsulated, stationary pipes NPS 3/4 to NPS 8.
7. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
8. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
9. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
10. Split Pipe Ring with or without Turnbuckle Hangers (MSS Type 11): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 8.
11. Extension Hinged or Two-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 3.
12. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30.
13. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.
14. Pipe Saddle Supports (MSS Type 36): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.
15. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.
16. Adjustable Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes NPS 2-1/2 to NPS 36 if vertical adjustment is required, with steel-pipe base stanchion support and cast-iron floor flange.
17. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30, from two rods if longitudinal movement caused by expansion and contraction might occur.
18. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes NPS 2-1/2 to NPS 24, from single rod if horizontal movement caused by expansion and contraction might occur.
19. Complete Pipe Rolls (MSS Type 44): For support of pipes NPS 2 to NPS 42 if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.
20. Pipe Roll and Plate Units (MSS Type 45): For support of pipes NPS 2 to NPS 24 if small horizontal movement caused by expansion and contraction might occur and vertical adjustment is not necessary.
21. Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes NPS 2 to NPS 30 if vertical and lateral adjustment during installation might be required in addition to expansion and contraction.

G. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24.
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 if longer ends are required for riser clamps.

H. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.

I. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.
3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
6. C-Clamps (MSS Type 23): For structural shapes.
7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
11. Malleable-Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
12. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:

    a. Light (MSS Type 31): 750 lb.
    b. Medium (MSS Type 32): 1500 lb.
    c. Heavy (MSS Type 33): 3000 lb.

13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.

15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.

J. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.

K. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.

L. Comply with MFMA-103 for metal framing system selections and applications that are not specified in piping system Sections.

M. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

END OF SECTION 23 05 29

SECTION 23 05 48.13
VIBRATION CONTROLS FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include rated load, rated deflection, and overload capacity for each vibration isolation device.
2. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of vibration isolation device type required.
3. Detail fabrication and assembly of equipment bases. Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.

B. Delegated-Design Submittal: For each vibration isolation device.

1. Include design calculations for selecting vibration isolators to comply with performance requirements and design criteria, including analysis data by manufacturer’s application engineer responsible for their preparation.

1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For air-spring mounts to include in operation and maintenance manuals.

1.4 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.5 VIBRATION CONTROL DESIGN CRITERIA

A. Isolate all motor driven and reciprocating mechanical equipment unless otherwise noted, from building structure, and from systems which they serve, to prevent equipment vibrations from being transmitted to structure. Unless specifically indicated, follow ASHRAE Application Handbook - Sound and Vibration Control, latest edition or manufacturer's recommendations for isolation selection.

B. Select and locate isolators to produce uniform loading and deflection. Use minimum of four isolators to support each piece of equipment.

C. Select vibration isolation devices based on lowest operating speed.

D. Vibration Criteria:

1. All rotating equipment shall operate at speeds less than 80% of their true critical speed. Unless otherwise required, equipment shall be balanced according to the recommendations given in the following schedules.

2. Vertical vibration of rotating equipment shall not be greater than levels indicated. Vibration shall be measured on equipment or steel-frame equipment base when equipment is mounted on its vibration isolation mounts. If equipment has inertia base, allowable vibration level is reduced by ratio of equipment weight alone to equipment weight plus inertia base weight.

Equipment Speed RPM	Maximum Allowable Vibration Displacement Peak-to-Peak (mil)
Under 600	4
600 to 1000	3
1000 or 2000	2
over 2000	1

3. Following field installation, each fan over 5 HP shall be balanced in accordance with the following schedule:

   a. Centrifugal fans - 25 mil/sec, rms

4. Final in-field balance shall be measured with each fan over 5 HP installed on springs specified for unit. Fans shall be loaded with design static pressure. Measurement shall be carried out in vertical axis at each corner of frame supporting fan/motor assembly.

PART 2 - PRODUCTS

2.1 ELASTOMERIC HANGERS

A. Elastomeric Mount in a Steel Frame with Upper and Lower Steel Hanger Rods: Retain "Manufacturers" Subparagraph and list of manufacturers below to require products from manufacturers listed or a comparable product from other manufacturers.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Kinetics Noise Control, Inc.
   b. Mason Industries, Inc.
   c. Vibration Eliminator Co., Inc.
   d. Vibration Mountings & Controls, Inc.

2. Frame: Steel, fabricated with a connection for an upper threaded hanger rod and an opening on the underside to allow for a maximum of 30 degrees of angular lower hanger-rod misalignment without binding or reducing isolation efficiency.
3. Dampening Element: Molded, oil-resistant rubber, neoprene, or other elastomeric material with a projecting bushing for the underside opening preventing steel to steel contact.

2.2 SPRING HANGERS

A. Combination Coil-Spring and Elastomeric-Insert Hanger with Spring and Insert in Compression:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Kinetics Noise Control, Inc.
   b. Mason Industries, Inc.
   c. Vibration Eliminator Co., Inc.
   d. Vibration Mountings & Controls, Inc.

2. Frame: Steel, fabricated for connection to threaded hanger rods and to allow for a maximum of 30 degrees of angular hanger-rod misalignment without binding or reducing isolation efficiency.
3. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
4. Minimum Additional Travel: 50 percent of the required deflection at rated load.
5. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
6. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
7. Elastomeric Element: Molded, oil-resistant rubber or neoprene. Steel-washer-reinforced cup to support spring and bushing projecting through bottom of frame.
8. Self-centering hanger rod cap to ensure concentricity between hanger rod and support spring coil.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and equipment to receive vibration isolation control devices for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in of reinforcement and cast-in-place anchors to verify actual locations before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 VIBRATION CONTROL DEVICE INSTALLATION

A. Installation of vibration isolators must not cause any change of position of equipment, piping, or ductwork resulting in stresses or misalignment.

END OF SECTION 23 05 48.13

SECTION 23 05 53
IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 ACTION SUBMITTALS

A. Product Data: None.

1.3 COORDINATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Plastic Labels for Equipment:

1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, and having predrilled holes for attachment hardware.
2. Letter Color: White.
3. Background Color: Red.
4. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
6. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
7. Fasteners: Stainless-steel rivets or self-tapping screws.
8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified.

2.2 PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.

B. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.

1. Exterior pipe labels furnished with laminated, waterproof pretensioned pipe labels with maximum UV resistant inks.

C. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

D. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.
2. Lettering Size: At least 1-1/2 inches high.

2.3 DUCT LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, and having predrilled holes for attachment hardware.

B. Letter Color: Black.

C. Background Color: White.

D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.

G. Fasteners: Stainless-steel rivets or self-tapping screws.

H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

I. Duct Label Contents: Include identification of duct service using same designations or abbreviations as used on Drawings; also include duct size and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with duct system service lettering to accommodate both directions or as separate unit on each duct label to indicate flow direction.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

C. Engraved Name Plates:

1. White letters on a red background, 1/16 inch thick plastic laminate, beveled edges, screw mounting, Setonply Style 2060 by Seton Name Plate Company or Emedolite- Style EIP by EMED Co., or equal by Marking Services, or W. H. Brady.

3.3 PIPE LABEL INSTALLATION

A. Comply with requirements in Section 230500 "Common Work Results for HVAC" for piping and valve identification.

B. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Near each valve and control device.
2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
4. At access doors, manholes, and similar access points that permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

C. Pipe Label Color Schedule:

1. Yellow background color with black letters.

D. Contractor to label all existing and new gas piping from the utility meter to all gas equipment and rooftop units in the Manawa High School. Include exterior labeling of exterior gas piping with laminated, waterproof pretensioned pipe labels with maximum UV resistant inks.

E. Exposed Interior Piping Color-Coding:

1. Painting of piping is specified in Division 09.

F. Paint exposed, exterior metal piping, valves, service regulators, service meters and meter bars, and piping specialties, except components, with factory-applied paint or protective coating.

1. Alkyd System: MPI EXT 5.1D.
2. Prime Coat: Alkyd anticorrosive metal primer.
3. Intermediate Coat: Exterior alkyd enamel matching topcoat.
4. Topcoat: Exterior alkyd enamel (gloss).
5. Color: Gray.

G. Paint exposed, interior metal piping, valves, service regulators, service meters and meter bars, and piping specialties, except components, with factory-applied paint or protective coating.

1. Latex Over Alkyd Primer System: MPI INT 5.1Q.
2. Prime Coat: Alkyd anticorrosive metal primer.
3. Intermediate Coat: Interior latex matching topcoat.
4. Topcoat: Interior latex (semigloss).
5. Color: Yellow.

H. Damage and Touchup: Repair marred and damaged factory-applied finishes with materials and by procedures to match original factory finish.

3.4 DUCT LABEL INSTALLATION

A. Install self-adhesive or stenciled duct labels with permanent adhesive on all air ducts.

B. Locate labels near points where ducts enter into and exit from concealed spaces and at maximum intervals of 50 feet in each space where ducts are exposed or concealed by removable ceiling system.

END OF SECTION 23 05 53

SECTION 23 05 93
TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 DEFINITIONS

A. AABC: Associated Air Balance Council.

B. NEBB: National Environmental Balancing Bureau.

C. TAB: Testing, adjusting, and balancing.

D. TABB: Testing, Adjusting, and Balancing Bureau.

E. TAB Specialist: An entity engaged to perform TAB Work.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: Within 30 days of Contractor's Notice to Proceed, submit documentation that the TAB contractor and this Project's TAB team members meet the qualifications specified in "Quality Assurance" Article.

B. Certified TAB reports.

1.4 QUALITY ASSURANCE

A. TAB Contractor Qualifications: Engage a TAB entity certified by AABC NEBB or TABB.

1. TAB Field Supervisor: Employee of the TAB contractor and certified by AABC NEBB or TABB.
2. TAB Technician: Employee of the TAB contractor and who is certified by AABC NEBB or TABB as a TAB technician.

B. Certify TAB field data reports and perform the following:

1. Review field data reports to validate accuracy of data and to prepare certified TAB reports.
2. Certify that the TAB team complied with the approved TAB plan and the procedures specified and referenced in this Specification.

C. TAB Report Forms: Use standard TAB contractor's forms approved by Architect. The remainder of the report to contain the appropriate standard NEBB, AABC, or TABB forms for each respective item and system. Fill out forms completely. Where information cannot be obtained or is not applicable indicate same.

D. Instrumentation Type, Quantity, Accuracy, and Calibration: As described in ASHRAE 111, Section 5, "Instrumentation."

E. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 7.2.2 - "Air Balancing."

F. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.7.2.3 - "System Balancing."

1.5 PROJECT CONDITIONS

A. Partial Owner Occupancy: Owner may occupy completed areas of building before Substantial Completion. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

1.6 COORDINATION

A. Notice: Provide five business days' advance notice for each test. Include scheduled test dates and times.

B. Perform TAB after leakage and pressure tests on air and water distribution systems have been satisfactorily completed.

1.7 PRE-INSTALLATION MEETING AND SCHEDULING

A. The test and balance agency is required to attend a pre-installation meeting with all other project contractors before the construction process is started. The test and balance agency shall give the Mechanical Contractor a detailed schedule of testing and balancing tasks for incorporation into the project schedule.

1.8 PRE-BALANCE CONFERENCE

A. 90 days prior to beginning testing, adjusting and balancing, schedule and conduct a conference with the Architect/Engineer, Owner’s Project Representative and the mechanical system and temperature control system installing Contractors. Provide AE and Commissioning Provider (CxP) with a complete copy of the TAB plan for the project. The objective is final coordination and verification of system operation and readiness for testing, adjusting and balancing procedures and scheduling procedures with the above mentioned parties. Indicate work required to be completed prior to testing, adjusting, and balancing and identify the party responsible for completion of that work.

1.9 EXISTING EQUIPMENT

A. For Manawa School District’s HS rooftop and indoor units shall be testing, adjusted and balanced for this project. Refer to the procedures below for testing equipment. Contractor to conduct readings for unit’s components static profiles and water balancing for existing air handling units.

B. Previous air balancing occurred in December 2014 for rooftop mechanical equipment replacement project. Previous TAB report can be made available by Owner’s Project Representative. Below is TAB certified contractor.

1. Badger Balancing, LLC.

    a. 8688 County Road, Omro WI 54963- 920-685-2300
    b. www.badgerbalancing.com

C. List of existing rooftop and indoor units as follows:

1. RTU-1 to RTU-16 – (ETR).
2. AHU-1 to AHU-3 – (ETR)
3. ERU-1 to ERU-4 – (ETR)
4. REF-1 – (ETR)
5. AHU-7 – (ETR): Elementary (ES)

D. Contractor to rebalance all space diffusers/registers/exhaust grilles and balance new air terminals to the drawing/schedules for new HVAC equipment and existing air handling units listed above.

1. Air terminals to the drawings/schedules.
2. Refer item 3.4 below for procedures.

E. Any known deficiencies found by the test and balance agency shall be report to Architect/Engineer. Once corrective work is completed, TAB contractor shall retest mechanical systems, equipment, and devices.

PART 2 - PRODUCTS

2.1 INSTRUMENTATION

A. Provide all required instrumentation to obtain proper measurements. Application of instruments and accuracy of instruments and measurements to be in accordance with the requirements of NEBB, AABC, or TABB Standards and instrument manufacturer's specifications.

B. All instruments used for measurements shall be accurate, and calibration histories for each instrument to be available for examination by DF upon request. Calibration and maintenance of all instruments to be in accordance with the requirements of NEBB, AABC, or TABB Standards

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems' designs that may preclude proper TAB of systems and equipment.

B. Examine systems for installed balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are accessible.

C. Examine the approved submittals for HVAC systems and equipment.

D. Examine design data including HVAC system descriptions, statements of design assumptions for environmental conditions and systems' output, and statements of philosophies and assumptions about HVAC system and equipment controls.

E. Examine ceiling plenums and underfloor air plenums used for supply, return, or relief air to verify that they meet the leakage class of connected ducts as specified in Section 233113 "Metal Ducts" and are properly separated from adjacent areas. Verify that penetrations in plenum walls are sealed and fire-stopped if required.

F. Examine equipment performance data including existing fans, RTUs and pump curves.

1. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
2. Calculate system-effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from the conditions used to rate equipment performance. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," or in SMACNA's "HVAC Systems - Duct Design." Compare results with the design data and installed conditions.

G. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.

H. Examine test reports specified in individual system and equipment Sections.

I. Examine HVAC equipment and filters and verify that bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.

J. Examine terminal units, such as variable-air-volume boxes, and verify that they are accessible, and their controls are connected and functioning.

K. Examine strainers. Verify that startup screens are replaced by permanent screens with indicated perforations.

L. Examine three-way valves for proper installation for their intended function of diverting or mixing fluid flows.

M. Examine heat-transfer coils for correct piping connections and for clean and straight fins.

N. Examine system existing pumps to ensure absence of entrained air in the suction piping.

O. Examine operating safety interlocks and controls on HVAC equipment.

P. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.2 PREPARATION

A. Prepare a TAB plan that includes strategies and step-by-step procedures.

B. Complete system-readiness checks and prepare reports. Verify the following:

1. Permanent electrical-power wiring is complete.
2. Hydronic systems are filled, clean, and free of air.
3. Automatic temperature-control systems are operational.
4. Equipment and duct access doors are securely closed.
5. Balance, smoke, and fire dampers are open.
6. Isolating and balancing valves are open and control valves are operational.
7. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.
8. Windows and doors can be closed so indicated conditions for system operations can be met.

3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Total System Balance" NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" and in this Section.

1. Comply with requirements in ASHRAE 62.1, Section 7.2.2 - "Air Balancing."

B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures.

1. After testing and balancing, install test ports and duct access doors that comply with requirements in Section 233300 "Air Duct Accessories."
2. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish according to Section 230713 "Duct Insulation," Section 230716 "HVAC Equipment Insulation," and Section 230719 "HVAC Piping Insulation."

C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.

D. Take and report testing and balancing measurements in inch-pound (IP) units.

3.4 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.

B. For variable-air-volume systems, develop a plan to simulate diversity.

C. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.

D. Check airflow patterns from the outdoor-air louvers and dampers and the return- and exhaust-air dampers through the supply-fan discharge and mixing dampers.

E. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.

F. Verify that motor starters are equipped with properly sized thermal protection.

G. Check dampers for proper position to achieve desired airflow path.

H. Check for airflow blockages.

I. Check condensate drains for proper connections and functioning.

J. Check for proper sealing of rooftop air-handling-unit components.

K. Verify that air duct system is sealed as specified in Section 233113 "Metal Ducts."

3.5 PROCEDURES FOR VARIABLE-AIR-VOLUME SYSTEMS

A. Compensating for Diversity: When the total airflow of all terminal units is more than the indicated airflow of the fan, place a selected number of terminal units at a minimum set-point airflow with the remainder at maximum-airflow condition until the total airflow of the terminal units equals the indicated airflow of the fan. Select the reduced-airflow terminal units so they are distributed evenly among the branch ducts.

B. Pressure-Independent, Variable-Air-Volume Systems: After the fan systems have been adjusted, adjust the variable-air-volume systems as follows:

1. Set outdoor-air dampers at minimum, and set return- and exhaust-air dampers at a position that simulates full-cooling load.
2. Select the terminal unit that is most critical to the supply-fan airflow and static pressure. Measure static pressure. Adjust system static pressure so the entering static pressure for the critical terminal unit is not less than the sum of the terminal-unit manufacturer's recommended minimum inlet static pressure plus the static pressure needed to overcome terminal-unit discharge system losses.
3. Measure total system airflow. Adjust to within indicated airflow.
4. Set terminal units at maximum airflow and adjust controller or regulator to deliver the designed maximum airflow. Use terminal-unit manufacturer's written instructions to make this adjustment. When total airflow is correct, balance the air outlets downstream from terminal units the same as described for constant-volume air systems.
5. Set terminal units at minimum airflow and adjust controller or regulator to deliver the designed minimum airflow. Check air outlets for a proportional reduction in airflow the same as described for constant-volume air systems.

    a. If air outlets are out of balance at minimum airflow, report the condition but leave outlets balanced for maximum airflow.

6. Remeasure the return airflow to the fan while operating at maximum return airflow and minimum outdoor airflow.

a. Adjust the fan and balance the return-air ducts and inlets the same as described for constant-volume air systems.

7. Measure static pressure at the most critical terminal unit and adjust the static-pressure controller at the main supply-air sensing station to ensure that adequate static pressure is maintained at the most critical unit.
8. Record final fan-performance data.

C. VAV Supply and exhaust duct system static pressure set point.

1. For VAV supply and exhaust systems with VAV air terminal devices, determine the minimum required duct static pressure at the DDC static pressure sensor location(s) needed to ensure that all VAV air terminals are operating at their design airflows with the most demanding VAV terminal wide open. Provide these static pressure numbers to the DDC temperature controls contractor and record them in the T&B report for each system.

3.6 GENERAL PROCEDURES FOR HYDRONIC SYSTEMS

A. Prepare test reports with pertinent design data, and number in sequence starting at pump to end of system. Check the sum of branch-circuit flows against the approved pump flow rate. Correct variations that exceed plus or minus 5 percent.

B. Prepare schematic diagrams of systems' "as-built" piping layouts.

C. Prepare hydronic systems for testing and balancing according to the following, in addition to the general preparation procedures specified above:

1. Open all manual valves for maximum flow.
2. Check liquid level in expansion tank.
3. Check makeup water-station pressure gage for adequate pressure for highest vent.
4. Check flow-control valves for specified sequence of operation and set at indicated flow.
5. Set differential-pressure control valves at the specified differential pressure. Do not set at fully closed position when pump is positive-displacement type unless several terminal valves are kept open.
6. Set system controls so automatic valves are wide open to heat exchangers.
7. Check pump-motor load. If motor is overloaded, throttle main flow-balancing device so motor nameplate rating is not exceeded.
8. Check air vents for a forceful liquid flow exiting from vents when manually operated.

D. Hydronic system differential pressure control set point.

1. For hydronic systems with variable speed pumping, determine the minimum required system differential pressure set point needed to ensure that all terminal devices are operating at their design water flows with the most demanding terminals device control valve wide open. Provide the differential control setting set point to the DDC temperature control contractor and record them in the T&B report for each system.

3.7 PROCEDURES FOR VARIABLE-FLOW HYDRONIC SYSTEMS

A. Balance systems with automatic two- and three-way control valves by setting systems at maximum flow through heat-exchange terminals and proceed as specified above for hydronic systems.

3.8 PROCEDURES FOR MOTORS

A. Motors, 1/2 HP and Larger: Test at final balanced conditions and record the following data:

1. Manufacturer's name, model number, and serial number.
2. Motor horsepower rating.
3. Motor rpm.
4. Efficiency rating.
5. Nameplate and measured voltage, each phase.
6. Nameplate and measured amperage, each phase.
7. Starter thermal-protection-element rating.

B. Motors Driven by Variable-Frequency Controllers: Test for proper operation at speeds varying from minimum to maximum. Test the manual bypass of the controller to prove proper operation. Record observations including name of controller manufacturer, model number, serial number, and nameplate data.

3.9 PROCEDURES FOR CONDENSING UNITS

A. Verify proper rotation of fans.

B. Measure entering- and leaving-air temperatures.

C. Record compressor data.

3.10 PROCEDURES FOR EXISTING BOILERS

A. Existing Hydronic Boilers: Measure and record entering- and leaving-water temperatures and water flow.

3.11 PROCEDURES FOR HEAT-TRANSFER COILS

A. Measure, adjust, and record the following data for each water coil:

1. Entering- and leaving-water temperature.
2. Water flow rate.
3. Water pressure drop.
4. Dry-bulb temperature of entering and leaving air.
5. Wet-bulb temperature of entering and leaving air for cooling coils.
6. Airflow.
7. Air pressure drop.

B. Measure, adjust, and record the following data for each electric heating coil:

1. Nameplate data.

2. Airflow.
3. Entering- and leaving-air temperature at full load.
4. Voltage and amperage input of each phase at full load and at each incremental stage.
5. Calculated kilowatt at full load.
6. Fuse or circuit-breaker rating for overload protection.

C. Measure, adjust, and record the following data for each refrigerant coil:

1. Dry-bulb temperature of entering and leaving air.
2. Wet-bulb temperature of entering and leaving air.
3. Airflow.
4. Air pressure drop.
5. Refrigerant suction pressure and temperature.

3.12 LABORATORY FUME HOODS

A. Adjust airflow from fume hoods to the scheduled airflow by measuring the airflow in the duct connected to the fume hood and adjusting the air terminal device as needed. Then measure the fume hood face velocity with the sash wide open. If the wide-open sash face velocity is below 50 fpm then adjust airflow to be at 50 fpm. After this balancing is complete and the other air balancing in the space containing the hood is complete, the fume hood supplier will calibrate the fume hood monitor and perform an “as installed” ASHRAE 110 test to verify that hood is properly containing fumes.

3.13 CRITICAL ROOM PRESSURE RELATIONSHIPS

A. For the following rooms the pressure relationship between the room and the adjacent space or corridor is critical. After the air balancing in the room is complete, measure and record in the T&B report the static pressure between the room listed and the adjacent corridor/room. Inform the AE of all instances where the pressure relationship does not match what is indicated in this schedule.

3.14 TOLERANCES

A. Set HVAC system's air flow rates and water flow rates within the following tolerances:

1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus or minus 10 percent.
2. Air Outlets and Inlets: Plus or minus 10 percent.
3. Heating-Water Flow Rate: Plus or minus 10 percent.
4. Cooling-Water Flow Rate: Plus or minus 10 percent.

3.15 FINAL REPORT

A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.

1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
2. Include a list of instruments used for procedures, along with proof of calibration.

B. Final Report Contents: In addition to certified field-report data, include the following:

1. Existing pump curves.
2. Fan curves.
3. Manufacturers' test data.
4. Field test reports prepared by system and equipment installers.
5. Other information relative to equipment performance; do not include Shop Drawings and product data.

C. General Report Data: In addition to form titles and entries, include the following data:

1. Title page.
2. Name and address of the TAB contractor.
3. Project name.
4. Project location.
5. Architect's name and address.
6. Engineer's name and address.
7. Contractor's name and address.
8. Report date.
9. Signature of TAB supervisor who certifies the report.
10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
11. Summary of contents including the following:

    a. Indicated versus final performance.
    b. Notable characteristics of systems.
    c. Description of system operation sequence if it varies from the Contract Documents.

12. Nomenclature sheets for each item of equipment.
13. Data for terminal units, including manufacturer's name, type, size, and fittings.
14. Notes to explain why certain final data in the body of reports vary from indicated values.
15. Test conditions for fans and pump performance forms including the following:

    a. Settings for outdoor-, return-, and exhaust-air dampers.
    b. Conditions of filters.
    c. Cooling coil, wet- and dry-bulb conditions.
    d. Fan drive settings including settings and percentage of maximum pitch diameter.
    e. Settings for supply-air, static-pressure controller.
    f. Other system operating conditions that affect performance.

D. Rooftop and Indoor Air Handling-Unit Test Reports: For air-handling units with coils, include the following:

1. Unit Data:

    a. Unit identification.
    b. Location.
    c. Make and type.

d. Model number and unit size.
e. Manufacturer's serial number.
f. Unit arrangement and class.
g. Discharge arrangement.
h. Sheave make, size in inches, and bore.
i. Center-to-center dimensions of sheave, and amount of adjustments in inches.
j. Number, make, and size of belts.
k. Number, type, and size of filters.

2. Motor Data:

a. Motor make, and frame type and size.
b. Horsepower and rpm.
c. Volts, phase, and hertz.
d. Full-load amperage and service factor.
e. Sheave make, size in inches, and bore.
f. Center-to-center dimensions of sheave, and amount of adjustments in inches.

3. Test Data (Indicated and Actual Values):

a. Total air flow rate in cfm.
b. Total system static pressure in inches wg.
c. Fan rpm.
d. Discharge static pressure in inches wg.
e. Filter static-pressure differential in inches wg.
f. Preheat-coil static-pressure differential in inches wg.
g. Cooling-coil static-pressure differential in inches wg.
h. Heating-coil static-pressure differential in inches wg.
i. Outdoor airflow in cfm.
j. Return airflow in cfm.
k. Outdoor-air damper position.
l. Return-air damper position.

E. Apparatus-Coil Test Reports:

1. Coil Data:

a. System identification.
b. Location.
c. Coil type.
d. Number of rows.
e. Fin spacing in fins per inch o.c.
f. Make and model number.
g. Face area in sq. ft.
h. Tube size in NPS.
i. Tube and fin materials.
j. Circuiting arrangement.

2. Test Data (Indicated and Actual Values):

a. Air flow rate in cfm.
b. Average face velocity in fpm.
c. Air pressure drop in inches wg.
d. Outdoor-air, wet- and dry-bulb temperatures in deg F.
e. Return-air, wet- and dry-bulb temperatures in deg F.
f. Entering-air, wet- and dry-bulb temperatures in deg F.
g. Leaving-air, wet- and dry-bulb temperatures in deg F.
h. Water flow rate in gpm.
i. Water pressure differential in feet of head or psig.
j. Entering-water temperature in deg F.
k. Leaving-water temperature in deg F.
l. Refrigerant expansion valve and refrigerant types.
m. Refrigerant suction pressure in psig.
n. Refrigerant suction temperature in deg F.

F. Fan Test Reports: For supply, return, and exhaust fans, include the following:

1. Fan Data:

a. System identification.
b. Location.
c. Make and type.
d. Model number and size.
e. Manufacturer's serial number.
f. Arrangement and class.
g. Sheave make, size in inches, and bore.
h. Center-to-center dimensions of sheave, and amount of adjustments in inches.

2. Motor Data:

a. Motor make, and frame type and size.
b. Horsepower and rpm.
c. Volts, phase, and hertz.
d. Full-load amperage and service factor.
e. Sheave make, size in inches, and bore.
f. Center-to-center dimensions of sheave, and amount of adjustments in inches.
g. Number, make, and size of belts.

3. Test Data (Indicated and Actual Values):

a. Suction static pressure in inches wg.

G. Round, and Rectangular Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:

1. Report Data:

a. System and air-handling-unit number.
b. Location and zone.

c. Traverse air temperature in deg F.
d. Duct static pressure in inches wg.
e. Duct size in inches.
f. Duct area in sq. ft.
g. Indicated air flow rate in cfm.
h. Indicated velocity in fpm.
i. Actual air flow rate in cfm.
j. Actual average velocity in fpm.
k. Barometric pressure in psig.

H. Air-Terminal-Device Reports:

1. Unit Data:

a. System and air-handling unit identification.
b. Location and zone.
c. Apparatus used for test.
d. Area served.
e. Make.
f. Number from system diagram.
g. Type and model number.
h. Size.
i. Effective area in sq. ft.

2. Test Data (Indicated and Actual Values):

a. Air flow rate in cfm.
b. Air velocity in fpm.
c. Preliminary air flow rate as needed in cfm.
d. Preliminary velocity as needed in fpm.
e. Final air flow rate in cfm.
f. Final velocity in fpm.
g. Space temperature in deg F.

I. System-Coil Reports: For reheat coils and water coils of terminal units, include the following:

1. Unit Data:

a. System and air-handling-unit identification.
b. Location and zone.
c. Room or riser served.
d. Coil make and size.
e. Flowmeter type.

2. Test Data (Indicated and Actual Values):

a. Air flow rate in cfm.
b. Entering-water temperature in deg F.
c. Leaving-water temperature in deg F.
d. Water pressure drop in feet of head or psig.

e. Entering-air temperature in deg F.
f. Leaving-air temperature in deg F.

J. VAV Supply Duct System Static Pressure Set Point

1. A. For VAV supply, return and exhaust systems with VAV air terminal devices, determine the minimum required duct static pressure at the DDC static pressure sensor location(s) needed to insure that all VAV air terminals are operating at their design airflows with the most demanding VAV terminal wide open. Provide these static pressure numbers to the DDC temperature controls contractor and record them in the T&B report for each system.

K. Existing Pump Test Reports: Calculate impeller size by plotting the shutoff head on pump curves and include the following:

1. Unit Data:

a. Unit identification.
b. Location.
c. Service.
d. Make and size.
e. Model number and serial number.
f. Water flow rate in gpm.
g. Water pressure differential in feet of head or psig.
h. Required net positive suction head in feet of head or psig.
i. Pump rpm.
j. Impeller diameter in inches.
k. Motor make and frame size.
l. Motor horsepower and rpm.
m. Voltage at each connection.
n. Amperage for each phase.
o. Full-load amperage and service factor.
p. Seal type.

2. Test Data (Indicated and Actual Values):

a. Static head in feet of head or psig.
b. Pump shutoff pressure in feet of head or psig.
c. Actual impeller size in inches.
d. Full-open flow rate in gpm.
e. Full-open pressure in feet of head or psig.
f. Final discharge pressure in feet of head or psig.
g. Final suction pressure in feet of head or psig.
h. Final total pressure in feet of head or psig.
i. Final water flow rate in gpm.
j. Voltage at each connection.
k. Amperage for each phase.

3.16 INSPECTIONS

A. Initial Inspection:

1. After testing and balancing are complete, operate each system and randomly check measurements to verify that the system is operating according to the final test and balance readings documented in the final report.
2. Check the following for each system:

    a. Measure airflow of at least 10 percent of air outlets.
    b. Measure water flow of at least 5 percent of terminals.
    c. Measure room temperature at each thermostat/temperature sensor. Compare the reading to the set point.
    d. Verify that balancing devices are marked with final balance position.
    e. Note deviations from the Contract Documents in the final report.

B. Final Inspection:

1. After initial inspection is complete and documentation by random checks verifies that testing and balancing are complete and accurately documented in the final report, request that a final inspection be made by Owner.
2. The TAB contractor's test and balance engineer shall conduct the inspection in the presence of Owner.
3. Owner shall randomly select measurements, documented in the final report, to be rechecked. Rechecking shall be limited to either 10 percent of the total measurements recorded or the extent of measurements that can be accomplished in a normal 8-hour business day.
4. If rechecks yield measurements that differ from the measurements documented in the final report by more than the tolerances allowed, the measurements shall be noted as "FAILED."
5. If the number of "FAILED" measurements is greater than 10 percent of the total measurements checked during the final inspection, the testing and balancing shall be considered incomplete and shall be rejected.

C. TAB Work will be considered defective if it does not pass final inspections. If TAB Work fails, proceed as follows:

1. Recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes; resubmit the final report and request a second final inspection.
2. If the second final inspection also fails, Owner may contract the services of another TAB contractor to complete TAB Work according to the Contract Documents and deduct the cost of the services from the original TAB contractor's final payment.

D. Prepare test and inspection reports.

3.17 DEFICIENCIES

A. Division 230000 contractor to correct any installation deficiencies found by the test and balance agency that were specified and/or shown on the Contract Documents to be performed as part of that division of work. Test and balance agency will notify the Owner’s Project Representative and Engineer of these items and instructions will be

issued to the Division 230000 contractor for correction of the deficient work. All corrective work to be done at no cost to the owner. Retest mechanical systems, equipment, and devices once corrective work is complete as specified.

3.18 FUNCTIONAL PERFORMANCE TESTING

A. Contractor is responsible for utilizing the functional performance test forms supplied under specification Section 23 08 00 Commissioning of HVAC in accordance with the procedures defined for functional performance testing in Section 01 91 13 for General Commissioning Requirements. Notify the A/E and commissioning provider 5 business days prior to performing functional performance testing so that they may witness

END OF SECTION 23 05 93

SECTION 23 07 13
DUCT INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory- and field-applied if any).

1.3 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

C. Install insulation in accordance with MICA National Commercial & Industrial Insulation Standards.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.5 COORDINATION

A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."

B. Coordinate clearance requirements with duct Installer for duct insulation application. Before preparing ductwork Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

1.6 SCHEDULING

A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Comply with requirements in "Duct Insulation Schedule, General," "Indoor Duct and Plenum Insulation Schedule," and "Aboveground, Outdoor Duct and Plenum Insulation Schedule" articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

F. Flexible Elastomeric Insulation Type D1: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type II for sheet materials.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Aeroflex USA, Inc.; Aerocel.
    b. Armacell LLC; AP Armaflex.
    c. K-Flex USA; Insul-Sheet, K-Flex Gray Duct Liner, and K-FLEX LS.

G. Mineral-Fiber Blanket Insulation Type D2: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type III with factory-applied FSK jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. CertainTeed Corp.; SoftTouch Duct Wrap.
    b. Johns Manville; Microlite.
    c. Knauf Insulation; Friendly Feel Duct Wrap.
    d. Manson Insulation Inc.; Alley Wrap.
    e. Owens Corning; SOFTR All-Service Duct Wrap.

H. Mineral-Fiber Board Insulation Type D3: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IA or Type IB. For duct and plenum applications, provide insulation with factory-applied FSK. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article. Minimum nominal density of 3 lbs. per cu. ft., and thermal conductivity of not more than 0.23 at 75 degrees F

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. CertainTeed Corp.; Commercial Board.
    b. Fibrex Insulations Inc.; FBX.
    c. Johns Manville; 800 Series Spin-Glas.
    d. Knauf Insulation; Insulation Board.
    e. Manson Insulation Inc.; AK Board.
    f. Owens Corning; Fiberglas 700 Series.

I. Mineral-Fiber, Pipe and Tank Insulation Type D4: Mineral or glass fibers bonded with a thermosetting resin. Semirigid board material with factory-applied FSK jacket complying with ASTM C 1393, Type II or Type IIIA Category 2, or with properties similar to ASTM C 612, Type IB. Nominal density is 2.5 lb/cu. ft. or more. Thermal conductivity (k-value) at 100 deg F is 0.29 Btu x in./h x sq. ft. x deg F or less. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. CertainTeed Corp.; CrimpWrap.
    b. Johns Manville; MicroFlex.
    c. Knauf Insulation; Pipe and Tank Insulation.
    d. Manson Insulation Inc.; AK Flex.
    e. Owens Corning; Fiberglas Pipe and Tank Insulation.

    f. Dow Chemical Company (The); Styrofoam

J. Polystyrene Type D6: Rigid, extruded cellular polystyrene intended for use as thermal insulation. Comply with ASTM C 578, Type IV or Type XIII, except thermal conductivity (k-value) shall not exceed 0.26 Btu x in./h x sq. ft. x deg F after 180 days of aging. Fabricate shapes according to ASTM C 450 and ASTM C 585.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Dow Chemical Company (The); Styrofoam

2.2 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.

B. Adhesives, sealants and protective finishes shall be as recommended by insulation manufacturer for applications specified.

C. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

D. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.3 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.

1. For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Adhesives, sealants, mastics and protective finishes shall be as recommended by insulation manufacturer for applications specified.

2.4 LAGGING ADHESIVES

A. Description: Comply with MIL-A-3316C, Class I, Grade A and shall be compatible with insulation materials, jackets, and substrates.

1. For indoor applications, use lagging adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Adhesives, sealants and protective finishes shall be as recommended by insulation manufacturer for applications specified.

2.5 SEALANTS

A. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Adhesives, joint sealants and flashing sealants and protective finishes shall be as recommended by insulation and jacketing manufacturer for applications specified.

C. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.6 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
2. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.

2.7 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

B. PVC Jacket Type DJ1: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Johns Manville; Zeston.
    b. P.I.C. Plastics, Inc.; FG Series.
    c. Proto Corporation; LoSmoke.
    d. Speedline Corporation; SmokeSafe.

2. Adhesive: As recommended by jacket material manufacturer.
3. Color: White.

C. Metal Jacket:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; Metal Jacketing Systems.
    b. ITW Insulation Systems; Aluminum and Stainless Steel Jacketing.
    c. RPR Products, Inc.; Insul-Mate.

2. Aluminum Jacket Type DJ2: Comply with ASTM B 209, Alloy 3003, 3005, 3105, or 5005, Temper H-14.

    a. Sheet and roll stock ready for shop or field sizing.
    b. Finish and thickness are indicated in field-applied jacket schedules.
    c. Moisture Barrier for Indoor Applications: 2.5-mil- thick polysurlyn.
    d. Moisture Barrier for Outdoor Applications: 2.5-mil thick polysurlyn.

D. Self-Adhesive Outdoor Jacket Type DJ4: 60-mil thick, laminated vapor barrier and waterproofing membrane for installation over insulation located aboveground outdoors; consisting of a rubberized bituminous resin on a cross laminated polyethylene film covered with stucco-embossed aluminum-foil facing.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Polyguard Products, Inc.; Alumaguard 60.
    b. Venturetape 1577CW

2.8 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. ABI, Ideal Tape Division; 428 AWF ASJ.
    b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0836.
    c. Compac Corporation; 104 and 105.
    d. Venture Tape; 1540 CW Plus, 1542 CW Plus, and 1542 CW Plus/SQ.

2. Width: 3 inches.
3. Thickness: 11.5 mils.
4. Adhesion: 90 ounces force/inch in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch in width.
7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. ABI, Ideal Tape Division; 491 AWF FSK.
    b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0827.
    c. Compac Corporation; 110 and 111.
    d. Venture Tape; 1525 CW NT, 1528 CW, and 1528 CW/SQ.

2. Width: 3 inches.
3. Thickness: 6.5 mils.
4. Adhesion: 90 ounces force/inch in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch in width.
7. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

C. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive; suitable for indoor and outdoor applications.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. ABI, Ideal Tape Division; 370 White PVC tape.
    b. Compac Corporation; 130.
    c. Venture Tape; 1506 CW NS.

2. Width: 2 inches.
3. Thickness: 6 mils.
4. Adhesion: 64 ounces force/inch in width.
5. Elongation: 500 percent.
6. Tensile Strength: 18 lbf/inch in width.

2.9 SECUREMENTS

A. Bands:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. ITW Insulation Systems; Gerrard Strapping and Seals.
    b. RPR Products, Inc.; Insul-Mate Strapping, Seals, and Springs.

2. Stainless Steel: ASTM A 167 or ASTM A 240/A 240M, Type 304 or Type 316; 0.015 inch thick, 3/4 inch wide with wing seal
3. Aluminum: ASTM B 209. Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 3/4 inch wide with wing seal.
4. Springs: Twin spring set constructed of stainless steel with ends flat and slotted to accept metal bands. Spring size determined by manufacturer for application.

B. Insulation Pins and Hangers:

1. Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch diameter shank, length to suit depth of insulation indicated.

    a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

        1) AGM Industries, Inc.; CWP-1.
        2) GEMCO; CD.
        3) Midwest Fasteners, Inc.; CD.
        4) Nelson Stud Welding; TPA, TPC, and TPS.

2. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch-diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch galvanized carbon-steel washer.

    a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

        1) AGM Industries, Inc.; CHP-1.
        2) GEMCO; Cupped Head Weld Pin.
        3) Midwest Fasteners, Inc.; Cupped Head.
        4) Nelson Stud Welding; CHP.

3. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick, galvanized-steel, aluminum or stainless-steel sheet to match duct construction, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.

a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

1) AGM Industries, Inc.; RC-150.
2) GEMCO; R-150.
3) Midwest Fasteners, Inc.; WA-150.
4) Nelson Stud Welding; Speed Clips.

b. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in exposed locations.

C. Staples: Outward-clinching insulation staples, nominal 3/4-inch- wide, stainless steel or Monel.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.

1. Verify that systems to be insulated have been tested and are free of defects.
2. Verify that surfaces to be insulated are clean and dry.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of ducts and fittings.

B. Install insulation materials, vapor barriers or retarders, jackets, and thicknesses required for each item of duct system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Keep insulation materials dry during application and finishing.

G. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

H. Install insulation with least number of joints practical.

I. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.

J. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

K. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3-inch-wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 4 inches o.c.

    a. For below ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct flanges and fittings.

L. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

M. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

N. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

O. Exposed Ductwork: Locate insulation and cover seams in least visible locations.

3.4 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
4. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
4. Seal jacket to wall flashing with flashing sealant.

C. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

D. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches.

1. Comply with requirements in Division 07 and fire-resistive joint sealers.

E. Insulation Installation at Floor Penetrations:

1. Duct: For penetrations through fire-rated assemblies, terminate insulation at fire damper sleeves and externally insulate damper sleeve beyond floor to match adjacent duct insulation. Overlap damper sleeve and duct insulation at least 2 inches.
2. Seal penetrations through fire-rated assemblies. Comply with requirements in Division 07.

3.5 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.6 INSTALLATION OF MINERAL-FIBER INSULATION

A. Blanket Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for duct and plenum surfaces.
2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:

    a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
    b. On duct sides with dimensions larger than 18 inches, place pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
    c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
    d. Do not overcompress insulation during installation.
    e. Impale insulation over pins and attach speed washers.
    f. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.

4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.

    a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
    b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches

5. Overlap unfaced blankets a minimum of 2 inches on longitudinal seams and end joints. At end joints, secure with steel bands spaced a maximum of 18 inches o.c.
6. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
7. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch- wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

B. Board Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for duct and plenum surfaces.
2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:

    a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
    b. On duct sides with dimensions larger than 18 inches, space pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
    c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
    d. Do not overcompress insulation during installation.
    e. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.

4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.

    a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
    b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches

5. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Groove and score insulation to fit as closely as possible to outside and inside radius of elbows. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
6. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch- wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

3.7 FIELD-APPLIED JACKET INSTALLATION

A. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints; for horizontal applications, install with longitudinal seams along top and bottom of tanks and vessels. Seal with manufacturer's recommended adhesive.

1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

B. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

3.8 FIRE-RATED INSULATION SYSTEM INSTALLATION

A. Where fire-rated insulation system is indicated, secure system to ducts and duct hangers and supports to maintain a continuous fire rating.

B. Insulate duct access panels and doors to achieve same fire rating as duct.

C. Install firestopping at penetrations through fire-rated assemblies. Fire-stop systems are specified in Division 07.

3.9 FINISHES

A. Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Division 09.

1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.

a. Finish Coat Material: Interior, flat, latex-emulsion size.

B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

C. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

D. Do not field paint aluminum or stainless-steel jackets.

3.10 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Inspect ductwork, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to one location(s) for each duct system defined in the "Duct Insulation Schedule, General" Article.

B. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

C. All reinstallation of insulation removed for inspection shall be performed at no additional cost to the Contract.

D. Any discovered deviation from the specified materials and methods shall be considered cause for spot-check dismantling of Work to be performed during the preceding day's work. If further deviations are so discovered, the day's Work proceeding that day may be requested to be checked. All dismantling and reinstallation shall be performed at no additional cost to the Contract.

3.11 DUCT INSULATION SCHEDULE, GENERAL

A. Items Not Insulated:

1. Fibrous-glass ducts.
2. Metal ducts with duct liner of sufficient thickness to comply with energy code and ASHRAE/IESNA 90.1.
3. Factory-insulated flexible ducts.
4. Factory-insulated plenums and casings.
5. Flexible connectors.
6. Vibration-control devices.
7. Factory-insulated access panels and doors.

3.12 INDOOR DUCT AND PLENUM INSULATION SCHEDULE

A. Insulation materials and thicknesses are identified below. If more than one material is listed for a duct system, selection from materials listed is Contractor's option.

Service	Exposure	Insulation Type	Insulation Thickness	Field Applied Jacket Type
Outside Air	Concealed	D2 or D3	2"	-
Outside Air	Exposed	D4	2"	-
Mixed Air (OA + RA)	Concealed	D2 or D3	1-1/2"	-
Mixed Air (OA + RA)	Exposed	D4	1-1/2"	-
Supply Air	Concealed	D2 or D3	1-1/2"	-
Exhaust or Relief from Damper to Outside Wall or Roof	Concealed	D2 or D3	2"	-
Exhaust or Relief from Damper to Outside Wall or Roof	Exposed	D4	2"	-

3.13 ABOVEGROUND, OUTDOOR DUCT AND PLENUM INSULATION SCHEDULE

A. Insulation materials and thicknesses are identified below.

Service	Exposure	Insulation Type	Insulation Thickness	Field Applied Jacket Type
Outside Air	Outdoor	D6	3"	DJ2
Supply Air	Outdoor	D6	3"	DJ2
Exhaust Air	Outdoor	D6	3"	DJ2
Mixed Air	Outdoor	D6	3”	DJ2

END OF SECTION 23 07 13

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SECTION 23 07 19
HVAC PIPING INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory and field applied if any).

1.3 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

C. Install insulation in accordance with MICA National Commercial & Industrial Insulation Standards.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.5 COORDINATION

A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Division 23 section "Hangers and Supports for HVAC Piping and Equipment."

B. Coordinate clearance requirements with piping Installer for piping insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

C. Coordinate installation and testing of heat tracing.

1.6 SCHEDULING

A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Comply with requirements in "Piping Insulation Schedule" articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

F. Flexible Elastomeric Insulation Type I3: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Aeroflex USA, Inc.; Aerocel.
    b. Armacell LLC; AP Armaflex.
    c. K-Flex USA; Insul-Lock, Insul-Tube, and K-FLEX LS.

2. Flexible closed cell, minimum nominal density of 5.5 lbs. per cu. ft., thermal conductivity of not more than 0.28 at 75 degrees F, maximum water vapor permeability of 0.08 perm-in, maximum water absorption of 1% by weight, rated for service range of -20 degrees F to 220 degrees F.

G. Mineral-Fiber, Preformed Pipe Insulation Type I5:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Fibrex Insulations Inc.; Coreplus 1200.
    b. Johns Manville; Micro-Lok.

c. Knauf Insulation; 1000-Degree Pipe Insulation.
d. Manson Insulation Inc.; Alley-K.
e. Owens Corning; Fiberglas Pipe Insulation.

2. Type I, 850 deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ-SSL. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article. Thermal conductivity of not more than 0.23 at 75 degrees F.
3. Type II, 1200 deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type II, Grade A, with factory-applied ASJ-SSL. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article. Thermal conductivity of not more than 0.23 at 75 degrees F.

H. Polyolefin (Type I10): Unicellular, polyethylene thermal plastic insulation. Comply with ASTM C 534 or ASTM C 1427, Type I, Grade 1 for tubular materials and Type II, Grade 1 for sheet materials.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Armacell LLC; Tubolit.
b. Nomaco Insulation; IMCOLOCK, IMCOSHEET, NOMALOCK, and NOMAPLY.

2.2 INSULATING CEMENTS

A. Mineral-Fiber Insulating Cement: Comply with ASTM C 195.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Ramco Insulation, Inc.; Super-Stik.

B. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Ramco Insulation, Inc.; Ramcote 1200 and Quik-Cote.

2.3 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.

B. Adhesives, sealants and protective finishes shall be as recommended by insulation and jacket manufacturer for applications specified.

C. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.4 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.

1. For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Adhesives, sealants, mastics and protective finishes shall be as recommended by insulation and jacket manufacturer for applications specified.

2.5 LAGGING ADHESIVES

A. Description: Comply with MIL-A-3316C, Class I, Grade A and shall be compatible with insulation materials, jackets, and substrates.

1. For indoor applications, use lagging adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Adhesives, sealants and protective finishes shall be as recommended by insulation manufacturer for applications specified.

2.6 SEALANTS

A. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Adhesives, joint sealants and flashing sealants and protective finishes shall be as recommended by insulation and jacket manufacturer for applications specified.

2.7 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.

2.8 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

B. PVC Jacket (J1): High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Johns Manville; Zeston.
b. P.I.C. Plastics, Inc.; FG Series.
c. Proto Corporation; LoSmoke.
d. Speedline Corporation; SmokeSafe.

2. Adhesive: As recommended by jacket material manufacturer.
3. Color: White.
4. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.

a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.

C. Metal Jacket (J2):

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; Metal Jacketing Systems.
b. ITW Insulation Systems; Aluminum and Stainless Steel Jacketing.
c. RPR Products, Inc.; Insul-Mate.

2. Aluminum Jacket: Comply with ASTM B 209, Alloy 3003, 3005, 3105, or 5005, Temper H-14.

a. Factory cut and rolled to size.
b. Moisture Barrier for Indoor Applications: 2.5-mil-thick polysurlyn.
c. Moisture Barrier for Outdoor Applications: 2.5-mil-thick polysurlyn.
d. Factory-Fabricated Fitting Covers:

1) Same material, finish, and thickness as jacket.
2) Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
3) Tee covers.
4) Flange and union covers.
5) End caps.
6) Beveled collars.
7) Valve covers.
8) Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

2.9 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. ABI, Ideal Tape Division; 428 AWF ASJ.
b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0836.
c. Compac Corporation; 104 and 105.
d. Venture Tape; 1540 CW Plus, 1542 CW Plus, and 1542 CW Plus/SQ.

2. Width: 3 inches.
3. Thickness: 11.5 mils.
4. Adhesion: 90 ounces force/inch in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch in width.
7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. ABI, Ideal Tape Division; 491 AWF FSK.
b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0827.
c. Compac Corporation; 110 and 111.
d. Venture Tape; 1525 CW NT, 1528 CW, and 1528 CW/SQ.

2. Width: 3 inches.
3. Thickness: 6.5 mils.
4. Adhesion: 90 ounces force/inch in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch in width.
7. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

C. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive; suitable for indoor and outdoor applications.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. ABI, Ideal Tape Division; 370 White PVC tape.
b. Compac Corporation; 130.
c. Venture Tape; 1506 CW NS.

2. Width: 2 inches.
3. Thickness: 6 mils.
4. Adhesion: 64 ounces force/inch in width.
5. Elongation: 500 percent.
6. Tensile Strength: 18 lbf/inch in width.

2.10 SECUREMENTS

A. Bands:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. ITW Insulation Systems; Gerrard Strapping and Seals.
    b. RPR Products, Inc.; Insul-Mate Strapping, Seals, and Springs.

2. Stainless Steel: ASTM A 167 or ASTM A 240/A 240M, Type 304 or Type 316; 0.015 inch thick, 3/4 inch wide with wing seal.
3. Aluminum: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 3/4 inch wide with wing seal.
4. Springs: Twin spring set constructed of stainless steel with ends flat and slotted to accept metal bands. Spring size determined by manufacturer for application.

B. Staples: Outward-clinching insulation staples, nominal 3/4-inch-wide, stainless steel or Monel.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.

1. Verify that systems to be insulated have been tested and are free of defects.
2. Verify that surfaces to be insulated are clean and dry.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

B. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.

C. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

G. Keep insulation materials dry during application and finishing.

H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

I. Install insulation with least number of joints practical.

J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

L. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3-inch-wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches on center.
3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 4 inches on center.

    a. For below-ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.

M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

P. For above-ambient services, do not install insulation to the following:

1. Vibration-control devices.
2. Testing agency labels and stamps.
3. Nameplates and data plates.
4. Manholes.
5. Handholes.
6. Cleanouts.
7. Unions
8. Strainers

Q. In systems with rigid insulation, slip joints shall be installed every 25-30 feet for thermal expansion. They shall overlap and be caulked according to the jacket manufacturer's installation recommendation. On cold piping, flexible fiberglass insulation shall separate the rigid insulation pieces at the slip joint.

3.4 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
4. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.

C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.

3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
4. Seal jacket to wall flashing with flashing sealant.

D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

E. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.

1. Comply with requirements in Division 07 for firestopping and fire-resistive joint sealers.

F. Insulation Installation at Floor Penetrations:

1. Pipe: Install insulation continuously through floor penetrations.
2. Seal penetrations through fire-rated assemblies. Comply with requirements in Division 07.

3.5 GENERAL PIPE INSULATION INSTALLATION

A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:

1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the

insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.

6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
9. Stencil or label the outside insulation jacket of each union with the word "union." Match size and color of pipe labels.

C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

D. Install removable insulation covers at locations indicated. Installation shall conform to the following:

1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.
4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

E. When insulating control valves, strainers, and any other devices requiring frequent access, the insulation shall be fit in such a way that there is an access section which can be readily removed and replaced without damaging adjacent insulation. If a different insulating material is used for boxing in control valve assemblies, etc., the thickness of the insulation shall be adjusted to provide the specified thermal resistance.

F. Insulation Installation on Valves and Pipe Specialties:

1. Install mitered segments of calcium silicate insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
2. Install insulation to flanges as specified for flange insulation application.
3. Finish valve and specialty insulation same as pipe insulation.

3.6 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

B. Insulation Installation on Pipe Flanges:

1. Install pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.
4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install mitered sections of pipe insulation.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed valve covers manufactured of same material as pipe insulation when available.
2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.
4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.7 INSTALLATION OF MINERAL-FIBER INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.

2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient surfaces, secure laps with outward-clinched staples at 6 inches on center.
4. For insulation with factory-applied jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

3.8 INSTALLATION OF POLYOLEFIN INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Seal split-tube longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

B. Insulation Installation on Pipe Flanges:

1. Install pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.

3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of polyolefin sheet insulation of same thickness as pipe insulation.
4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install mitered sections of polyolefin pipe insulation.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install cut sections of polyolefin pipe and sheet insulation to valve body.
2. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.
4. Secure insulation to valves and specialties, and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.9 FIELD-APPLIED JACKET INSTALLATION

A. Where FSK jackets are indicated, install as follows:

1. Draw jacket material smooth and tight.
2. Install lap or joint strips with same material as jacket.
3. Secure jacket to insulation with manufacturer's recommended adhesive.
4. Install jacket with 1-1/2-inch laps at longitudinal seams and 3-inch-wide joint strips at end joints.
5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.

B. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints; for horizontal applications. Seal with manufacturer's recommended adhesive.

1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

C. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches on center and at end joints.

3.10 FINISHES

A. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

B. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

C. Do not field paint aluminum or stainless-steel jackets.

3.11 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Inspect pipe, fittings, strainers, and valves, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three locations of straight pipe, six locations of fittings, and three locations of valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.

C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

D. All reinstallation of insulation removed for inspection shall be performed at no additional cost to the Contract.

E. Any discovered deviation from the specified materials and methods shall be considered cause for spot-check dismantling of Work to be performed during the preceding day's work. If further deviations are so discovered, the day's Work proceeding that day may be requested to be checked. All dismantling and reinstallation shall be performed at no additional cost to the Contract.

F. Prior to initiation of work, samples of insulation materials shall be submitted for approval, and a sample of the installation of a section of pipe and fitting demonstrating installation techniques and workmanship shall be witnessed and approved.

3.12 PIPING INSULATION SCHEDULE, GENERAL

A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:

1. Drainage piping located in crawl spaces.
2. Underground piping.
3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.
4. Hot water piping inside radiation, convector, or cabinet heater enclosures.
5. Piping unions for systems not requiring a vapor barrier.

3.13 PIPING INSULATION SCHEDULE

Service	Pipe Size	Insulation Type	Insulation Thickness	Field Applied Jacket Type	Field Applied Jacket (Outdoor Locations)
Heating Hot Water	1-1/2" and smaller	I5	1.5"	-	J2
	2" to 3"	I5	2"	-	J2
	4" and larger	I5	2"	-	J2
Refrigerant Suction 40F to 20F	1-1/4" and smaller	I3	1"	-	J2
	1-1/2" and larger	I3	1.5"	-	J2
Make-up Cold Water	1-1/2" and smaller	I5	0.5"	-	J2
	2" and larger	I5	1"	-	J2
Cooling Coil Condensate Drain	1-1/2" and smaller	I5	0.5"	-	J2
	2" and larger	I5	1"	-	J2

END OF SECTION 23 07 19

SECTION 23 08 00
COMMISSIONING OF HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes commissioning process requirements for HVAC&R systems, assemblies, and equipment.

B. Related Sections:

1. Section 019113 "General Commissioning Requirements" for general commissioning process requirements.

1.3 DEFINITIONS

A. Commissioning Plan: A document that outlines the organization, schedule, allocation of resources, and documentation requirements of the commissioning process.

B. CxA: Commissioning Authority.

C. HVAC&R: Heating, Ventilating, Air Conditioning, and Refrigeration.

D. Systems, Subsystems, Equipment, and Components: Where these terms are used together or separately, they shall mean "as-built" systems, subsystems, equipment, and components.

1.4 INFORMATIONAL SUBMITTALS

A. Certificates of readiness.

B. Certificates of completion of installation, prestart, and startup activities.

1.5 CONTRACTOR'S RESPONSIBILITIES

A. Perform commissioning tests at the direction of the CxA.

B. Attend construction phase controls coordination meeting.

C. Attend testing, adjusting, and balancing review and coordination meeting.

D. Participate in HVAC&R systems, assemblies, equipment, and component maintenance orientation and inspection as directed by the CxA.

E. Provide information requested by the CxA for final commissioning documentation.

F. Provide measuring instruments and logging devices to record test data, and provide data acquisition equipment to record data for the complete range of testing for the required test period.

1.6 CxA'S RESPONSIBILITIES

A. Provide Project-specific construction checklists and commissioning process test procedures for actual HVAC&R systems, assemblies, equipment, and components to be furnished and installed as part of the construction contract.

B. Direct commissioning testing.

C. Verify testing, adjusting, and balancing of Work are complete.

D. Provide test data, inspection reports, and certificates in Systems Manual.

1.7 COMMISSIONING DOCUMENTATION

A. Provide the following information to the CxA for inclusion in the commissioning plan:

1. Plan for delivery and review of submittals, systems manuals, and other documents and reports.
2. Identification of installed systems, assemblies, equipment, and components including design changes that occurred during the construction phase.
3. Process and schedule for completing construction checklists and manufacturer's prestart and startup checklists for HVAC&R systems, assemblies, equipment, and components to be verified and tested.
4. Certificate of completion certifying that installation, prestart checks, and startup procedures have been completed.
5. Certificate of readiness certifying that HVAC&R systems, subsystems, equipment, and associated controls are ready for testing.
6. Test and inspection reports and certificates.
7. Corrective action documents.
8. Verification of testing, adjusting, and balancing reports.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TESTING PREPARATION

A. Certify that HVAC&R systems, subsystems, and equipment have been installed, calibrated, and started and are operating according to the Contract Documents.

B. Certify that HVAC&R instrumentation and control systems have been completed and calibrated, that they are operating according to the Contract Documents, and that pretest set points have been recorded.

C. Certify that testing, adjusting, and balancing procedures have been completed and that testing, adjusting, and balancing reports have been submitted, discrepancies corrected, and corrective work approved.

D. Set systems, subsystems, and equipment into operating mode to be tested (e.g., normal shutdown, normal auto position, normal manual position, unoccupied cycle, emergency power, and alarm conditions).

E. Inspect and verify the position of each device and interlock identified on checklists.

F. Check safety cutouts, alarms, and interlocks with smoke control and life-safety systems during each mode of operation.

G. Testing Instrumentation: Install measuring instruments and logging devices to record test data as directed by the CxA.

3.2 TESTING AND BALANCING VERIFICATION

A. Prior to performance of testing and balancing Work, provide copies of reports, sample forms, checklists, and certificates to the CxA.

B. Notify the CxA at least 10 days in advance of testing and balancing Work and provide access for the CxA to witness testing and balancing Work.

C. Provide technicians, instrumentation, and tools to verify testing and balancing of HVAC&R systems at the direction of the CxA.

1. The CxA will notify testing and balancing Contractor 10 days in advance of the date of field verification. Notice will not include data points to be verified.
2. The testing and balancing Contractor shall use the same instruments (by model and serial number) that were used when original data were collected.
3. Failure of an item includes, other than sound, a deviation of more than 10 percent. Failure of more than 10 percent of selected items shall result in rejection of final testing, adjusting, and balancing report. For sound pressure readings, a deviation of 3 dB shall result in rejection of final testing. Variations in background noise must be considered.
4. Remedy the deficiency and notify the CxA so verification of failed portions can be performed.

3.3 GENERAL TESTING REQUIREMENTS

A. Provide technicians, instrumentation, and tools to perform commissioning test at the direction of the CxA.

B. Scope of HVAC&R testing shall include entire HVAC&R installation, from central equipment for heat generation and refrigeration through distribution systems to each conditioned space. Testing shall include measuring capacities and effectiveness of operational and control functions.

C. Test all operating modes, interlocks, control responses, and responses to abnormal or emergency conditions, and verify proper response of building automation system controllers and sensors.

D. The CxA along with the HVAC&R Contractor and their subcontractors, testing and balancing Contractor, and HVAC&R Instrumentation and Control Contractor prepare detailed testing plans, procedures, and checklists for HVAC&R systems, subsystems, and equipment.

E. Tests will be performed using design conditions whenever possible.

F. Simulated conditions may need to be imposed using an artificial load when it is not practical to test under design conditions. Before simulating conditions, calibrate testing instruments. Provide equipment to simulate loads. Set simulated conditions as directed by the CxA and document simulated conditions and methods of simulation. After tests, return settings to normal operating conditions.

G. The CxA may direct that set points be altered when simulating conditions is not practical.

H. The CxA may direct that sensor values be altered with a signal generator when design or simulating conditions and altering set points are not practical.

I. If tests cannot be completed because of a deficiency outside the scope of the HVAC&R system, document the deficiency and report it to the Owner. After deficiencies are resolved, reschedule tests.

J. If the testing plan indicates specific seasonal testing, complete appropriate initial performance tests and documentation and schedule seasonal tests.

3.4 HVAC&R SYSTEMS, SUBSYSTEMS, AND EQUIPMENT TESTING PROCEDURES

A. HVAC&R Instrumentation and Control System Testing: Field testing plans and testing requirements are specified in Section 230900 "Instrumentation and Control for HVAC" and Section 230993 "Sequence and Operations for HVAC Controls." Assist the CxA with preparation of testing plans.

B. Pipe system cleaning, flushing, hydrostatic tests, and chemical treatment requirements are specified in HVAC piping Sections. HVAC&R Contractor shall prepare a pipe system cleaning, flushing, and hydrostatic testing plan. Provide cleaning, flushing, testing, and treating plan and final reports to the CxA. Plan shall include the following:

1. Sequence of testing and testing procedures for each section of pipe to be tested, identified by pipe zone or sector identification marker. Markers shall be keyed to Drawings for each pipe sector, showing the physical location of each designated pipe test section. Drawings keyed to pipe zones or sectors shall be formatted to allow each section of piping to be physically located and identified when referred to in pipe system cleaning, flushing, hydrostatic testing, and chemical treatment plan.
2. Description of equipment for flushing operations.
3. Minimum flushing water velocity.

4. Tracking checklist for managing and ensuring that all pipe sections have been cleaned, flushed, hydrostatically tested, and chemically treated.

C. Refrigeration System Testing: Provide technicians, instrumentation, tools, and equipment to test performance of refrigerant compressors and condensers, heat pumps, and other refrigeration systems. The CxA shall determine the sequence of testing and testing procedures for each equipment item and pipe section to be tested.

D. HVAC&R Distribution System Testing: Provide technicians, instrumentation, tools, and equipment to test performance of air and hydronic distribution systems; special exhaust; and other distribution systems, including HVAC&R terminal equipment and unitary equipment.

E. Vibration Tests: Provide technicians, instrumentation, tools, and equipment to test performance of vibration isolation controls.

END OF SECTION 23 08 00

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DDC INPUT / OUTPUT SUMMARY TABLE

M&H PROJECT NO: 190225.01 — **DDC CONTROLLERS PROVIDED UNDER SPECIFICATION SECTION 23 09 00**

PROJECT: Manawa HS/ES

LOCATION: Manawa, WI

SYSTEM: Rooftop Units RTU-17, 18, 19 20, 21, 22 and 23. (mixed air VAV electrically actuated)

Middle/High School

POINT DESCRIPTION	HARDWARE: OUTPUT DIGITAL: Control Relay	24VAC	Contactor	2-Pos Actuator	OUTPUT ANALOG: Tri-State Actuator	Duration Adjust Actuator	4-20 mA	0-10 VDC	INPUT DIGITAL: Current Sensing Switch	Control Relay Contact	Switch Closure	Auxiliary Contact	Diff Pressure Switch	Flow Switch	INPUT ANALOG: Temperature	Relative Humidity	Differential Pressure	Gauge Pressure	Static Pressure	Flow	SOFTWARE ALARMS DIGITAL: Equipment Status	Maintenance	Pressure	ALARMS ANALOG: High Limit	Low Limit	Maintenance	ENERGY MANAGEMENT SYSTEM FUNCTIONS: Day/Night Setback	Demand Limiting	Dial-up I/O	Duty Cycling	Optimum Start/Stop	Scheduled Start/Stop	Totalization	Trend	Equipment Integration	Fire Alarm Integration	Security/Access Integration	Elect PQM Integration	Chiller Integration	Dry-bulb Economizer	HW/OA Reset	CHW Reset	Smoke Control	Fire Alarm Override	Comments
Supply Discharge Air Temperature															X									X	X								X											
Mixed Air Temperature															X									X	X								X											
Return Air Temperature															X									X	X								X											
Space Temperature (Room xx)															X									X	X								X											
Supply Air Flow																				X				X									X											
Gas Control Valve								X																																					
Gas Heating Coil Disch Air Temp															X									X	X								X											
Return Air Damper								X																									X							X				
Relief Air Damper								X																									X							X				
Relief Air Static Pressure																			X														X							X				
Minimum OA Damper								X																									X											
Economizer OA Damper								X																									X							X				
Minimum OA Flow																				X				X	X								X											
Supply Fan VFD Speed								X																																				
Supply Fan Status									X												X												X											
Supply Fan Start/Stop	X																															X	X											
Supply Air Static Pressure																			X					X											X									
Prefilter Differential Pressure																	X							X		X																		
Freeze Stat												X									X																							Electric freezestat
Fire Alarm Shutdown												X									X																							X	
Carbon Dioxide Sensor CO_2												X																																

DDC INPUT / OUTPUT SUMMARY TABLE

M&H PROJECT NO: 190225.01 — **DDC CONTROLLERS PROVIDED UNDER SPECIFICATION SECTION 23 09 00**

PROJECT: **Manawa HS/ES**

LOCATION: **Manawa, WI**

SYSTEM: Air Handling Units AHU-7 and Exhaust Fan PRV-4. (mixed air VAV electrically actuated)

Elementary School

| | HARDWARE | | | | | | | | | | | | | | | | SOFTWARE | | | | | | | | | | | | | | | |

DDC INPUT / OUTPUT SUMMARY TABLE

M&H PROJECT NO: 190225.01 | **DDC CONTROLLERS PROVIDED UNDER SPECIFICATION SECTION 23 09 00**

PROJECT: Manawa HS/ES

LOCATION: Manawa, WI

SYSTEM: Fans — Middle/High School

POINT DESCRIPTION	HARDWARE: OUTPUT: DIGITAL: Control Relay	Solenoid	Contactor	2-Pos Actuator	ANALOG: Elect/PneuTransducr	Electric Actuator	4-20 mA	0-10 VDC	HARDWARE: INPUT: DIGITAL: Current Sensing Switch	Control Relay Contact	Switch Closure	Auxiliary Contact	Diff Pressure Switch	Flow Switch	ANALOG: Temperature	Relative Humidity	Differential Pressure	Gauge Pressure	Static Pressure	Flow	SOFTWARE: ALARMS: DIGITAL: Equipment Status	Maintenance	Pressure	ANALOG: High Limit	Low Limit	ENERGY MANAGEMENT SYSTEM FUNCTIONS: Day/Night Setback	Demand Limiting	Dial-up I/O	Duty Cycling	Optimum Start/Stop	Scheduled Start/Stop	Totalization	Trend	Lighting Integration	Fire Alarm Integration	Security/Access Integration	Elect PQM Integration	Chiller Integration	Manual Changeover	HW/OA Reset	CHW Reset	Smoke Control	Fire Alarm Override	Comments
Exhaust Fans																																											
Exhaust Fan EF-10 Status									X												X													X										
Exhaust Fan EF-10 Start/Stop	X																														X	X												
Exhaust Fan EF-11 Status									X												X													X										
Exhaust Fan EF-11 Start/Stop	X																														X	X												
Exhaust Fan EF-12 Status									X												X													X										
Exhaust Fan EF-12 Start/Stop	X																														X	X												
Exhaust Fan EF-13 Status									X												X													X										
Exhaust Fan EF-13 Start/Stop	X																														X	X												
Exhaust Fan EF-14 Status									X												X													X										
Exhaust Fan EF-14 Start/Stop	X																														X	X												
Exhaust Fan PRV-4 Status									X												X													X										
Exhaust Fan PRV-4 Start/Stop	X																														X	X												
Destratification Fans DF-1/2																																												
Supply Fan Status									X												X													X										
Supply Fan Start/Stop	X																														X	X												
Dust Collector DC-1																																												
Dust Collector Fan Status									X												X													X										
Dust Collector Fan Start/Stop	X																														X	X												

DDC INPUT / OUTPUT SUMMARY TABLE

M&H PROJECT NO: 190225.01 — **DDC CONTROLLERS PROVIDED UNDER SPECIFICATION SECTION 23 09 00**

PROJECT: Manawa HS/ES

LOCATION: Manawa, WI

SYSTEM: Miscellaneous Points — Middle/High School

POINT DESCRIPTION	HARDWARE: OUTPUT: DIGITAL: Control Relay	Solenoid	Contactor	2-Pos Actuator	ANALOG: Elect/PneuTransducr	Electric Actuator	4-20 mA	0-10 VDC	HARDWARE: INPUT: DIGITAL: Current Sensing Switch	Control Relay Contact	Switch Closure	Auxiliary Contact	Diff Pressure Switch	Flow Switch	ANALOG: Temperature	Relative Humidity	Differential Pressure	Gauge Pressure	Static Pressure	Flow	SOFTWARE: ALARMS: DIGITAL: Equipment Status	Maintenance	Pressure	ANALOG: High Limit	Low Limit			ENERGY MANAGEMENT SYSTEM FUNCTIONS: Day/Night Setback	Demand Limiting	Dial-up I/O	Duty Cycling	Optimum Start/Stop	Scheduled Start/Stop	Totalization	Trend		Lighting Integration	Fire Alarm Integration	Security/Access Integration	Elect PQM Integration	Chiller Integration	Manual Changeover	HW/OA Reset	CHW Reset	Smoke Control	Fire Alarm Override	Comments
Elevator Machine Room																																												
Space Air Temperature															X									X	X										X									
ELEVATOR																																												
Elevator Fault Alarm												X									X																							
Unit Heaters UH-7, 8 & 9																																												
Space Air Temperature															X									X	X										X									
HW Heating Valve [1&2]					X	X	X	X										X																	X									
CUH Heaters CUH-10,11,12, & 13																																												
Space Air Temperature															X									X	X										X									
Discharge Air Temperature															X																				X									
Fan - Status									X												X														X									
Fan - Start/Stop	X																																X	X									
HW Heating Valve [1&2]																																												
Convectors C-1,2,3 4,5 & 6																																												
Space Air Temperature															X									X	X										X									
HW Heating Valve [1&2]																																												

DDC INPUT / OUTPUT SUMMARY TABLE

M&H PROJECT NO: 190225.01 — **DDC CONTROLLERS PROVIDED UNDER SPECIFICATION SECTION 23 09 00**

PROJECT: Manawa HS/ES

LOCATION: Manawa, WI

SYSTEM: Miscellaneous Points — Middle/High School

POINT DESCRIPTION	HARDWARE: OUTPUT: DIGITAL: Control Relay	Solenoid	Contactor	2-Pos Actuator	OUTPUT: ANALOG: Elect/PneuTransducr	Electric Actuator	4-20 mA	0-10 VDC	HARDWARE: INPUT: DIGITAL: Current Sensing Switch	Control Relay Contact	Switch Closure	Auxiliary Contact	Diff Pressure Switch	Flow Switch	INPUT: ANALOG: Temperature	Relative Humidity	Differential Pressure	Gauge Pressure	Static Pressure	Flow	SOFTWARE: ALARMS: DIGITAL: Equipment Status	Maintenance	Pressure	ALARMS: ANALOG: High Limit	Low Limit			ENERGY MANAGEMENT SYSTEM FUNCTIONS: Day/Night Setback	Demand Limiting	Dial-up I/O	Duty Cycling	Optimum Start/Stop	Scheduled Start/Stop	Totalization	Trend		Lighting Integration	Fire Alarm Integration	Security/Access Integration	Elect PQM Integration	Chiller Integration	Manual Changeover	HW/OA Reset	CHW Reset	Smoke Control	Fire Alarm Override	Comments
Fire/Smoke Dampers																																												
FSD-1 Damper End Switch											X																																		Note 1 & 2
FSD-1 Damper				X																																								
FSD-2 Damper End Switch											X																																	Note 1 & 2
FSD-2 Damper				X																																								
FSD-3 Damper End Switch											X																																	Note 1 & 2
FSD-3 Damper				X																																								
FSD-4 Damper End Switch											X																																	Note 1 & 2
FSD-4 Damper				X																																								
FSD-5 Damper End Switch											X																																	Note 1 & 2
FSD-5 Damper				X																																								
FSD-6 Damper End Switch											X																																	Note 1 & 2
FSD-6 Damper				X																																								
FSD-7 Damper End Switch											X																																	Note 1 & 2
FSD-7 Damper				X																																								
Fire Alarm/Protection																																												
Alarm												X									X																						
Trouble												X									X																						
Supervisory												X									X																						

DDC INPUT / OUTPUT SUMMARY TABLE

M&H PROJECT NO: 190225.01 — **DDC CONTROLLERS PROVIDED UNDER SPECIFICATION SECTION 23 09 00**

PROJECT: Manawa HS/ES

LOCATION: Manawa, WI

SYSTEM: Supply VAV Terminals (See plans for Qty) Middle/High School

POINT DESCRIPTION	HARDWARE: OUTPUT / DIGITAL: Control Relay	Solenoid	Contactor	24 VAC	OUTPUT / ANALOG: Tri-State Actuator	Duration Adjust Actuator	4-20 mA	0-10 VDC	HARDWARE: INPUT / DIGITAL: Current Sensing Switch	Control Relay Contact	Switch Closure	Auxiliary Contact	Diff Pressure Switch	Flow Switch	INPUT / ANALOG: Temperature	Resistive	Differential Pressure	Actuator Feedback	Static Pressure	Flow	SOFTWARE: ALARMS / DIGITAL: Equipment Status	Maintenance	Pressure	ALARMS / ANALOG: High Limit	Low Limit			ENERGY MANAGEMENT SYSTEM FUNCTIONS: Day/Night Setback	Demand Limiting	Dial-up I/O	Duty Cycling	Optimum Start/Stop	Scheduled Occ/Unoc	Totalization	Trend	Redundancy Control	Lighting Integration	Fire Alarm Integration	Security/Access Integration	Elect PQM Integration	Chiller Integration	CFM Offset	OA Lockout	CHW Reset	Smoke Control	Fire Alarm Override	Comments
Space Temperature															X									X	X										X											
Temperature Setpoint Adjust[5]																X																														Integral w/Sensor
Unnocupied Override Button											X																																			Integral w/Sensor
Supply Air Damper [1 & 2]					X	X	X	X										X																											
Supply Air Flow																				X																X									
Discharge Air Temperature															X																				X									
HW Reheat Valve [1&3]					X	X	X	X										X																X									
Software Points [4]																																													
Occupied Heating Setpoint																																													
Occupied Cooling Setpoint																																												
Unoccupied Heating Setpoint																																												
Unoccupied Cooling Setpoint																																													
Standby Heating Setpoint																																													
Standby Cooling Setpoint																																													
Reheat Lockout Command																																													
Occupied/Unoccupied Command																																				X									
Actual Flow Setpoint																																						X							
Actual Heating Setpoint																																						X							
Actual Cooling Setpoint																																						X							
Temperature Setpoint Adjust Range[5]																																													

Notes:

1. Analog outputs must utilize a calculated proportional command from software. Actual output can be any type but floating outputs shall have feedback from the acutator so actual actuator position is known.
2. Damper actuators can utilize stepper type motors.
3. Provide proportional actuation.
4. The minimum software points listed, if necessary to the application, shall be mapped. Any additional software points that are available and requested by the Owner shall be mapped by the DDC contractor.
5. Separate heating and cooling setpoints are preferred. If temperature setpoint is a single input that will offset the heating and cooling supervisory setpoints up or down together by an adjustable range.

DDC INPUT / OUTPUT SUMMARY TABLE

M&H PROJECT NO: 190225.01 — **DDC CONTROLLERS PROVIDED UNDER SPECIFICATION SECTION 23 09 00**

PROJECT: Manawa HS/ES

LOCATION: Manawa, WI

SYSTEM: Constant Volume Reheat Coils (See plans for Qty) Middle/High School

POINT DESCRIPTION	HARDWARE: OUTPUT DIGITAL: Control Relay	Solenoid	Contactor	24 VAC	OUTPUT ANALOG: Tri-State Actuator	Duration Adjust Actuator	4-20 mA	0-10 VDC	INPUT DIGITAL: Current Sensing Switch	Control Relay Contact	Switch Closure	Auxiliary Contact	Diff Pressure Switch	Flow Switch	INPUT ANALOG: Temperature	Resistive	Differential Pressure	Feedback for Tri-State	Static Pressure	Flow	SOFTWARE: ALARMS DIGITAL: Equipment Status	Maintenance	Pressure	ALARMS ANALOG: High Limit	Low Limit	Run Time		ENERGY MANAGEMENT SYSTEM FUNCTIONS: Day/Night Setback	Demand Limiting	Dial-up I/O	Duty Cycling	Optimum Start/Stop	Scheduled Start/Stop	Totalization	Trend	Redundancy Control	Lighting Integration	Fire Alarm Integration	Security/Access Integration	Elect PQM Integration	Chiller Integration	CFM Offset	OA Lockout	CHW Reset	Smoke Control	Fire Alarm Override	Comments
Hardware Points																																															
Zone Temperature															X									X	X											X											
Temperature Setpoint Adjust [4]																X																														
Discharge Air Temperature															X																				X											
HW Reheat Valve [1&2]					X			X										X																	X											
Software Points (Mapped)[3]																																														
Occupied Heating Setpoint																																														
Occupied Cooling Setpoint																																														
Unoccupied Heating Setpoint																																														
Unoccupied Cooling Setpoint																																														
Radiation Lockout Command																																														
Occupied/Unoccupied Command																																														
Actual Heating Setpoint																																						X									
Actual Cooling Setpoint																																						X									
Temperature Setpoint Adjust Range[4]																																														

Notes:

1. Analog outputs must utilize a calculated proportional command from software. Actual output can be any type but floating outputs shall have feedback from the acutator so actual actuator position is known
2. Provide proportional actuation.
3. The minimum software points listed, if necessary to the application, shall be mapped. Any additional software points that are available and requested by the user Agency shall be mapped by the DDC co
4. Separate heating and cooling setpoints are preferred. If temperature setpoint is a single input that will offset the heating and cooling supervisory setpoints up or down together by an adjustable range.

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SECTION 23 09 93
SEQUENCE OF OPERATIONS FOR HVAC CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes control sequences for HVAC systems, subsystems, and equipment.

B. Related Sections include the following:

1. Section 230900 "Instrumentation and Control for HVAC" for control equipment and devices and for submittal requirements.

1.3 DEFINITIONS

A. DDC: Direct digital control.

B. VAV: Variable air volume.

C. Inches w.g.: Inches of water gauge, or inches of water column.

1.4 GENERAL

A. A value in this specification followed by the word “adjustable” means the value can be changed manually through the DDC system by the Owner.

B. All duct mounted smoke detectors shall be provided and installed by this contractor. This includes ALL power, temperature control, and alarm wiring.

C. All duct mounted smoke detectors shall be provided and installed by this contractor. 120/1 electrical power to the detectors will be provided by the Electrical Contractor. ALL other required wiring to achieve a complete and fully functioning duct smoke detection system that is California code and NFPA standard compliant as well as acceptable to the local authority having jurisdiction. Wire all duct smoke detectors to a single remote alarm horn and trouble annunciator alarm wall mounted in a normally occupied area. Verify alarm horn and trouble annunciator location with Owner.

D. All control points shall be exposed as BACnet objects and shall be viewable and editable over the internet from a remote location with a standard web browser.

E. When filter pressure monitoring and control is required for a unit, filter monitoring and control shall apply to all filter banks in the unit.

1.5 HEATING CONTROL SEQUENCES

A. Heating-Water Supply Temperature Control:

1. Input Device: Resistance temperature sensor.
2. Output Device: Control valve.
3. Action: Modulate control valve to maintain heating-water supply temperature.
4. Display:

    a. Heating-water supply temperature.
    b. Heating-water supply temperature set point.
    c. Control-valve position.

B. Heating-Water System Control:

1. General: Control digitally with dedicated stand-alone mechanical system controller.
2. Input Devices:

    a. Supply water temperature sensor.
    b. Return water temperature sensor.
    c. Outside air temperature sensor. (not input from BAS)
    d. Water flow sensors.

3. Set Points:

    a. Heating System Enable: 63 deg F (adjustable).
    b. Heating System Disable: 65 deg F (adjustable).
    c. Supply Water Temperature:

        1) 180 deg F (adjustable) when the outside air temperature is -10 deg F (adjustable) or below.
        2) 100 deg F (adjustable) when the outside air temperature is 65 deg F (adjustable) or above. Coordinate minimum hot water temperature with boiler manufacturer recommendations.
        3) Linear relationship between the two points above.

4. Boilers and Primary Pumps:

    a. Sequence and modulate boilers to maintain heating-water supply temperature.
    b. Start primary pump before enabling boiler. Enable boiler when flow is proven.
    c. When the lead boiler is unable to maintain heating-water supply temperature at full fire for more than five minutes, and the lead boiler has been running at least 30 minutes (adjustable), start the lag boiler and pump.
    d. When multiple boilers are firing, modulate boilers together at the same rate.
    e. When multiple boilers are firing at less than 45% of full fire, shut down the lag boiler and pump.
    f. Boiler/Pump Shutdown:

1) Initiate boiler shutdown sequence.
2) Continue running pump for two minutes (adjustable) after boiler shutdown, then shut off pump.
3) Do not allow boiler to restart until 15 minutes (adjustable) after shutdown.

g. Conditions: Disable boilers and primary pumps when both secondary pumps are off.

5. Secondary Pumps: Each pump controlled by "HAND-OFF-AUTO" selector switch located on electrical MCC panel.

a. When switch in "HAND" position, run pump continuously.
b. When switch is "OFF" position, disable pump.
c. When switch in "AUTO" position, pump shall be controlled by outside air temperature and BAS.

1) When outdoor air temperature drops below the heating system enable set point, energize the lead secondary pump with the lag pump standing idle.
2) When outdoor air temperature rises above the heating system disable set point, de-energize both secondary pumps.

6. Lead/Lag Control:

a. Switch lead/lag pump and boiler assignments weekly at a time when maintenance personnel are available. Verify scheduled times with maintenance personnel.
b. Switch the lead/lag secondary pumps at a slightly different time than the boilers and primary pumps.
c. Prove new lead boiler and primary pump operating before allowing former lead boiler and primary pump to shut down.

7. Safeties:

a. All safety controls shall come factory installed and be integral with boiler and shall not be overridden by the BAS.
b. Provide integration of boiler flame safeguard controls with BAS. Integration shall provide monitoring of all data available at these controllers via the BAS. Install Communications Interface furnished by the boiler manufacturer. Provide all necessary wiring between communications interface and burner controllers (provided by boiler manufacturer).
c. Flame Safeguard: Flame safeguard microprocessor shall annunciate discrete alarm conditions.
d. Annunciate off-normal alarm whenever boiler status does not equal command.

8. Failures:

a. Communication or equipment failure of lead boiler, BAS shall automatically switch lead/lag boiler assignments and signal a BAS alarm.
b. Boiler Failure or Primary Pump Failure: Disable pump and boiler and signal an alarm. Switch the lead/lag assignments of the boiler and primary pump.
c. Secondary Pump Failure: Disable pump and signal an alarm. Switch the lead/lag assignments of the secondary pumps.
d. Sensor Failure: Upon the failure of an analog sensor, associated fire rates shall remain at their last position and alarm shall be annunciated.

9. Display:

a. Heating-water supply temperature. Trend. Alarm.
b. Heating-water supply temperature set point. Trend.
c. Return water temperature. Trend.
d. Outside air temperature. Trend.
e. Fire rate for each boiler. Trend. Totalize run time.
f. Pump status. Trend. Totalize run time. (each pump)
g. Heating system enable set point.
h. Heating system disable set point.
i. Pump run delay after boiler shutdown set point.
j. Boiler restart delay after shutdown set point.
k. Supply water temperature reset schedule points.

C. Heating-Water Supply Temperature Reset:

1. Input Device: Electric, outdoor-air-reset controller.
2. Output Device: DDC system software.
3. Action: Reset heating-water supply temperature in straight-line relationship with outdoor-air temperature for the following conditions:

a. 200 deg F heating water when outdoor-air temperature is minus 20 deg F lowest outdoor-air temperature.
b. 140 deg F heating water when outdoor-air temperature is 75 deg F.
c. 120 deg F minimum, heating-water temperature.

4. Display:

a. Outdoor-air temperature.
b. Heating-water supply temperature.
c. Heating-water supply temperature set point.

D. Control Primary Circulating Pump(s):

1. Input Device: DDC system.
2. Output Device: DDC system command to starter relay.
3. Action: Energize pump(s) at outdoor-air temperatures below 65 deg F.
4. Display:

a. Outdoor-air temperature.
b. Operating status of primary circulating pump(s).

1.6 VAV AIR HANDLING UNIT CONTROL SEQUENCES, DDC CONTROL

A. General: DDC control with dedicated stand-alone HVAC controller.

B. Occupancy: Occupied or unoccupied as determined by DDC system occupancy time schedule and temporary occupancy override buttons. When any zone is in occupied mode, the system shall be in occupied mode.

C. Economizer: Enable economizer mode when the outdoor dry bulb air temperature is below the return air dry bulb temperature. Otherwise disable economizer mode.

D. Warm-up / Cool-down Mode:

1. Damper Positions: Same as unoccupied mode.
2. Fans and Zone Temperature Set Points: Same as occupied mode.

E. Supply Air Temperature Control:

1. Temperature Set Point: Constant 55 deg F (adjustable)
2. Alarms:

a. Signal alarm when temperature drops below 45 deg F (7 deg C) (adjustable).
b. Signal alarm when temperature rises above 125deg F (adjustable).

F. Return Fan:

1. Fail Position: Off.
2. Action:

a. Fan Start: Ramp up speed slowly – no faster than full speed after 5 minutes.
b. Fan On: Run the fan under any of the following conditions:

1) Occupied mode.
2) Warm-up / Cool-down mode.
3) During unoccupied periods when heating or cooling is called for, as determined by a signal from any VAV box in the system.

c. Fan Off: All other times.

3. Speed Control:

a. Modulate motor speed controller to maintain static pressure in economizer section 0.05 inches w.g. (adjustable) above outdoor static pressure.
b. If the exhaust air damper is fully open and the building pressure exceeds set point, then the return fan speed shall modulate to maintain the building static pressure.
c. Set variable-speed drive to minimum speed when fan is stopped.

4. Air Flow Measurement: Display measured airflow in DDC system display.

5. Limits:

   a. Freeze Protection:

      1) Input Device: Coil-mounted averaging element thermostat (freezestat), located on downstream side of heating coil.
      2) Output Device: Hard wired through motor starters to both fans; local alarm light on freezestat and DDC system alarm.
      3) Action: Disable if freezestat temperature is below 37 deg F.

   b. Smoke Control:

      1) Input Device: Duct-mounted smoke detector, located in return and/or supply air duct.
      2) Output Device: Hard wired through motor starters to both fans; DDC system alarm.
      3) Action: Disable fans if smoke is sensed in duct.

   c. High Pressure:

      1) Input Device: Static-pressure transmitter sensing supply duct static pressure referenced to static pressure outside the duct.
      2) Output Device: DDC system binary output to motor starters to both fans and DDC system alarm.
      3) Action: Stop both fans and signal alarm when static pressure rises above 2.0 inches w.g. (adjustable).

G. Exhaust Air Damper:

1. Fail Position: Closed.
2. Occupied or Economizer: Modulate to maintain the building pressure at 0.03" w.g. (adjustable) higher than the pressure outside, using a PI loop.
3. Otherwise: Closed.

H. Return Air Damper:

1. Fail Position: Open.
2. Economizer Damper Open (Not Closed): Modulate with the outside air economizer damper to maintain the mixed air temperature 2 deg F (1 deg C) below the discharge air temperature set point, using a PI loop.
3. Unoccupied, No Economizer: Open.
4. Otherwise: Modulate to maintain the mixing box pressure at 0.2" w.g. (adjustable) lower than the pressure outside, using a PI loop. A static low limit sensor with manual reset shall stop the unit when the pressure is more negative than -0.5" w.g. (adjustable).

I. Economizer Damper:

1. Fail Position: Closed.
2. No Economizer: Closed.

3. Economizer: Modulate with the return air economizer damper to maintain the mixed air temperature 2 deg F (1 deg C) below the discharge air temperature set point, using a PI loop.

J. Minimum Outside Air Filter:

1. Signal alarm when the differential pressure exceeds 0.5 inches w.g. (adjustable).

K. Minimum Outside Air Damper:

1. Fail Position: Closed.
2. Unoccupied: Closed.
3. Occupied: Modulate to maintain air flow at set point, using a PI loop. Refer to air handling unit schedule for minimum air flow rates. Signal low alarm when air flow is more than 15% below set point.

L. Mixed Air Temperature: Signal alarm when temperature, as sensed by an averaging type sensor, is below 40 deg F (adjustable).

Retain subparagraph and associated subparagraphs above for fans equipped with variable inlet vanes; retain first subparagraph and associated subparagraphs below for fans equipped with variable-speed drives.

M. Filter Differential Pressure:

1. Signal alarm when the differential pressure exceeds 1.0 inches w.g. (adjustable).

N. Hydronic Heating Coil Control Valve:

1. Fail Position: Open.
2. Action:

    a. When fans are running, modulate to maintain supply air temperature set point.
    b. When fans are not running, modulate to maintain mixed air temperature within $\pm$2 deg F of 40 deg F (adjustable).

3. Conditions:

    a. Close valve when economizer damper is open, even partially.
    b. Close valve when cooling coil valve is open.

O. DX Cooling Coil Control:

1. Cooling Compressor(s):

    a. Fail Position: Off.
    b. Cycle/stage to maintain supply air temperature set point.
    c. Otherwise: Off.

2. Conditions:

a. Disable compressor(s) when heating coil valve is open.
b. Disable compressor(s) when the fans are off.
c. Per ACCU manufacturer's factory-installed safety conditions.

P. Supply Fan:

1. Fail Position: Off.
2. Initiate:

a. Start 5 seconds (adjustable) after the return fan is commanded to run.
b. Ramp up speed slowly – no faster than full speed after 5 minutes.

3. Speed Control – PI Loop Control:

a. Input Device: Static-pressure transmitter sensing supply duct static pressure referenced to conditioned-space static pressure.
b. Action: Modulate fan speed to maintain the supply duct static pressure at setpoint using PI loop.

1) Static Pressure Set Point Reset:

a) Identify the critical zone VAV box damper (the most open damper on VAV boxes in the system) every 5 minutes and determine its percent open.
b) When the critical zone VAV box damper is less than 80% open, then the static pressure set point shall be lowered 0.1 inches w.g.
c) When the critical zone VAV box damper is more than 90% open, then the static pressure set point shall be raised 0.1 inches w.g.
d) Otherwise, the static pressure set point shall remain unchanged.

4. Limits:

a. Freeze Protection:

1) Input Device: Coil-mounted averaging element thermostat (freezestat), located on downstream side of heating coil.
2) Output Device: Hard wired through motor starters to both fans; local alarm light on freezestat and DDC system alarm.
3) Action: Disable if freezestat temperature is below 37 deg F.

b. Smoke Control:

1) Input Device: Duct-mounted smoke detector, located in return and/or supply air duct.
2) Output Device: Hard wired through motor starters to both fans; DDC system alarm.
3) Action: Disable fans if smoke is sensed in duct.

c. High Pressure:

1) Input Device: Static-pressure transmitter sensing supply duct static pressure referenced to static pressure outside the duct.
2) Output Device: DDC system binary output to motor starters to both fans and DDC system alarm.
3) Action: Stop both fans and signal alarm when static pressure rises above 2.0 inches w.g. (adjustable).

Q. Coordination of Air-Handling Unit Sequences: Ensure that controls have common inputs and do not overlap in function.

R. Failure Modes:

1. Power Failure: Put all devices in failure positions. Stagger restart upon restoration of power.
2. Fire Alarm: Put all devices in failure positions.
3. Supply Fan Failure:

   a. Input Device: Current sensor on supply fan.
   b. Output Device: DDC system alarm.
   c. Action: If fan is not running 30 seconds (adjustable) after command to start, put all devices in failure position and signal an alarm with manual reset.

4. Return Fan Failure:

   a. Input Device: Current sensor on return fan.
   b. Output Device: DDC system alarm.
   c. Action: If fan is not running 30 seconds (adjustable) after command to start, put all devices in failure position and signal an alarm with manual reset.

S. Operator Station Display: Indicate the following on operator workstation display terminal:

1. DDC system graphic.
2. DDC system on-off indication. Trend. Totalize run time. Totalize on-off cycles. Alarm sensor failure.
3. DDC system occupied/unoccupied mode. Trend.
4. Outdoor-air-temperature indication. Alarm sensor failure.
5. Return air temperature indication. Trend. Alarm sensor failure.
6. Return fan on-off indication. Trend. Alarm fan failure with manual reset. Alarm sensor failure.
7. Return fan speed (% of full speed). Trend.
8. Time delay before return fan failure alarm.
9. Economizer section static pressure indication. Trend. Alarm sensor failure.
10. Economizer section static pressure set point.
11. Building static-pressure indication. Trend. Alarm sensor failure.
12. Building static-pressure set point.
13. Exhaust air damper position indication (% open). Trend.
14. Return air damper position indication (% open). Trend.
15. Economizer air damper position indication (% open). Trend.

16. Minimum outside air damper position indication (% open). Trend.
17. Minimum outside air filter differential pressure indication. Trend. Alarm high. Alarm low. Alarm sensor failure.
18. Minimum outside air filter low differential pressure set point.
19. Minimum outside air filter high differential pressure set point.
20. Minimum outside air flow indication. Trend. Alarm low. Alarm sensor failure.
21. Minimum outside air flow set point.
22. Minimum outside air flow low alarm set point.
23. Mixing box static pressure indication. Trend. Alarm low. Alarm sensor failure.
24. Mixing box static pressure set point.
25. Mixing box static pressure low alarm set point.
26. Filter air pressure drop indication. Trend. Alarm high. Alarm low. Alarm sensor failure.
27. Filter low differential pressure set point.
28. Filter high differential pressure set point.
29. Mixed air temperature indication. Trend. Alarm low. Alarm sensor failure.
30. Mixed air temperature low alarm set point.
31. Mixed air temperature set point when fans are off.
32. Heating coil control valve position (% open). Trend.
33. Compressor(s) status. Override capability. Trend. Alarm compressor failure.
34. DX cooling lockout temperature. Override capability.
35. Supply fan on-off indication. Trend. Alarm fan failure with manual reset. Alarm sensor failure.
36. Supply fan start command delay after command to start return fan.
37. Supply fan speed (% of full speed). Trend.
38. Supply duct static pressure indication. Trend. Alarm high. Alarm sensor failure.
39. Supply duct static pressure set point. Trend.
40. Supply duct static pressure high limit set point.
41. Identification of critical zone VAV box. Trend.
42. Damper position of critical zone VAV box. Trend.
43. Supply air temperature indication. Trend. Alarm high. Alarm low. Alarm sensor failure.
44. Supply air temperature set point. Trend.
45. Supply air temperature low alarm set point.
46. Supply air temperature high alarm set point.
47. Time delay before supply fan failure alarm.

1.7 TERMINAL UNIT OPERATING SEQUENCE

A. Cabinet Unit Heater, Hydronic:

1. Room Temperature:

   a. Input Device: Room thermostat.
   b. Set Point: 65 deg F. Allowable Range: 55 to 75 deg F (13 to 24 deg C)
   c. Fan: Cycle to maintain room temperature at set point when the hot water supply temperature is 110 deg F or greater as sensed by line voltage aquastat.
   d. Valve:

      1) Fail Position: Open.

2) Action: Two-position; cycle to maintain room temperature at set point.

e. Display:

1) Room temperature indication as measured by room temperature sensor.

B. Unit Heater, Hydronic:

1. Room Temperature:

a. Input Device: Room thermostat.
b. Set Point: 65 deg F. Allowable Range: 55 to 75 deg F (13 to 24 deg C)
c. Fan: Cycle to maintain room temperature at set point when the hot water supply temperature is 110 deg F or greater as sensed by line voltage aquastat.
d. Valve:

1) Fail Position: Open.
2) Action: Two-position; cycle to maintain room temperature at set point.

2. Display:

a. Room temperature indication as measured by room temperature sensor.

C. Heating Coils, Hydronic:

1. Room Temperature:

a. Input Device: Electronic temperature sensor.
b. Output Device: Electronic control-valve operators.
c. Action: Modulate valve to maintain temperature.

2. Display:

a. Room temperature indication.
b. Room temperature set point.
c. Control-valve position.

D. Heating Coils, Electric: Room thermostat sequences stages of heating.

E. Radiators and Convectors, Hydronic:

1. Room Temperature:

a. Input Device: Room thermostat.
b. Output Device: Electronic control-valve operators.
c. Action: Modulate valve to maintain temperature.

1) Occupied Temperature: 75 deg F.

2) Unoccupied Temperature: 65 deg F.

2. Display:

a. Room/area served.
b. Room temperature indication.
c. Room temperature set point.
d. Room temperature set point, occupied.
e. Room temperature set point, occupied standby.
f. Room temperature set point, unoccupied.
g. Control-valve position as percent open.

F. VAV Box with Hydronic Reheat Coils:

1. Occupancy: Occupied or unoccupied as determined by DDC system occupancy time schedule and temporary occupancy override buttons. Temporary occupancy override shall last 3 hours (adjustable).
2. Room Temperature Control:

a. Input Device: Electronic temperature sensor with set points adjustable at sensor.
b. Set Points:

1) Occupied Room Temperature

a) Heating: 68 deg F; Allowable Range: 55 to 85 deg F.
b) Cooling: 75 deg F; Allowable Range: 55 to 85 deg F.

2) Unoccupied Room Temperature:

a) Heating: 60 deg F; Allowable Range: 55 to 85 deg F.
b) Cooling: 80 deg F; Allowable Range: 55 to 85 deg F.
c) Deadband: Plus or minus 2 deg F; Allowable range: 0 to 5 deg F.

3) Allowable Deviation Above Cooling Set Point or Below Heating Set Point Before Alarm: 4 deg F; Allowable Range 1 to 10 deg F.

c. Damper:

1) Fail Position: Last.
2) Modulate to maintain airflow setpoint. Adjust airflow setpoint to maintain cooling set point temperature using PI loop, subject to the maximum and minimum airflow limits shown on the equipment schedule.
3) For VAV boxes in systems that use damper position in a static pressure set point reset optimization strategy, close the damper each day at midnight to re-zero the damper position indicator, then reopen to last position and resume normal control.

d. Reheat Coil Valve:

1) Fail Position: Last.
2) Modulate to maintain heating set point using PI loop.

e. When in unoccupied mode, and the room temperature is above the unoccupied cooling set point plus the deadband or below the unoccupied heating setpoint minus the deadband, signal the air handling unit controller to run the air handling unit. When the temperature is satisfied, signal the air handling unit controller that the temperature is satisfied and the air handling unit does not need to run for this zone. (The air handler will continue running if another zone temperature is not satisfied.)

3. Display:

a. Room/area served.
b. Room occupied/unoccupied status. Trend. Override capability.
c. Temporary occupied override duration set point.
d. Room temperature indication. Trend. Alarm when deviates too much from set point.
e. Room temperature set point, occupied, cooling. Override capability.
f. Room temperature set point, occupied, heating. Override capability.
g. Room temperature set point, unoccupied, cooling. Override capability.
h. Room temperature set point, unoccupied, heating. Override capability.
i. Room temperature set point for current mode. Trend.
j. Discharge air temperature. Trend
k. Allowable deviation from set point before alarm.
l. Air flow indication. Trend.
m. Unoccupied deadband set point.
n. Air flow set point. Trend. Override capability.
o. Air-damper position as percent open. Trend. Override capability.
p. Control-valve position as percent open. Trend. Override capability.
q. Tuning parameters for PI loop, displayed on separate screen with other adjustable tuning parameters.

1.8 VENTILATION SEQUENCES

A. Exhaust Fan: Interlock with light switch cycles fan.

1. Off when the light switch is off after a 30 second (adjustable 0 to 60 seconds) delay period.
2. On when the light switch is on.

B. Exhaust Fan: Interlocked with room thermostat and damper.

1. Room Temperature Set Point: 85 deg F (29 deg C); Allowable Range: 55 to 95 deg F (13 to 35 deg C).
2. When the room temperature is above set point, open the damper and turn on the fan.
3. When the room temperature is below set point, close the damper and turn off the fan.

C. Exhaust Fan: With H-O-A switch and interlocked with room thermostat and damper.

1. Room Temperature Set Point: 85 deg F (29 deg C); Allowable Range: 55 to 95 deg F (13 to 35 deg C).
2. Failure Position: Off.
3. Controlled by HAND-OFF-AUTO switch.

    a. HAND: On.
    b. OFF: Off.
    c. AUTO:

        1) When the room temperature is above set point, open the damper and turn on the fan.
        2) When the room temperature is below set point, close the damper and turn off the fan.

D. Exhaust Fan: Interlocked with air handling unit.

1. Failure Position: Off.
2. Action:

    a. On when the associated air handling unit is in occupied mode.
    b. Off when the associated air handling unit is in unoccupied mode.

E. Exhaust Fan: With H-O-A switch and interlocked with air handling unit.

1. Failure Position: Off.
2. Controlled by HAND-OFF-AUTO switch.

    a. HAND: On.
    b. OFF: Off.
    c. AUTO:

        1) On when the associated air handling unit is in occupied mode.
        2) Off when the associated air handling unit is in unoccupied mode.

1.9 MISCELLANEOUS SEQUENCES

A. Manual Emergency Shutdown:

1. Input Device: Emergency Shutdown Pushbutton.
2. Output Device: DDC system alarm.
3. Action: Put all devices in failure position and signal an alarm. Manual reset through the DDC system shall silence the alarm and a separate manual reset through the DDC system to re-enable the equipment.

1.10 ROOFTOP AIR CONDITIONING UNIT OPERATING SEQUENCES

A. Packaged Rooftop Unit (RTU-x) Control:

1. The RTU shall be controlled by the factory installed unit-mounted microprocessor control system.
2. Safety Controls:

a. Smoke detector in main return air ductwork from unit shall de-energize fan and provide signal to DDC temperature control system which will sound fire alarm horn upon detection of smoke.
b. Provide freezestat to stop unit fan and close outside air damper if unit discharge air temperature is below 37°F (adjustable). Provide alarm signal to DDC temperature control system. Manual re-start of unit fan motor required.

3. Scheduling:

a. Unit occupied/unoccupied operation shall be scheduled through the factory installed unit-mounted microprocessor control system.

4. Occupied Period:

a. Unit supply fan shall run continuously.
b. Return air damper shall be manually positioned to full open. Motorization not required.
c. Outdoor air damper shall be manually positioned to full closed. Motorization not required.

5. Unoccupied Period:

a. Unit supply fan off.

6. Temperature Control:

a. During occupied Period, unit cooling systems shall be staged to maintain space temperature of 75°F (adjustable)
b. Input Device: Room temperature sensor.
c. Allowable Deviation Above Cooling Set Point or Below Heating Set Point Before Alarm: 5 deg F; Allowable range 1 to 10 deg F.

1.11 FIRE/SMOKE DAMPER INTERLOCK (HARDWIRE TYPE):

1. Wire fire/smoke damper end switches into the supply and return fan safety circuits so that the following selected fire/smoke dampers are open on fan status and close them when all of the supply fans have been off for five minutes.

2. The fire/smoke dampers hardwired to the fan safety circuits are: FSD-x1, FSD-x2, etc. All fire/smoke damper end switches including smoke dampers that are hardwired and are not hardwired to the fan safety circuits shall be monitored individually by the DDC system.

3. Fire/smoke dampers shall be commanded open on fan status. If the AHU supply fan fails to prove on after a delay of 5 minutes (adj.), the dampers shall be commanded closed again to prevent smoke migration and the AHU fans shall be latched off in software.

4. Provide manual push-button switch located in this control panel and a software point to reset latch out of the unit.

5. Fire/smoke dampers power shall be by the 23 09 14 temperature control contractor and shall have the fire/smoke dampers binary output relay contact wired in series a relay contact slaved from the fire alarm control module so that either signal shall cause the fire/smoke dampers to close. All fire/smoke dampers shall be interlock to one single digital output through the DDC system in event of detection though the fire alarm panel.

6. Refer to schedule on drawings for list of fire/smoke dampers to be interlocked with RTU-21.

PART 2 - EXECUTION (Not Used)

END OF SECTION 23 09 93

SECTION 23 11 23
FACILITY NATURAL-GAS PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

1.3 PERFORMANCE REQUIREMENTS

A. Minimum Operating-Pressure Ratings:

1. Piping and Valves: 100 psig minimum unless otherwise indicated.
2. Service Regulators: 100 psig minimum unless otherwise indicated.

B. Natural-Gas System Pressures within Buildings: Two pressure ranges. Primary pressure is more than 0.5 psig but not more than 5 psig and is reduced to secondary pressure of 0.5 psig or less.

C. Natural gas pressures shall not exceed five (5) pounds per square inch gauge on building side of the meter.

D. Interruption of Existing Natural Gas Service: Do not interrupt natural gas service to facilities occupied by School District or others unless permitted under the following conditions and then only after arranging to provide purging and startup of natural gas supply according to requirements indicated:

E. Notify Owner's Project Representative no fewer than 30 days in advance of proposed interruption of natural gas service. Do not proceed with interruption of natural gas service without Owner's Project Representative written permission.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of the following:

1. Piping specialties.
2. Corrugated, stainless-steel tubing with associated components.

3. Valves. Include pressure rating, capacity, settings, and electrical connection data of selected models.
4. Pressure regulators. Indicate pressure ratings and capacities.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For pressure regulators to include in emergency, operation, and maintenance manuals.

1.6 QUALITY ASSURANCE

A. Steel Support Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Handling Flammable Liquids: Remove and dispose of liquids from existing natural-gas piping according to requirements of authorities having jurisdiction.

B. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

C. Store and handle pipes and tubes having factory-applied protective coatings to avoid damaging coating, and protect from direct sunlight.

1.8 PROJECT CONDITIONS

A. Interruption of Existing Natural-Gas Service: Do not interrupt natural-gas service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide purging and startup of natural-gas supply according to requirements indicated:

1. Notify Owner no fewer than two days in advance of proposed interruption of natural-gas service.
2. Do not proceed with interruption of natural-gas service without Owner's written permission.

1.9 COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided.

B. Coordinate requirements for access panels and doors for valves installed concealed behind finished surfaces. Comply with requirements in Division 08.

1.10 NATURAL GAS SERVICE

A. Perform site survey, research public utility records, and verify existing utility locations. Contact utility-locating service for area where Project is located.

B. Include cost of alterations of existing gas service, meters, and reducing valves in base bid. This includes work performed by the Gas Company to and including the gas meters or other performed services.

PART 2 - PRODUCTS

2.1 PIPES, TUBES, AND FITTINGS

A. Pipe and Fittings: See drawing schedule for pipe and fitting material requirements.

2.2 PIPING SPECIALTIES

A. Appliance Flexible Connectors:

1. Indoor, Fixed-Appliance Flexible Connectors: Comply with ANSI Z21.24.
2. Indoor, Movable-Appliance Flexible Connectors: Comply with ANSI Z21.69.
3. Outdoor, Appliance Flexible Connectors: Comply with ANSI Z21.75.
4. Corrugated stainless-steel tubing with polymer coating.
5. Operating-Pressure Rating: 0.5 psig.
6. End Fittings: Zinc-coated steel.
7. Threaded Ends: Comply with ASME B1.20.1.
8. Maximum Length: 72 inches

B. Quick-Disconnect Devices: Comply with ANSI Z21.41.

1. Copper-alloy convenience outlet and matching plug connector.
2. Nitrile seals.
3. Hand operated with automatic shutoff when disconnected.
4. For indoor or outdoor applications.
5. Adjustable, retractable restraining cable.

C. Y-Pattern Strainers:

1. Body: ASTM A 126, Class B, cast iron with bolted cover and bottom drain connection.
2. End Connections: Threaded ends for NPS 2 and smaller; flanged ends for NPS 2-1/2 and larger.
3. Strainer Screen: 60-mesh startup strainer and perforated stainless-steel basket with 50 percent free area.
4. CWP Rating: 125 psig.

D. Weatherproof Vent Cap: Cast- or malleable-iron increaser fitting with corrosion-resistant wire screen, with free area at least equal to cross-sectional area of connecting pipe and threaded-end connection.

2.3 JOINING MATERIALS

A. Joint Compound and Tape: Suitable for natural gas.

B. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

2.4 MANUAL GAS SHUTOFF VALVES

A. General Requirements for Metallic Valves, NPS 2 and Smaller: Comply with ASME B16.33.

1. CWP Rating: 125 psig.
2. Threaded Ends: Comply with ASME B1.20.1.
3. Dryseal Threads on Flare Ends: Comply with ASME B1.20.3.
4. Tamperproof Feature: Locking feature for valves indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
5. Listing: Listed and labeled by an NRTL acceptable to authorities having jurisdiction for valves 1 inch and smaller.
6. Service Mark: Valves 1-1/4 inches to NPS 2 shall have initials "WOG" permanently marked on valve body.

B. General Requirements for Metallic Valves, NPS 2-1/2 and Larger: Comply with ASME B16.38.

1. CWP Rating: 125 psig.
2. Flanged Ends: Comply with ASME B16.5 for steel flanges.
3. Tamperproof Feature: Locking feature for valves indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
4. Service Mark: Initials "WOG" shall be permanently marked on valve body.

C. Two-Piece, Full-Port, Bronze Ball Valves with Bronze Trim: MSS SP-110.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. BrassCraft Manufacturing Company; a Masco company.
    b. Conbraco Industries, Inc.; Apollo Div.
    c. Lyall, R. W. & Company, Inc.
    d. McDonald, A. Y. Mfg. Co.
    e. Perfection Corporation; a subsidiary of American Meter Company.

2. Body: Bronze, complying with ASTM B 584.
3. Ball: Chrome-plated bronze.
4. Stem: Bronze; blowout proof.
5. Seats: Reinforced TFE; blowout proof.
6. Packing: Threaded-body packnut design with adjustable-stem packing.

7. Listing: Valves NPS 1 and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
8. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

D. Bronze Plug Valves: MSS SP-78.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Lee Brass Company.
   b. McDonald, A. Y. Mfg. Co.

2. Body: Bronze, complying with ASTM B 584.
3. Plug: Bronze.
4. Operator: Square head or lug type with tamperproof feature where indicated.
5. Listing: Valves NPS 1 and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
6. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

E. Cast-Iron, Nonlubricated Plug Valves: MSS SP-78.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. McDonald, A. Y. Mfg. Co.
   b. Mueller Co.; Gas Products Div.
   c. Xomox Corporation; a Crane company.

2. Body: Cast iron, complying with ASTM A 126, Class B.
3. Plug: Bronze or nickel-plated cast iron.
4. Seat: Coated with thermoplastic.
5. Stem Seal: Compatible with natural gas.
6. Operator: Square head or lug type with tamperproof feature where indicated.
7. Listing: Valves NPS 1 and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
8. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

2.5 PRESSURE REGULATORS

A. General Requirements:

1. Single stage and suitable for natural gas.
2. Steel jacket and corrosion-resistant components.
3. Elevation compensator.
4. End Connections: Threaded for regulators NPS 2 and smaller; flanged for regulators NPS 2-1/2 and larger.

B. Line Pressure Regulators: Comply with ANSI Z21.80.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Actaris.
    b. American Meter Company.
    c. Eclipse Combustion, Inc.
    d. Fisher Control Valves and Regulators; Division of Emerson Process Management.
    e. Invensys.
    f. Maxitrol Company.
    g. Richards Industries; Jordan Valve Div.

2. Body and Diaphragm Case: Cast iron or die-cast aluminum.
3. Springs: Zinc-plated steel; interchangeable.
4. Diaphragm Plate: Zinc-plated steel.
5. Seat Disc: Nitrile rubber resistant to gas impurities, abrasion, and deformation at the valve port.
6. Orifice: Aluminum; interchangeable.
7. Seal Plug: Ultraviolet-stabilized, mineral-filled nylon.
8. Single-port, self-contained regulator with orifice no larger than required at maximum pressure inlet, and no pressure sensing piping external to the regulator.
9. Pressure regulator shall maintain discharge pressure setting downstream, and not exceed 150 percent of design discharge pressure at shutoff.
10. Overpressure Protection Device: Factory mounted on pressure regulator.
11. Atmospheric Vent: Factory- or field-installed, stainless-steel screen in opening if not

C. Appliance Pressure Regulators: Comply with ANSI Z21.18.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Canadian Meter Company Inc.
    b. Eaton Corporation; Controls Div.
    c. Harper Wyman Co.
    d. Maxitrol Company.
    e. SCP, Inc.

2. Body and Diaphragm Case: Die-cast aluminum.
3. Springs: Zinc-plated steel; interchangeable.
4. Diaphragm Plate: Zinc-plated steel.
5. Seat Disc: Nitrile rubber.
6. Seal Plug: Ultraviolet-stabilized, mineral-filled nylon.
7. Factory-Applied Finish: Minimum three-layer polyester and polyurethane paint finish.
8. Regulator may include vent limiting device, instead of vent connection, if approved by authorities having jurisdiction.
9. Maximum Inlet Pressure: 1 psig.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for natural-gas piping system to verify actual locations of piping connections before equipment installation.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Close equipment shutoff valves before turning off natural gas to premises or piping section.

B. Inspect natural-gas piping according tothe International Fuel Gas Code to determine that natural-gas utilization devices are turned off in piping section affected.

C. Comply withthe International Fuel Gas Code requirements for prevention of accidental ignition.

3.3 OUTDOOR PIPING INSTALLATION

A. Comply with the International Fuel Gas Code for installation and purging of natural-gas piping.

B. Steel Piping with Protective Coating:

1. Apply joint cover kits to pipe after joining to cover, seal, and protect joints.
2. Repair damage to PE coating on pipe as recommended in writing by protective coating manufacturer.
3. Replace pipe having damaged PE coating with new pipe.

C. Install fittings for changes in direction and branch connections.

D. Install pressure gage upstream and downstream from each service regulator. Pressure gages are specified in Section 230519 "Meters and Gages for HVAC Piping."

3.4 INDOOR PIPING INSTALLATION

A. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.

B. Comply with the International Fuel Gas Code for installation and purging of natural-gas piping.

C. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

D. Arrange for pipe spaces, chases, slots, sleeves, and openings in building structure during progress of construction, to allow for mechanical installations.

E. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

F. Gas piping joints shall be welded from main natural gas riser to each emergency shut-off valve and all ceiling plenum returns.

G. Valves, regulators, flanges, union type fittings and similar appurtenances shall be accessible for operation and servicing and shall not be located above ceilings, within chases, walls/partitions, spaces utilized as return air plenums or non-accessible locations.

H. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

I. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

J. Locate valves for easy access.

K. Install piping free of sags and bends.

L. Install fittings for changes in direction and branch connections.

M. Verify final equipment locations for roughing-in.

N. Comply with requirements in Sections specifying gas-fired appliances and equipment for roughing-in requirements.

O. Drips and Sediment Traps: Install drips at points where condensate may collect, including service-meter outlets. Locate where accessible to permit cleaning and emptying. Do not install where condensate is subject to freezing.

    1. Construct drips and sediment traps using tee fitting with bottom outlet plugged or capped. Use nipple a minimum length of 3 pipe diameters, but not less than 3 inches long and same size as connected pipe. Install with space below bottom of drip to remove plug or cap.

P. Extend relief vent connections for service regulators, line regulators, and overpressure protection devices to outdoors and terminate with weatherproof vent cap.

Q. Conceal pipe installations in walls, pipe spaces, utility spaces, above ceilings, below grade or floors, and in floor channels unless indicated to be exposed to view.

R. Concealed Location Installations: Except as specified below, install concealed natural-gas piping and piping installed under the building in containment conduit constructed of steel pipe with welded joints as described in Part 2. Install a vent pipe from containment conduit to outdoors and terminate with weatherproof vent cap.

1. Above Accessible Ceilings: Natural-gas piping, fittings, valves, and regulators may be installed in accessible spaces without containment conduit.
2. In Walls or Partitions: Protect tubing installed inside partitions or hollow walls from physical damage using steel striker barriers at rigid supports.

    a. Exception: Tubing passing through partitions or walls does not require striker barriers.

3. Prohibited Locations:

    a. Do not install natural-gas piping in or through circulating air ducts, clothes or trash chutes, chimneys or gas vents (flues), ventilating ducts, or dumbwaiter or elevator shafts.
    b. Do not install natural-gas piping in solid walls or partitions.

S. Use eccentric reducer fittings to make reductions in pipe sizes. Install fittings with level side down.

T. Connect branch piping from top or side of horizontal piping.

U. Install unions in pipes NPS 2 and smaller, adjacent to each valve, at final connection to each piece of equipment. Unions are not required at flanged connections.

V. Do not use natural-gas piping as grounding electrode.

W. Extension bars shall not be used for supporting gas piping. Gas piping shall not be used to support any other piping or component.

X. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

Y. Install strainer on inlet of each line-pressure regulator and automatic or electrically operated valve.

Z. Install pressure gage upstream and downstream from each line regulator. Pressure gages are specified in Section 230519 "Meters and Gages for HVAC Piping."

AA. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 230500 “Common Work Results for HVAC."

BB. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 230500 “Common Work Results for HVAC."

CC. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 230500 “Common Work Results for HVAC."

3.5 VALVE INSTALLATION

A. Install manual gas shutoff valve for each gas appliance ahead of corrugated stainless-steel tubing, aluminum, or copper connector.

B. Install regulators and overpressure protection devices with maintenance access space adequate for servicing and testing.

3.6 PIPING JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Threaded Joints:

1. Thread pipe with tapered pipe threads complying with ASME B1.20.1.
2. Cut threads full and clean using sharp dies.
3. Ream threaded pipe ends to remove burrs and restore full inside diameter of pipe.
4. Apply appropriate tape or thread compound to external pipe threads unless dryseal threading is specified.
5. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

D. Welded Joints:

1. Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators.
2. Bevel plain ends of steel pipe.
3. Patch factory-applied protective coating as recommended by manufacturer at field welds and where damage to coating occurs during construction.

3.7 HANGER AND SUPPORT INSTALLATION

A. Install seismic restraints on piping. Comply with requirements for devices specified in Section 230548 "Vibration Controls for HVAC."

B. Comply with requirements for pipe hangers and supports specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."

C. Install hangers for horizontal steel piping with the following maximum spacing and minimum rod sizes:

1. NPS 1 and Smaller: Maximum span, 96 inches; minimum rod size, 3/8 inch.
2. NPS 1-1/4: Maximum span, 108 inches; minimum rod size, 3/8 inch.
3. NPS 1-1/2 and NPS 2: Maximum span, 108 inches; minimum rod size, 3/8 inch.
4. NPS 2-1/2 to NPS 3: Maximum span, 10 feet; minimum rod size, 1/2 inch.

D. Install hangers for horizontal, corrugated stainless-steel tubing with the following maximum spacing and minimum rod sizes:

1. NPS 3/8: Maximum span, 48 inches; minimum rod size, 3/8 inch.
2. NPS 1/2: Maximum span, 72 inches; minimum rod size, 3/8 inch.
3. NPS 3/4 and Larger: Maximum span, 96 inches; minimum rod size, 3/8 inch.

E. Provide additional intermediate supports as required so deflection of piping does not exceed 1/240 of span.

F. Support spacings listed above are minimum requirements. Contractor shall provide additional supports as required by codes or authority having jurisdiction at no additional cost to contract.

3.8 CONNECTIONS

A. Connect to utility's gas main according to utility's procedures and requirements.

B. Install natural-gas piping electrically continuous and bonded to gas appliance equipment grounding conductor of the circuit powering the appliance according to NFPA 70.

C. Install piping adjacent to appliances to allow service and maintenance of appliances.

D. Connect piping to appliances using manual gas shutoff valves and unions. Install valve within 72 inches of each gas-fired appliance and equipment. Install union between valve and appliances or equipment.

E. Sediment Traps: Install tee fitting with capped nipple in bottom to form drip, as close as practical to inlet of each appliance.

3.9 LABELING AND IDENTIFYING

A. Comply with requirements in Section 230553 "Identification for HVAC Piping and Equipment" for piping and valve identification.

B. Contractor to label all existing and new gas piping from the utility meter to all gas equipment in Manawa High School.

3.10 PAINTING

A. Paint exposed, exterior metal piping, valves, service regulators, service meters and meter bars, earthquake valves, and piping specialties, except components, with factory-applied paint or protective coating.

1. Alkyd System: MPI EXT 5.1D.

    a. Prime Coat: Alkyd anticorrosive metal primer.
    b. Intermediate Coat: Exterior alkyd enamel matching topcoat.
    c. Topcoat: Exterior alkyd enamel (gloss).
    d. Color: Gray.

B. Paint exposed, interior metal piping, valves, service regulators, service meters and meter bars, earthquake valves, and piping specialties, except components, with factory-applied paint or protective coating.

1. Latex Over Alkyd Primer System: MPI INT 5.1Q.

    a. Prime Coat: Alkyd anticorrosive metal primer.
    b. Intermediate Coat: Interior latex matching topcoat.
    c. Topcoat: Interior latex (semigloss).
    d. Color: Gray.

C. Damage and Touchup: Repair marred and damaged factory-applied finishes with materials and by procedures to match original factory finish.

3.11 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Test, inspect, and purge natural gas according to the International Fuel Gas Code and authorities having jurisdiction.

C. Natural-gas piping will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

E. Prior to start-up, Contractor shall verify existing gas system pressure downstream of gas meter as indicated on plans. If meter pressure is not within ±5% of pressure indicated on plans, Contractor shall notify the Architect/Engineer and Owner immediately.

1. If a pressure tap is not available for connectors of a gas pressure gauge, one shall be installed at no additional cost to the Contract.

F. Install downstream gas pressure measurement and gage shall be taken within 15 feet of the gas meter discharge.

G. If a pressure tap is not available for connectors of a gas pressure gauge, one shall be installed at no additional cost to the Contract.

H. Provide ¼" pressure tap should be installed 2-4 feet downstream of the regulator for pressure gauge.

3.12 OUTDOOR AND INDOOR PIPING SCHEDULE

A. See pipe and valve schedule on drawings for piping materials schedule.

3.13 ABOVEGROUND MANUAL GAS SHUTOFF VALVE SCHEDULE

A. See pipe and valve schedule on drawings for piping materials schedule.

END OF SECTION 23 11 23

SECTION 23 21 13
HYDRONIC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of the following:
   1. Contractor shall submit piping schedule indicating the ASTM specification number of the pipe being proposed along with its type and grade and sufficient information to indicate the type and rating of fittings for each service.
   2. Type F Steel Pipe: Statement from manufacturer on his letterhead that the pipe furnished meets the ASTM specification contained in this section.
   3. Type E or S Steel Pipe: Mill certification papers, also known as material test reports, for the pipe furnished for this project, in English. Heat numbers on these papers to match the heat numbers stenciled on the pipe. Chemical analysis indicated on the mill certification papers to meet or exceed the requirements of the referenced ASTM specification.
   4. Copper Tube: Statement from manufacturer on his letterhead that the pipe furnished meets the ASTM specification contained in this section.
   5. Chemical treatment.

1.3 QUALITY ASSURANCE

A. Steel Support Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Pipe Welding: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code: Section IX.
   1. Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation.
   2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Promptly inspect shipments to insure that the material is undamaged and complies with specifications.

B. Cover pipe to eliminate rust and corrosion while allowing sufficient ventilation to avoid condensation. Do not store materials directly on grade. Protect pipe, tube, and fitting ends so they are not damaged. Where end caps are provided or specified, take precautions so the caps remain in place. Protect fittings, flanges, and unions by storage inside or by durable, waterproof, above ground packaging.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Hydronic piping components and installation shall be capable of withstanding the following minimum working pressure and temperature unless otherwise indicated:
   1. Hot-Water Heating Piping: 150 psig at 200 deg F.
   2. Condensate-Drain Piping: 150 deg F.
   3. Air-Vent Piping: 200 deg F.

2.2 COPPER TUBE AND FITTINGS

A. Drawn-Temper Copper Tubing: ASTM B 88, Type L.

B. Annealed-Temper Copper Tubing: ASTM B 88, Type K.

C. Wrought-Copper Unions: ASME B16.22.

2.3 STEEL PIPE AND FITTINGS

A. Steel Pipe: ASTM A 53/A 53M, black steel with plain ends; welded and seamless, Grade B, and wall thickness as indicated in "Piping Applications" Article.

B. Cast-Iron Threaded Fittings: ASME B16.4; Classes 125 and 250 as indicated in "Piping Applications" Article.

C. Malleable-Iron Threaded Fittings: ASME B16.3, Classes 150 and 300 as indicated in "Piping Applications" Article.

D. Malleable-Iron Unions: ASME B16.39; Classes 150, 250, and 300 as indicated in "Piping Applications" Article.

E. Cast-Iron Pipe Flanges and Flanged Fittings: ASME B16.1, Classes 25, 125, and 250; raised ground face, and bolt holes spot faced as indicated in "Piping Applications" Article.

F. Wrought-Steel Fittings: ASTM A 234/A 234M, wall thickness to match adjoining pipe.

G. Wrought Cast- and Forged-Steel Flanges and Flanged Fittings: ASME B16.5, including bolts, nuts, and gaskets of the following material group, end connections, and facings:
   1. Material Group: 1.1.
   2. End Connections: Butt welding.
   3. Facings: Raised face.

2.4 JOINING MATERIALS

A. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
   1. ASME B16.21, nonmetallic, flat, asbestos free, 1/8-inch maximum thickness unless otherwise indicated.

a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.

B. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

C. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

D. Welding Filler Metals: Comply with AWS D10.12M/D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

E. Gasket Material: Thickness, material, and type suitable for fluid to be handled and working temperatures and pressures.

2.5 TRANSITION FITTINGS

A. See specification section 230500 “Common Work Results for HVAC.”

2.6 DIELECTRIC FITTINGS

A. See specification section 230500 “Common Work Results for HVAC.”

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

A. See drawing mechanical piping and valve schedule for piping application requirements.

B. Hot-water heating piping, aboveground, NPS 2 and smaller, shall be any of the following:
1. Type L, drawn-temper copper tubing, wrought-copper fittings, and soldered joints.
2. Schedule 40, Grade B, Type 96 steel pipe; Class 125, cast-iron fittings; cast-iron flanges and flange fittings; and threaded joints.

C. Hot-water heating piping, aboveground, NPS 2-1/2 and larger, shall be any of the following:
1. Schedule 40 steel pipe, wrought-steel fittings and wrought-cast or forged-steel flanges and flange fittings, and welded and flanged joints.

D. Condensate-Drain Piping: Type K, annealed-temper copper tubing with soldered or flared joints.

E. Air-Vent Piping:
1. Inlet: Same as service where installed with metal-to-plastic transition fittings for plastic piping systems according to piping manufacturer's written instructions.
2. Outlet: Type K, annealed-temper copper tubing with soldered or flared joints.

F. Safety-Valve-Inlet and -Outlet Piping for Hot-Water Piping: Same materials and joining methods as for piping specified for the service in which safety valve is installed with

metal-to-plastic transition fittings for plastic piping systems according to piping manufacturer's written instructions.

G. Gaskets:
   1. Water and Glycol Systems: Branded, compressed, non-asbestos sheet gaskets. Klingersil C4401, Garlock 3000, JM Clipper 978-C or approved equal.

3.2 PIPING INSTALLATIONS

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

E. Install piping to permit valve servicing.

F. Install piping at indicated slopes. Install piping at a uniform grade of 0.2 percent or 1 inch in 40 feet upward in direction of flow.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Install piping to allow application of insulation.

J. Select system components with pressure rating equal to or greater than system operating pressure.

K. Install groups of pipes parallel to each other, spaced to permit applying insulation and servicing of valves.

L. Install drains, consisting of a tee fitting, NPS 3/4 ball valve, and short NPS 3/4 threaded nipple with cap, at low points in piping system mains and elsewhere as required for system drainage.

M. Reduce pipe sizes using eccentric reducer fitting installed with level side up.

N. Main branches and runouts to terminal equipment may be made at the top, top 45 degree, side, and/or bottom 45 degree of the main provided that there are drain valves suitably located for complete system drainage and manual air vents are located at all top and top 45 degree connections. Bottom connections are not acceptable unless approved by the Engineer.

O. Use top or top 45 degree connection to main for upfeed risers and bottom 45 degree connection to main for downfeed risers. Bottom connections are not acceptable unless approved by the DFD Mechanical Inspector.

P. Use a minimum of two elbows in each pipe line to a piece of terminal equipment to provide flexibility for expansion and contraction of the piping systems. Offset pipe connections at equipment to allow for service, such as removal of the terminal device.

Q. Use eccentric fittings for changes in horizontal pipe sizes with the fittings installed for proper air venting. Concentric fittings may be used for changes in vertical pipe sizes.

R. Install valves according to Section 230523 "General-Duty Valves for HVAC Piping."

S. Install unions in piping, NPS 2 and smaller, adjacent to valves, at final connections of equipment, and elsewhere as indicated.

T. Install flanges in piping, NPS 2-1/2 and larger, at final connections of equipment and elsewhere as indicated.

U. Install shutoff valve immediately upstream of each dielectric fitting.

V. Comply with requirements in Section 230516 "Expansion Fittings and Loops for HVAC Piping" for installation of expansion loops, expansion joints, anchors, and pipe alignment guides.

W. Comply with requirements in Section 230553 "Identification for HVAC Piping and Equipment" for identifying piping.

X. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 230500 “Common Work Results for HVAC."

Y. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 230500 “Common Work Results for HVAC."

Z. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 230500 “Common Work Results for HVAC.”

AA. Do not route piping through transformer vaults or above transformers, panelboards, or switchboards, including the required service space for this equipment, unless the piping is serving this equipment

3.3 DIELECTRIC FITTING INSTALLATION

A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.

3.4 HANGERS AND SUPPORTS

A. Comply with requirements in Section 230529 "Hangers and Supports for HVAC Piping and Equipment" for hanger, support, and anchor devices. Comply with the following requirements for maximum spacing of supports.

B. Comply with requirements in Section 230548 "Vibration Controls for HVAC" for seismic restraints.

C. Install the following pipe attachments:
   1. Adjustable steel clevis hangers for individual horizontal piping less than 20 feet long.
   2. Adjustable roller hangers and spring hangers for individual horizontal piping 20 feet or longer.
   3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet or longer, supported on a trapeze.
   4. Spring hangers to support vertical runs.
   5. Provide copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.

D. Install hangers for steel piping with the following maximum spacing and minimum rod sizes:
   1. NPS 3/4: Maximum span, 7 feet.
   2. NPS 1: Maximum span, 7 feet.
   3. NPS 1-1/2: Maximum span, 9 feet.
   4. NPS 2: Maximum span, 10 feet.
   5. NPS 2-1/2: Maximum span, 11 feet.
   6. NPS 3 and Larger: Maximum span, 12 feet.

E. Install hangers for drawn-temper copper piping with the following maximum spacing and minimum rod sizes:
   1. NPS 3/4: Maximum span, 5 feet; minimum rod size, 1/4 inch.
   2. NPS 1: Maximum span, 6 feet; minimum rod size, 1/4 inch.
   3. NPS 1-1/4Maximum span, 7 feet; minimum rod size, 3/8 inch.
   4. NPS 1-1/2: Maximum span, 8 feet; minimum rod size, 3/8 inch.
   5. NPS 2: Maximum span, 8 feet; minimum rod size, 3/8 inch.
   6. NPS 2-1/2: Maximum span, 9 feet; minimum rod size, 3/8 inch.
   7. NPS 3 and Larger: Maximum span, 10 feet; minimum rod size, 3/8 inch.

F. Support vertical runs at roof, at each floor, and at 10-foot intervals between floors.

3.5 PIPE JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.

D. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
   1. Apply appropriate Teflon tape or thread lubricant compound to external pipe threads unless dry seal threading is specified.
   2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
   3. No hard setting pipe thread cement or caulking will be allowed.

E. Welded Joints: Construct joints according to AWS D10.12M/D10.12, using qualified processes and welding operators according to "Quality Assurance" Article.

F. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

3.6 TERMINAL EQUIPMENT CONNECTIONS

A. Sizes for supply and return piping connections shall be the same as or larger than equipment connections.

B. Install Automatic Temperature-Control Valves in accessible locations close to connected equipment.

C. Install bypass piping with globe valve around Automatic Flow-Control Valve at end of hydronic system main.

D. Install ports for pressure gages and thermometers at coil inlet and outlet connections. Comply with requirements in Section 230519 "Meters and Gages for HVAC Piping."

E. Trap each cooling coil drain pan connection with a trap seal of sufficient depth to prevent conditioned air from moving through the piping. Extend drain piping to nearest code approved drain location. Construct trap with plugged tee for cleanout purposes as detailed.

3.7 FIELD QUALITY CONTROL

A. Prepare hydronic piping according to ASME B31.9 and as follows:
   1. Leave joints, including welds, uninsulated and exposed for examination during test.
   2. Provide temporary restraints for expansion joints that cannot sustain reactions due to test pressure. If temporary restraints are impractical, isolate expansion joints from testing.
   3. Flush hydronic piping systems with clean water; then remove and clean or replace strainer screens.
   4. Isolate equipment from piping. If a valve is used to isolate equipment, its closure shall be capable of sealing against test pressure without damage to valve. Install blinds in flanged joints to isolate equipment.
   5. Install existing safety valve, set at a pressure no more than one-third higher than test pressure, to protect against damage by expanding liquid or other source of overpressure during test.

B. Perform the following tests on hydronic piping:
   1. Use ambient temperature water as a testing medium unless there is risk of damage due to freezing. Another liquid that is safe for workers and compatible with piping may be used.
   2. While filling system, use vents installed at high points of system to release air. Use drains installed at low points for complete draining of test liquid.
   3. Isolate existing expansion tanks and determine that hydronic system is full of water.
   4. Subject piping system to hydrostatic test pressure that is not less than 1.5 times the system's working pressure. Test pressure shall not exceed maximum pressure for any vessel, pump, valve, or other component in system under test. Verify that stress due to pressure at bottom of vertical runs does not exceed 90 percent of specified minimum yield strength or 1.7 times the "SE" value in Appendix A in ASME B31.9, "Building Services Piping."
   5. After hydrostatic test pressure has been applied for at least 10 minutes, examine piping, joints, and connections for leakage. Eliminate leaks by tightening, repairing, or replacing components, and repeat hydrostatic test until there are no leaks.
   6. Prepare written report of testing.

C. Perform the following before operating the system:
   1. Open manual valves fully.
   2. Inspect existing hydronic pumps for proper rotation.
   3. Set existing makeup pressure-reducing valves for required system pressure.
   4. Inspect air vents at high points of system and determine if all are installed and operating freely (automatic type), or bleed air completely (manual type).
   5. Set temperature controls so all coils are calling for full flow.
   6. Inspect and set operating temperatures of hydronic equipment, such as existing boilers, to specified values.
   7. Verify lubrication of motors and bearings.

3.8 CHEMICAL TREATMENT

A. Install chemical treatment piping as indicated on the drawings, as detailed, and as recommended by the supplier of the chemical treatment equipment.

3.9 INITIAL FILL AND VENT

A. Fill hydronic systems with appropriate working fluids as specified. All system fluids shall be chemically treated as specified in Section 23 25 00 – HVAC WATER TREATMENT.

B. For closed piping systems, all air trapped at high points shall be relieved through the manual air vents prior to notifying Project’s Representative that the systems are ready to be tested and balanced.

END OF SECTION 23 21 13

SECTION 23 21 16
HYDRONIC PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of the following:

1. Valves: Include flow and pressure drop curves based on manufacturer's testing for calibrated-orifice balancing valves and automatic flow-control valves.
2. Air-control devices.
3. Hydronic specialties.

1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For air-control devices, hydronic specialties, and special-duty valves to include in emergency, operation, and maintenance manuals.

1.4 QUALITY ASSURANCE

A. Pipe Welding: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code: Section IX.

1. Safety valves and pressure vessels shall bear the appropriate ASME label. Fabricate and stamp air separators and expansion tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Hydronic piping components and installation shall be capable of withstanding the following minimum working pressure and temperature unless otherwise indicated:

1. Hot-Water Heating Piping:150 psig at 200 deg F.
2. Condensate-Drain Piping: 150 deg F.
3. Air-Vent Piping: 200 deg F.

2.2 VALVES

A. Gate, Globe, Check, Ball, and Butterfly Valves: Comply with requirements specified in Section 230523 "General-Duty Valves for HVAC Piping."

B. Automatic Temperature-Control Valves, Actuators, and Sensors: Comply with requirements specified in Section 230900 "Instrumentation and Control for HVAC."

C. Bronze, Calibrated-Orifice, Balancing Valves:

1. Manufacturers: Subject to compliance with requirements, provide the named product or a comparable product by one the following:

    a. Armstrong Pumps, Inc.
    b. Bell & Gossett Domestic Pump.
    c. Flow Design Inc.
    d. Griswold Controls.
    e. Nexus Valve, Inc.
    f. Taco.
    g. Tour & Andersson; available through Victaulic Company.

2. Body: Bronze, ball or plug type with calibrated orifice or venturi.
3. Ball: Brass or stainless steel.
4. Plug: Resin.
5. Seat: PTFE.
6. End Connections: Threaded or socket.
7. Pressure Gage Connections: Integral seals for portable differential pressure meter.
8. Handle Style: Lever, with memory stop to retain set position.
9. CWP Rating: Minimum 125 psig.
10. Maximum Operating Temperature: 250 deg F.

D. Cast-Iron or Steel, Calibrated-Orifice, Balancing Valves:

1. Manufacturers: Subject to compliance with requirements, provide the named product or a comparable product by one the following:

    a. Armstrong Pumps, Inc.
    b. Bell & Gossett Domestic Pump.
    c. Flow Design Inc.
    d. Griswold Controls.
    e. Nexus Valve, Inc.
    f. Taco.
    g. Tour & Andersson.

2. Body: Cast-iron or steel body, ball, plug, or globe pattern with calibrated orifice or venturi.
3. Ball: Brass or stainless steel.
4. Stem Seals: EPDM O-rings.
5. Disc: Glass and carbon-filled PTFE.
6. Seat: PTFE.
7. End Connections: Flanged or grooved.
8. Pressure Gage Connections: Integral seals for portable differential pressure meter.
9. Handle Style: Lever, with memory stop to retain set position.
10. CWP Rating: Minimum 125 psig.

11. Maximum Operating Temperature: 250 deg F.

E. Automatic Flow-Control Valves:

1. Manufacturers: Subject to compliance with requirements, provide the named product or a comparable product by one the following:

   a. Flow Design Inc.
   b. Griswold Controls.
   c. Nexus Valve, Inc.

2. Body: Brass or ferrous metal.
3. Piston and Spring Assembly: Stainless steel, tamper proof, self-cleaning, and removable.
4. Combination Assemblies: Include bronze or brass-alloy ball valve.
5. Identification Tag: Marked with zone identification, valve number, and flow rate.
6. Size: Same as pipe in which installed.
7. Performance: Maintain constant flow, plus or minus 5 percent over system pressure fluctuations.
8. Minimum CWP Rating: 175 psig.
9. Maximum Operating Temperature: 200 deg F.

2.3 AIR-CONTROL DEVICES

A. Manual Air Vents:

1. Manufacturers: Subject to compliance with requirements, provide the named product or a comparable product by one the following:

   a. AMTROL, Inc.
   b. Armstrong Pumps, Inc.
   c. Bell & Gossett Domestic Pump.
   d. Nexus Valve, Inc.
   e. Taco, Inc.

2. Body: Bronze.
3. Internal Parts: Nonferrous.
4. Operator: Screwdriver or thumbscrew.
5. Inlet Connection: NPS 1/2.
6. Discharge Connection: NPS 1/8.
7. CWP Rating: 150 psig.
8. Maximum Operating Temperature: 225 deg F.

2.4 HYDRONIC PIPING SPECIALTIES

A. Y-Pattern Strainers:

1. Body: ASTM A 126, Class B, cast iron with bolted cover and bottom drain connection.
2. End Connections: Threaded ends for NPS 2 and smaller; flanged ends for NPS 2-1/2 and larger.

3. Strainer Screen: Stainless-steel, 20-mesh strainer, or perforated stainless-steel basket.
4. CWP Rating: 125 psig.

B. Expansion Fittings: Comply with requirements in Section 230516 "Expansion Fittings and Loops for HVAC Piping."

PART 3 - EXECUTION

3.1 VALVE APPLICATIONS

A. Install shutoff-duty valves at each branch connection to supply mains and at supply connection to each piece of equipment.

B. Install calibrated-orifice, balancing valves in the return pipe of each heating terminal.

C. Install Automatic Flow-Control Valves at end of the hydronic system in Area A – Fitness Center. Set at minimum flowrate of 5 gpm.

3.2 HYDRONIC SPECIALTIES INSTALLATION

A. Install manual air vents at high points in piping, at heat-transfer coils, and elsewhere as required for system air venting.

END OF SECTION 23 21 16

SECTION 23 23 00
REFRIGERANT PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes refrigerant piping used for air-conditioning applications.

1.3 PERFORMANCE REQUIREMENTS

A. Line Test Pressure for Refrigerant R-410A:

1. Suction Lines for Air-Conditioning Applications: 300 psig.
2. Hot-Gas and Liquid Lines: 535 psig.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of valve and refrigerant piping specialty indicated. Include pressure drop, based on manufacturer's test data, for the following:

1. Thermostatic expansion valves.
2. Solenoid valves.
3. Hot-gas bypass valves.
4. Filter dryers.
5. Strainers.
6. Pressure-regulating valves.
7. Refrigerant piping indicated on Drawings is schematic only. Size piping and design actual piping layout, including oil traps, double risers, specialties, and pipe and tube sizes to accommodate, as a minimum, equipment provided, elevation difference between compressor and evaporator, and length of piping to ensure proper operation and compliance with warranties of connected equipment.

1.5 INFORMATIONAL SUBMITTALS

A. Field quality-control test reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For refrigerant valves and piping specialties to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

B. Comply with ASHRAE 15, "Safety Code for Refrigeration Systems."

C. Comply with ASME B31.5, "Refrigeration Piping and Heat Transfer Components."

1.8 PRODUCT STORAGE AND HANDLING

A. Store piping in a clean and protected area with end caps in place to ensure that piping interior and exterior are clean when installed.

1.9 COORDINATION

A. Coordinate size and location of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 07.

PART 2 - PRODUCTS

2.1 COPPER TUBE AND FITTINGS

A. Copper Tube: ASTM B 88, Type K or L

B. Wrought-Copper Fittings: ASME B16.22.

C. Wrought-Copper Unions: ASME B16.22.

D. Solder Filler Metals: ASTM B 32. Use 95-5 tin antimony or alloy HB solder to join copper socket fittings on copper pipe.

E. Brazing Filler Metals: AWS A5.8.

F. Flexible Connectors:

1. Body: Tin-bronze bellows with woven, flexible, tinned-bronze-wire-reinforced protective jacket.
2. End Connections: Socket ends.
3. Offset Performance: Capable of minimum 3/4-inch misalignment in minimum 7-inch-long assembly.
4. Pressure Rating: Factory test at minimum 500 psig.
5. Maximum Operating Temperature: 250 deg F.

2.2 VALVES AND SPECIALTIES

A. Check Valves:

1. Body: Ductile iron, forged brass, or cast bronze; globe pattern.
2. Bonnet: Bolted ductile iron, forged brass, or cast bronze; or brass hex plug.
3. Piston: Removable polytetrafluoroethylene seat.
4. Closing Spring: Stainless steel.
5. Manual Opening Stem: Seal cap, plated-steel stem, and graphite seal.
6. End Connections: Socket, union, threaded, or flanged.
7. Maximum Opening Pressure: 0.50 psig.
8. Working Pressure Rating: 500 psig.

9. Maximum Operating Temperature: 275 deg F.

B. Service Valves:

1. Body: Forged brass with brass cap including key end to remove core.
2. Core: Removable ball-type check valve with stainless-steel spring.
3. Seat: Polytetrafluoroethylene.
4. End Connections: Copper spring.
5. Working Pressure Rating: 500 psig.

C. Solenoid Valves: Comply with ARI 760 and UL 429; listed and labeled by an NRTL.

1. Body and Bonnet: Plated steel.
2. Solenoid Tube, Plunger, Closing Spring, and Seat Orifice: Stainless steel.
3. Seat: Polytetrafluoroethylene.
4. End Connections: Threaded.
5. Electrical: Molded, watertight coil in NEMA 250 enclosure of type required by location with 1/2-inch conduit adapter.
6. Working Pressure Rating: 400 psig.
7. Maximum Operating Temperature: 240 deg F.
8. Manual operator.

D. Safety Relief Valves: Comply with ASME Boiler and Pressure Vessel Code; listed and labeled by an NRTL.

1. Body and Bonnet: Ductile iron and steel, with neoprene O-ring seal.
2. Piston, Closing Spring, and Seat Insert: Stainless steel.
3. Seat Disc: Polytetrafluoroethylene.
4. End Connections: Threaded.
5. Working Pressure Rating: 400 psig.
6. Maximum Operating Temperature: 240 deg F.

E. Thermostatic Expansion Valves: Comply with ARI 750.

1. Body, Bonnet, and Seal Cap: Forged brass or steel.
2. Diaphragm, Piston, Closing Spring, and Seat Insert: Stainless steel.
3. Packing and Gaskets: Non-asbestos.
4. Capillary and Bulb: Copper tubing filled with refrigerant charge.
5. Reverse-flow option (for heat-pump applications).
6. End Connections: Socket, flare, or threaded union.
7. Working Pressure Rating: 700 psig.

F. Hot-Gas Bypass Valves: Comply with UL 429; listed and labeled by an NRTL.

1. Body, Bonnet, and Seal Cap: Ductile iron or steel.
2. Diaphragm, Piston, Closing Spring, and Seat Insert: Stainless steel.
3. Packing and Gaskets: Non-asbestos.
4. Solenoid Tube, Plunger, Closing Spring, and Seat Orifice: Stainless steel.
5. Seat: Polytetrafluoroethylene.
6. Equalizer: Internal.

7. Electrical: Molded, watertight coil in NEMA 250 enclosure of type required by location with 1/2-inch conduit adapter, and 24-V ac coil.
8. End Connections: Socket.
9. Set Pressure:
10. Throttling Range: Maximum 5 psig.
11. Working Pressure Rating: 500 psig.
12. Maximum Operating Temperature: 240 deg F.

G. Straight-Type Strainers:

1. Body: Welded steel with corrosion-resistant coating.
2. Screen: 100-mesh stainless steel.
3. End Connections: Socket or flare.
4. Working Pressure Rating: 500 psig.
5. Maximum Operating Temperature: 275 deg F.

H. Angle-Type Strainers:

1. Body: Forged brass or cast bronze.
2. Drain Plug: Brass hex plug.
3. Screen: 100-mesh monel.
4. End Connections: Socket or flare.
5. Working Pressure Rating: 500 psig.
6. Maximum Operating Temperature: 275 deg F.

I. Moisture/Liquid Indicators:

1. Body: Forged brass.
2. Window: Replaceable, clear, fused glass window with indicating element protected by filter screen.
3. Indicator: Color coded to show moisture content in ppm.
4. Minimum Moisture Indicator Sensitivity: Indicate moisture above 60 ppm.
5. End Connections: Socket or flare.
6. Working Pressure Rating: 500 psig.
7. Maximum Operating Temperature: 240 deg F.

J. Replaceable-Core Filter Dryers: Comply with ARI 730.

1. Body and Cover: Painted-steel shell with ductile-iron cover, stainless-steel screws, and neoprene gaskets.
2. Filter Media: 10 micron, pleated with integral end rings; stainless-steel support.
3. Desiccant Media: Activated charcoal.
4. Access Ports: NPS 1/4 connections at entering and leaving sides for pressure differential measurement.
5. Maximum Pressure Loss: 2 psig.
6. Working Pressure Rating: 500 psig.
7. Maximum Operating Temperature: 240 deg F.

K. Permanent Filter Dryers: Comply with ARI 730.

1. Body and Cover: Painted-steel shell.

2. Filter Media: 10 micron, pleated with integral end rings; stainless-steel support.
3. Desiccant Media: Activated charcoal.
4. End Connections: Socket.
5. Access Ports: NPS 1/4 connections at entering and leaving sides for pressure differential measurement.
6. Maximum Pressure Loss: 2 psig.
7. Working Pressure Rating: 500 psig.
8. Maximum Operating Temperature: 240 deg F.

2.3 REFRIGERANTS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Atofina Chemicals, Inc.
2. DuPont Company; Fluorochemicals Div.
3. Honeywell, Inc.; Genetron Refrigerants.
4. INEOS Fluor Americas LLC.

B. ASHRAE 34, R-410A: Pentafluoroethane/Difluoromethane.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS FOR REFRIGERANT R-410A

A. Suction Lines NPS 1-1/2 and Smaller for Conventional Air-Conditioning Applications: Copper, Type ACR, annealed-temper tubing and wrought-copper fittings with soldered joints.

B. Suction Lines NPS 2 to NPS 3-1/2 for Conventional Air-Conditioning Applications: Copper, Type L, drawn-temper tubing and wrought-copper fittings with brazed joints.

C. Hot-Gas and Liquid Lines, and Suction Lines for Applications:

1. NPS 5/8 and Smaller: Copper, Type L, annealed- or drawn-temper tubing and wrought-copper fittings with soldered joints.
2. NPS 3/4 to NPS 1 and Smaller: Copper, Type K, annealed- or drawn-temper tubing and wrought-copper fittings with soldered joints.
3. NPS 1-1/4 and Smaller: Copper, Type K, drawn-temper tubing and wrought-copper fittings with 95-5 tin-antimony soldered joints.
4. NPS 1-1/2 to NPS 2: Copper, Type K, drawn-temper tubing and wrought-copper fittings with Alloy HB soldered joints.

D. Safety-Relief-Valve Discharge Piping:

1. NPS 5/8 and Smaller: Copper, Type L, annealed- or drawn-temper tubing and wrought-copper fittings with soldered joints.
2. NPS 3/4 to NPS 1 and Smaller: Copper, Type K, annealed- or drawn-temper tubing and wrought-copper fittings with soldered joints.

3. NPS 1-1/4 and Smaller: Copper, Type K, drawn-temper tubing and wrought-copper fittings with 95-5 tin-antimony soldered joints.
4. NPS 1-1/2 to NPS 2: Copper, Type K, drawn-temper tubing and wrought-copper fittings with Alloy HB soldered joints.

3.2 VALVE AND SPECIALTY APPLICATIONS

A. Install service valves for gage taps at inlet and outlet of hot-gas bypass valves and strainers if they are not an integral part of valves and strainers.

B. Install solenoid valves upstream from each expansion valve and hot-gas bypass valve. Install solenoid valves in horizontal lines with coil at top.

C. Install thermostatic expansion valves as close as possible to distributors on evaporators.

1. Install valve so diaphragm case is warmer than bulb.
2. Secure bulb to clean, straight, horizontal section of suction line using two bulb straps. Do not mount bulb in a trap or at bottom of the line.
3. If external equalizer lines are required, make connection where it will reflect suction-line pressure at bulb location.

D. Install safety relief valves where required by ASME Boiler and Pressure Vessel Code. Pipe safety-relief-valve discharge line to outside according to ASHRAE 15.

E. Install moisture/liquid indicators in liquid line at the inlet of the thermostatic expansion valve or at the inlet of the evaporator coil capillary tube.

F. Install strainers upstream from and adjacent to the following unless they are furnished as an integral assembly for device being protected:

1. Solenoid valves.
2. Thermostatic expansion valves.
3. Hot-gas bypass valves.
4. Compressor.

G. Install filter dryers in liquid line between compressor and thermostatic expansion valve, and in the suction line at the compressor.

H. Install flexible connectors at compressors.

3.3 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems; indicated locations and arrangements. Install piping as indicated unless deviations to layout are approved on Shop Drawings.

B. Install refrigerant piping according to ASHRAE 15.

C. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping adjacent to machines to allow service and maintenance.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Select system components with pressure rating equal to or greater than system operating pressure.

J. Refer to Section 230900 "Instrumentation and Control for HVAC" and Section 230993 "Sequence of Operations for HVAC Controls" for solenoid valve controllers, control wiring, and sequence of operation.

K. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.

L. Arrange piping to allow inspection and service of refrigeration equipment. Install valves and specialties in accessible locations to allow for service and inspection. Install access doors or panels, as specified in Division 8, if valves or equipment requiring maintenance are concealed behind finished surfaces.

M. Install refrigerant piping in rigid or flexible conduit in locations where exposed to mechanical injury.

N. Slope refrigerant piping as follows:

1. Install horizontal hot-gas discharge piping with a uniform slope downward away from compressor.
2. Install horizontal suction lines with a uniform slope downward to compressor.
3. Install traps and double risers to entrain oil in vertical runs.
4. Liquid lines may be installed level.

O. When brazing or soldering, remove solenoid-valve coils and sight glasses; also remove valve stems, seats, and packing, and accessible internal parts of refrigerant specialties. Do not apply heat near expansion-valve bulb.

P. Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation installation.

Q. Identify refrigerant piping and valves according to Section 230553 "Identification for HVAC Piping and Equipment."

R. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 230500 “Common Work Results for HVAC."

S. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 230500 “Common Work Results for HVAC."

T. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 230500 “Common Work Results for HVAC."

3.4 PIPE JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Soldered Joints: Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook."

D. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."

1. Use Type BcuP, copper-phosphorus alloy for joining copper socket fittings with copper pipe.
2. Use Type BAg, cadmium-free silver alloy for joining copper with bronze or steel.

3.5 HANGERS AND SUPPORTS

A. Hanger, support, and anchor products are specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."

B. Install the following pipe attachments:

1. Adjustable steel clevis hangers for individual horizontal runs less than 20 feet long.
2. Roller hangers and spring hangers for individual horizontal runs 20 feet or longer.
3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet or longer, supported on a trapeze.
4. Spring hangers to support vertical runs.
5. Copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.

C. Install hangers for copper tubing with the following maximum spacing and minimum rod sizes:

1. NPS 1/2: Maximum span, 60 inches; minimum rod size, 1/4 inch.
2. NPS 5/8: Maximum span, 60 inches; minimum rod size, 1/4 inch.
3. NPS 1: Maximum span, 72 inches; minimum rod size, 1/4 inch.

4. NPS 1-1/4: Maximum span, 96 inches; minimum rod size, 3/8 inch.
5. NPS 1-1/2: Maximum span, 96 inches; minimum rod size, 3/8 inch.
6. NPS 2: Maximum span, 96 inches; minimum rod size, 3/8 inch.

D. Support multifloor vertical runs at least at each floor.

3.6 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

B. Tests and Inspections:

1. Comply with ASME B31.5, Chapter VI.
2. Test refrigerant piping, specialties, and receivers. Isolate compressor, condenser, evaporator, and safety devices from test pressure if they are not rated above the test pressure.
3. Test high- and low-pressure side piping of each system separately at not less than the pressures indicated in Part 1 "Performance Requirements" Article.

    a. Fill system with nitrogen to the required test pressure.
    b. System shall maintain test pressure at the manifold gage throughout duration of test.
    c. Test joints and fittings with electronic leak detector or by brushing a small amount of soap and glycerin solution over joints.
    d. Remake leaking joints using new materials, and retest until satisfactory results are achieved.

3.7 SYSTEM CHARGING

A. Charge system using the following procedures:

1. Install core in filter dryers after leak test but before evacuation.
2. Evacuate entire refrigerant system with a vacuum pump to 500 micrometers. If vacuum holds for 12 hours, system is ready for charging.
3. Break vacuum with refrigerant gas, allowing pressure to build up to 2 psig.
4. Charge system with a new filter-dryer core in charging line.

3.8 ADJUSTING

A. Adjust thermostatic expansion valve to obtain proper evaporator superheat.

B. Adjust high- and low-pressure switch settings to avoid short cycling in response to fluctuating suction pressure.

C. Adjust set-point temperature of air-conditioning controllers to the system design temperature.

D. Perform the following adjustments before operating the refrigeration system, according to manufacturer's written instructions:

1. Verify that compressor oil level is correct.

2. Open compressor suction and discharge valves.
3. Open refrigerant valves except bypass valves that are used for other purposes.
4. Check open compressor-motor alignment and verify lubrication for motors and bearings.

E. Replace core of replaceable filter dryer after system has been adjusted and after design flow rates and pressures are established.

END OF SECTION 23 23 00

SECTION 23 25 13
WATER TREATMENT FOR CLOSED-LOOP HYDRONIC SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 DEFINITIONS

A. TSS: Total suspended solids are solid materials, including organic and inorganic, that are suspended in the water. These solids may include silt, plankton, and industrial wastes.

1.3 ACTION SUBMITTALS

A. Product Data: Include rated capacities, operating characteristics, and furnished specialties and accessories for the following products:
   1. Chemical material safety data sheets.

B. Shop Drawings: Pretreatment and chemical treatment equipment and piping connections to hydronic systems.

1.4 INFORMATIONAL SUBMITTALS

A. Water Analysis Provider Qualifications: Verification of experience and capability of HVAC water-treatment service provider.

B. Verification of existing bypass feeders and chemical test equipment in High School's mechanical rooms served hot-water heating system.

C. Verification of WI registration of backflow preventers for closed-loop makeup water, if required.

D. Field quality-control reports.

E. Other Informational Submittals:

   1. Water-Treatment Program: Written sequence of operation on an annual basis for the application equipment required to achieve water quality defined in "Performance Requirements" Article.
   2. Water Analysis: Illustrate water quality available at Project site.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For sensors, injection pumps, and controllers to include in emergency, operation, and maintenance manuals.

1.6 QUALITY ASSURANCE

A. HVAC Water-Treatment Service Provider Qualifications: A minimum five years experienced HVAC water-treatment service provider capable of analyzing water qualities, installing water-treatment equipment, and applying water treatment as specified in this Section.

A. This documentation shall become a part of the Operation and Maintenance Manual and shall include the cleaning procedure for each system, personnel involved, results of chemical analyses, and volume for closed loop systems.
   1. System cleaning includes piping and equipment.

B. Scope of Maintenance Service: Provide chemicals and service program to maintain water conditions required above to inhibit corrosion and scale formation for hydronic piping and equipment. Services and chemicals shall be provided for a period of one year from date of Substantial Completion and shall include the following:

   1. Initial glycol and water analysis and HVAC water-treatment recommendations.
   2. Startup assistance for Contractor to flush the systems, clean with detergents, and initially fill systems with required chemical treatment prior to operation.
   3. Periodic field service and consultation.
   4. Customer report charts and log sheets.
   5. Laboratory technical analysis.
   6. Analyses and reports of all chemical items concerning safety and compliance with government regulations.

1.7 MAINTENANCE SERVICE

A. Scope of Maintenance Service: Provide chemicals and service program to maintain water conditions required above to inhibit corrosion and scale formation for hydronic piping and equipment. Services and chemicals shall be provided for a period of one year from date of Substantial Completion and shall include the following:
   1. Initial water analysis and HVAC water-treatment recommendations.
   2. Startup assistance for Contractor to flush the systems, clean with detergents, and initially fill systems with required chemical treatment prior to operation.
   3. Periodic field service and consultation.
   4. Customer report charts and log sheets.
   5. Laboratory technical analysis.
   6. Analyses and reports of all chemical items concerning safety and compliance with government regulations.

B. Closed loop systems:

   1. The contractor shall perform start up and cleaning water treatment for High School.
   2. All chemicals shall be provided by the Water Treatment Contractor for the duration of the warranty period.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide the following as School District's preferred vendor:
   1. WATERTECH of America, Inc.
      Shane Forrest
      Phone: (715)-490-5999
      Email: shane@watertechusa.com

2.2 PERFORMANCE REQUIREMENTS

A. Water quality for hydronic systems shall minimize corrosion, scale buildup, and biological growth for optimum efficiency of hydronic equipment without creating a hazard to operating personnel or the environment.

B. Base HVAC water treatment on quality of water available at Project site, hydronic system equipment material characteristics and functional performance characteristics, operating personnel capabilities, and requirements and guidelines of authorities having jurisdiction.

C. Closed hydronic systems, including hot-water heating, shall have the following water qualities:
   1. pH: Maintain a value within 9.0 to 10.5.
   2. "P" Alkalinity: Maintain a value within 100 to 500 ppm.
   3. Boron: Maintain a value within 100 to 200 ppm.
   4. Chemical Oxygen Demand: Maintain a maximum value of 100 ppm.
   5. Soluble Copper: Maintain a maximum value of 0.20 ppm.
   6. TSS: Maintain a maximum value of 10 ppm.
   7. Ammonia: Maintain a maximum value of 20 ppm.
   8. Free Caustic Alkalinity: Maintain a maximum value of 20 ppm.
   9. Microbiological Limits:
      a. Total Aerobic Plate Count: Maintain a maximum value of 1000 organisms/mL.
      b. Total Anaerobic Plate Count: Maintain a maximum value of 100 organisms/mL.
      c. Nitrate Reducers: Maintain a maximum value of 100 organisms/mL.
      d. Sulfate Reducers: Maintain a maximum value of zero organisms/mL.
      e. Iron Bacteria: Maintain a maximum value of zero organisms/mL.

D. SYSTEM CLEANER
   1. Blend of organic alkaline penetrants, emulsifiers, surfactants and corrosion inhibitors that remove grease and petroleum products from the interior of piping systems. Cleaners that contain trisodium phosphate are specifically not acceptable.

E. SYSTEM INHIBITOR
   1. Scale and corrosion inhibitor consisting of boron nitrite, benzol thiazol, benzotriazole, mercapto-benzo-thiazole, and tolyltrizole silicates.

F. CLOSED WATER SYSTEM TREATMENT

1. Sequestering agent to reduce deposits and adjust pH: polyphosphate.
2. Corrosion inhibitors: boron-nitrite, sodium nitrite and borax, sodium totyltriazole, low molecular weight polymers, phosphonates, sodium molybdate, or sulphites.

    a. Conductivity enhancers: phosphates or phosphonates

2.3 MANUAL CHEMICAL-FEED EQUIPMENT

A. Use existing bypass feeders: Steel, with corrosion-resistant exterior coating, minimum 3-1/2-inch fill opening in the top, and existing NPS 3/4 bottom inlet and top side outlet. Quarter turn or threaded fill cap with gasket seal and diaphragm to lock the top on the feeder when exposed to system pressure in the vessel.
   1. Capacity: 2 gal.
   2. Minimum Working Pressure: 125 psig.

2.4 CHEMICALS

A. Chemicals shall be as recommended by water-treatment system manufacturer that are compatible with piping system components and connected equipment and that can attain water quality specified in "Performance Requirements" Article.

2.5 GLYCOL WATER TREATMENT

A. Basis-of-Design Product: The existing hydronics system has EGH 35% using Wausau Chemical. The design is based on the following:
   1. Wausau Chemical Corp: Ethelyne 35%

B. Subject to compliance with requirements, provide the named product or a comparable product by one the following assuming hydronic system is completely replaced with another manufacturer's EGH:

1.	Dow Chemical	: DowTherm SR-1
2.	Dupont	: TELAR
3.	Nalco	: Freeze-Shield 2812
4.	Union Carbide	: Ucartherm

C. Mix treated ethylene glycol with distilled water in ratio of 35% glycol by volume. The water shall meet manufacturer's requirements. ***Non-potable water shall not be used.***

D. Glycol shall include corrosion inhibitors and stability compounds. The glycol shall be pH between 6.0 and 8.5.

PART 3 - EXECUTION

3.1 WATER ANALYSIS

A. Perform an analysis of glycol supply water to determine quality of water available at Project site.

3.2 EXISTING BACKFLOW PREVENTERS

A. Verify the existing backflow preventers for existing makeup-water connections to closed water systems are registered and tested per WI DSPS Regulatory Agency. The cross connection control assembly registration and test reporting by device tester using DSPS form SBD-9927. Coordinate with Owner.

3.3 CLEANING SEQUENCE

A. General:

1. Systems are to be cleaned before they are used for any purpose except conduct pressure test before cleaning. Add cleaner to closed systems at concentrations as recommended by the manufacturer. Remove water filter elements from the system before starting circulation.
2. Use neutralizer agents on recommendation of the system cleaner supplier and approval of the Architect/Engineer.
3. Remove, clean, and replace strainer screens.
4. Inspect, remove sludge, and flush low points with clean water after cleaning process is completed. Include disassembly of components as required.
5. Provide documentation form showing the existing system cleaning, flushing, and proper startup.

B. Hot Water Heating Systems:

1. Add cleaner to the system water until the M alkalinity value is 250 above that of the initial fill water. Verify the M alkalinity level before and after the addition of the cleaner by means of chemical tests that are observed by the Owner's construction representative; include results of all tests in the Operating and Maintenance manuals.
2. Apply heat while circulating, slowly raising temperature to 160°F and maintain for 12 hours minimum; vent all high points to assure 100% system circulation. Remove heat and circulate to 100°F or less; drain system as quickly as possible and refill with clean water.
3. Circulate for 6 hours at design temperature, vent air at all high points, then drain. Refill with clean water and repeat until the system cleaner is removed and the M alkalinity level returns to normal. Remove and clean all strainers. Re-vent the system and install clean filter elements in water filters. Treat with scale and corrosion inhibitors before using the system for building heating or cooling.

3.4 INSTALLATION

A. Install chemical application equipment on concrete bases, level and plumb. Maintain manufacturer's recommended clearances. Arrange units so controls and devices that require servicing are accessible. Anchor chemical tanks and floor-mounting accessories to substrate.

B. Install water testing equipment on wall near water chemical application equipment.

C. Install interconnecting control wiring for chemical treatment controls and sensors.

3.5 CONNECTIONS

A. Where installing piping adjacent to equipment, allow space for service and maintenance.

B. Make piping connections between HVAC water-treatment equipment and dissimilar-metal piping with dielectric fittings. Comply with requirements in Section "Hydronic Piping Specialties."

C. Install shutoff valves on HVAC water-treatment equipment inlet and outlet. Metal general-duty valves are specified in Section 230523 "General-Duty Valves for HVAC Piping."

D. Confirm applicable electrical requirements in Division 26.

E. Ground equipment according to Division 26.

F. Connect wiring according to Division 26.

3.6 FIELD QUALITY CONTROL

A. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
   1. Inspect field-assembled components and equipment installation, including piping and electrical connections.
   2. Inspect piping and equipment to determine that systems and equipment have been cleaned, flushed, and filled with water, and are fully operational before introducing chemicals for water-treatment system.
   3. Place HVAC water-treatment system into operation and calibrate controls during the preliminary phase of hydronic systems' startup procedures.
   4. Do not enclose, cover, or put piping into operation until it is tested and satisfactory test results are achieved.
   5. Test for leaks and defects. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
   6. Leave uncovered and unconcealed new, altered, extended, and replaced water piping until it has been tested and approved. Expose work that has been covered or concealed before it has been tested and approved.
   7. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow test pressure to stand for four hours. Leaks and loss in test pressure constitute defects.
   8. Repair leaks and defects with new materials and retest piping until no leaks exist.

B. Equipment will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

D. At four-week intervals following Substantial Completion, perform separate water analyses on hydronic systems to show that automatic chemical-feed systems are maintaining water quality within performance requirements specified in this Section. Submit written reports of water analysis advising Owner of changes necessary to adhere to "Performance Requirements" Article.

E. Comply with ASTM D 3370 and with the following standards:
   1. Silica: ASTM D 859.
   2. Acidity and Alkalinity: ASTM D 1067.
   3. Iron: ASTM D 1068.
   4. Water Hardness: ASTM D 1126.

3.7 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain HVAC water-treatment systems and equipment.

B. Provide site inspection of equipment during scheduled shutdown to evaluate success of the treatment program. Make recommendations in writing based on these inspections.

END OF SECTION 23 25 13

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SECTION 23 31 13
METAL DUCTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMAR'Y

A. Section Includes:

1. Shop-fabricated, field-assembled, single wall casings for HVAC equipment.
2. Single-wall rectangular ducts and fittings.
3. Double-wall rectangular ducts and fittings.
4. Single-wall round ducts and fittings.
5. Sheet metal materials.
6. Duct liner.
7. Sealants and gaskets.
8. Hangers and supports.

1.3 PERFORMANCE REQUIREMENTS

A. Delegated Duct Design: Duct construction, including sheet metal thicknesses, seam and joint construction, reinforcements, and hangers and supports, shall comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and performance requirements and design criteria indicated in "Duct Schedule" Article.

B. Structural Performance: Duct hangers and supports shall withstand the effects of gravity loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible".

C. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

D. Indicated duct sizes are inside clear dimensions.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of the following products:

1. Factory-fabricated metal ducts.
2. Liners and adhesives.
3. Sealants and gaskets

B. Product Data: For each type of the following products:

1. Leakage Test Report for Documentation of work performed for compliance with ASHRAE/IESNA 90.1, Section 6.4.4.2.2 - "Duct Leakage Tests."

2. Duct-Cleaning Test Report for Documentation of work performed for compliance with ASHRAE 62.1, Section 7.2.4 - "Ventilation System Start-up."
3. Product Data for adhesives and sealants, documentation including printed statement of VOC content.
4. Laboratory Test Reports for adhesives and sealants, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Shop Drawings: For HVAC metal ducts. Include plans, elevations, sections, components, and attachments to other work.

1. Detail HVAC casing assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Sheet metal thickness(es).
3. Reinforcement and spacing.
4. Seam and joint construction.

1.5 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Product Certificates: For acoustically critical casings, from manufacturer.

1. Show sound-absorption coefficients in each octave band lower than those scheduled when tested according to ASTM C 423.
2. Show airborne sound transmission losses lower than those scheduled when tested according to ASTM E 90.

1.6 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports.
2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum," for aluminum supports.
3. AWS D9.1M/D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.

B. Construct all ductwork to be free from vibration, chatter, objectionable pulsations and leakage under specified operating conditions. Objectionable conditions shall be corrected to the satisfaction of the Owner, at no cost to the Contract.

PART 2 - PRODUCTS

2.1 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.

B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-1, "Rectangular Duct/Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

E. Duct Joints for Stainless Steel Ducts:

1. All sizes: Welded longitudinal seam joint construction.

F. Leakage Class: All rectangular ductwork shall be SMACNA Leakage Class 6.

G. Seams: All longitudinal seams shall be “Pittsburgh” style. Snap-lock seams are not allowed.

H. Crossbreak or bead rectangular ductwork. Crossbreaks shall be “out” on positive pressure duct and “in” on negative pressure ducts.

2.2 DOUBLE-WALL RECTANGULAR DUCTS AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. McGill AirFlow LLC.
2. Sheet Metal Connectors, Inc.

B. Rectangular Ducts: Fabricate ducts with indicated dimensions for the inner duct.

C. Outer Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.

D. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-1, "Rectangular Duct/Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

E. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

F. Interstitial Insulation: Fibrous-glass liner complying with ASTM C 1071, NFPA 90A, or NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard."

1. Maximum Thermal Conductivity: 0.27 Btu x in./h x sq. ft. x deg F conductivity at 75 deg F mean temperature.
2. Install spacers that position the inner duct at uniform distance from outer duct without compressing insulation.
3. Coat insulation with antimicrobial coating.
4. Cover insulation with polyester film complying with UL 181, Class 1.

G. Inner Duct: Minimum 0.028-inch perforated galvanized sheet steel having 3/32-inch-diameter perforations, with overall open area of 23 percent sheet steel.

H. Formed-on Transverse Joints (Flanges): Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-1, "Rectangular Duct/Traverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

I. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.3 SINGLE-WALL ROUND DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Lindab Inc.
    b. McGill AirFlow LLC.
    c. SEMCO Incorporated.
    d. Sheet Metal Connectors, Inc.
    e. Spiral Manufacturing Co., Inc.

B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Round Duct Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

1. Transverse Joints in Ducts Larger Than 60 Inches in Diameter: Flanged.

C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Round Duct Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

1. Fabricate with machine-formed, round spiral lock seam duct. Longitudinal or snap lock seams are not allowed.
2. Button punch snap lock (figure 1-5, type L-2) and internal standing seam joints (figure 1-6) are not allowed.
3. Fabricate round ducts larger than 90 inches in diameter with butt-welded longitudinal seams.

D. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

E. Duct Joints for Stainless Steel Ducts:

1. All sizes: Continuously welded longitudinal seams and joints construction.

F. Leakage Class: All round ductwork shall be SMACNA Leakage Class 3

2.4 SHEET METAL MATERIALS

A. See drawing schedule for sheet metal material requirements.

B. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

C. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.

1. Galvanized Coating Designation: G90.
2. Finishes for Surfaces Exposed to View: Mill phosphatized.

D. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304, as indicated in the "Duct Schedule" Article; cold rolled, annealed, sheet. Exposed surface finish shall be No. 2B, No. 2D, No. 3, or No. 4 as indicated in the "Duct Schedule" Article.

E. Aluminum Sheets: Comply with ASTM B 209 Alloy 3003, H14 temper; with mill finish for concealed ducts, and standard, one-side bright finish for duct surfaces exposed to view.

F. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

1. Where black and galvanized steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.

G. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

H. Provide paint grip type ductwork where ductwork is exposed and indicated to be painted.

I. Double-Tee Pan Ductwork: Where indicated on drawings, enclose the space between two double-tee stems with minimum 20 gauge, No. 4 finish. 1" thick insulated, galvanized, sandwich steel panels. Every 5'-0" on center, there shall be a 1½" x 20 gauge standing seam joint.

1. See double-tee stem enclosure detail on drawings.
2. Insulation shall be polyisocyanurate or polystyrene.

2.5 EXHAUST DUCT (Moisture laden air)

A. Moisture laden ductwork systems include Showers

B. Exhaust ducts conveying moisture laden air, other than dishwasher exhaust, to be constructed of sheet aluminum in accordance with SMACNA standards.

C. Seal all joints and seams watertight

2.6 RESIDENTIAL STOVE HOOD EXHAUST

A. Safety and Professional Services SPS 364/IMC 506.3.4 requires that duct systems serving Type 1 residential grade grease hood appliances be sized to provide a duct air velocity of not less than 500 fpm. Size ductwork accordingly.

B. In concealed locations use minimum 18 gauge stainless steel with all joints welded liquid tight or prefabricated grease duct, Underwriters Laboratory, Inc listed with aluminized steel shell

C. Factory prefabricated duct may still require a 2-hr fire rated enclosure or fire stop insulation where concealed and serving a Type I hood (grease vapors or smoke).

D. In exposed areas, use 18 gauge or heavier stainless steel with a number 3 finish and with all joints welded liquid tight or prefabricated Underwriters Laboratory, Inc listed duct with stainless steel shell. Grind and polish all welded joints and seams to a number 3 finish.

E. Provide expanded take-offs for branch duct connections or 45 degree entry fittings. Square edge 90 degree take-off fittings or straight taps will not be accepted.

F. Use elbows and tees with a center line radius to width or diameter ratio of 1.5 wherever space permits shall be used wherever possible. Shorter radius elbows may be used in areas with limited space with prior approval of the Architect/Engineer.

G. No turning vanes may be used in residential stove hood's exhaust duct.

H. Supporting steel and hangers shall not be lighter than the duct gauge.

2.7 DRYER VENT DUCTWORK

A. United Sheet Metal and round helically wound lock seam zinc coated steel conduit.

B. All fittings shall be 20 gauge zinc coated steel.

C. Ninety (90) deg. elbows shall have a minimum of 5 sections.

D. Final connection to dryer shall meet UL listing and have a maximum length 6’-0”.

2.8 FUME HOOD EXHAUST DUCTWORK

A. Use PVC coated steel or stainless steel duct and fittings. Use stainless steel for all exposed installations below suspended ceilings.

B. Use 304 stainless steel for flanged gasketed connections.

C. Use 18 gauge or heavier 304 stainless steel sheet for externally welded ductwork. Grind and polish joints and seams to a #3 finish minimum.

D. Seal all ductwork air tight in accordance with SMACNA seal class A requirements.

2.9 DUST COLLECTOR SYSTEM DUCTWORK

A. Duct system classes not indicated on the drawings to be as follows:

1. Dust Collection Exhaust 3 System class

B. Construction of ducts as follows: Up to 5” dia., 22 gauge galvanized iron; 6” to 8” dia., 20 gauge galvanized iron; 9” and larger dia., 18 gauge galvanized iron.

C. Elbows to be constructed 2 gauges heavier than connecting ducts.

D. Elbows in bends shall be not less than 5 section mitered elbows designed with a mean radius of not less than 1-1/2 times the diameter of the connecting ducts.

E. Seal all duct joints in accordance with SMACNA seal Class A requirements utilizing

F. Hardcast, Inc., Iron Grip 601 water based UL classified vinyl acrylic duct sealant or

G. Lindab Spirosafe self-sealing system. Clean all surfaces of dirt, oil and grease before application.

H. Contractor shall provide welded seams fittings to prevent leaks

2.10 DUCT LINER

A. Fibrous-Glass Duct Liner: Comply with ASTM C 1071, NFPA 90A, or NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard."

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. CertainTeed Corporation; Insulation Group.
    b. Johns Manville.
    c. Knauf Insulation.
    d. Owens Corning.
    e. Maximum Thermal Conductivity:

        1) Type I, Flexible: 0.27 Btu x in./h x sq. ft. x deg Fat 75 deg F mean temperature.
        2) Type II, Rigid: 0.23 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature.

2. Antimicrobial Erosion-Resistant Coating: Apply to the surface of the liner that will form the interior surface of the duct to act as a moisture repellent and erosion-resistant coating. Antimicrobial compound shall be tested for efficacy by an NRTL and registered by the EPA for use in HVAC systems.
3. Water-Based Liner Adhesive: Comply with NFPA 90A or NFPA 90B and with ASTM C 916.

    a. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
    b. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

B. Insulation Pins and Washers:

1. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch galvanized carbon-steel washer.
2. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick galvanized steel; with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.

C. Shop Application of Duct Liner: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 7-11, "Flexible Duct Liner Installation."

1. Adhere a single layer of indicated thickness of duct liner with at least 90 percent adhesive coverage at liner contact surface area. Attaining indicated thickness with multiple layers of duct liner is prohibited.
2. Apply adhesive to transverse edges of liner facing upstream that do not receive metal nosing.
3. Butt transverse joints without gaps, and coat joint with adhesive.
4. Fold and compress liner in corners of rectangular ducts or cut and fit to ensure butted-edge overlapping.

5. Do not apply liner in rectangular ducts with longitudinal joints, except at corners of ducts, unless duct size and dimensions of standard liner make longitudinal joints necessary.
6. Secure liner with mechanical fasteners 4 inches from corners and at intervals not exceeding 12 inches transversely; at 3 inches from transverse joints and at intervals not exceeding 18 inches longitudinally.
7. Secure transversely oriented liner edges facing the airstream with metal nosings that have either channel or "Z" profiles or are integrally formed from duct wall. Fabricate edge facings at the following locations:

    a. Fan discharges.
    b. Intervals of lined duct preceding unlined duct.

8. Secure insulation between perforated sheet metal inner duct of same thickness as specified for outer shell. Use mechanical fasteners that maintain inner duct at uniform distance from outer shell without compressing insulation.

    a. Sheet Metal Inner Duct Perforations: 3/32-inch diameter, with an overall open area of 23 percent.

9. Terminate inner ducts with buildouts attached to fire-damper sleeves, dampers, turning vane assemblies, or other devices. Fabricated buildouts (metal hat sections) or other buildout means are optional; when used, secure buildouts to duct walls with bolts, screws, rivets, or welds.

2.11 SEALANT AND GASKETS

A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.

B. Water-Based Joint and Seam Sealant:

1. Application Method: Brush on.
2. Solids Content: Minimum 65 percent.
3. Shore A Hardness: Minimum 20.
4. Water resistant.
5. Mold and mildew resistant.
6. VOC: Maximum 75 g/L (less water).
7. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
8. Service: Indoor or outdoor.
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

C. Flanged Joint Sealant: Comply with ASTM C 920.

1. General: Single-component, acid-curing, silicone, elastomeric.
2. Type: S.
3. Grade: NS.
4. Class: 25.
5. Use: O.

6. For indoor applications, sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
7. Sealant shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

D. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

E. Round Duct Joint O-Ring Seals:

1. Seal shall provide maximum leakage class of 3 cfm/100 sq. ft. at 1-inch wg and shall be rated for 10-inch wg static-pressure class, positive or negative.
2. EPDM O-ring to seal in concave bead in coupling or fitting spigot.
3. Double-lipped, EPDM O-ring seal, mechanically fastened to factory-fabricated couplings and fitting spigots.

2.12 HANGERS AND SUPPORTS

A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.

B. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.

C. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct."

D. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.

E. Steel Cables for Stainless-Steel Ducts: Stainless steel complying with ASTM A 492.

F. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.

G. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

H. Trapeze and Riser Supports:

1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
2. Supports for Stainless-Steel Ducts: Stainless-steel shapes and plates.
3. Supports for Aluminum Ducts: Aluminum.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.

B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.

C. Install round ducts in maximum practical lengths.

D. Install ducts with fewest possible joints.

E. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.

F. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.

G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

H. Install ducts with a clearance of 4 inch, plus allowance for insulation thickness.

I. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.

J. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.

K. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers. Comply with requirements in Section 233300 "Air Duct Accessories" for fire and smoke dampers.

L. Protect duct interiors from moisture, construction debris and dust, and other foreign materials. Comply with SMACNA's "IAQ Guidelines for Occupied Buildings Under Construction," Appendix G, "Duct Cleanliness for New Construction Guidelines."

M. Ductwork sleeves in exposed areas shall be formed with galvanized steel.

N. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

O. At ends of ducts not connected to equipment or air distribution devices at time of ductwork installation, provide temporary closure of polyethylene film or other covering until time connections to be completed.

P. Sizing Variation: Round ducts may be installed in place of rectangular ducts and rectangular ducts may be installed in place of round ducts using equivalency tables from

ASHRAE or SMACNA. No variation of duct configuration or sizes permitted except by written permission from Architect/Engineer.

Q. Drain Pockets:

1. Provide form drain pocket in outdoor air or any duct carrying high-moisture air.
2. Connect to drainage system.

R. Provide expanded take-offs for branch duct connections or 45 degree entry fittings. Square edge 90 degree take-off fittings or straight taps will not be accepted

S. Size Change:

1. Increase and decrease duct sizes gradually, not exceeding 20 degrees divergence and 30 degrees convergence from connecting upstream duct surface, unless otherwise noted on drawings.
2. Maximum divergence upstream of equipment to be 20 degrees and maximum convergence downstream to be 30 degrees.

T. Where ducts pass through interior partitions and exterior walls and are exposed to view, conceal spaces between construction openings and ducts or duct insulation with sheet metal flanges of same metal thickness as ducts. Overlap openings on 4 sides by at least 1-1/2 inches.

1. Where ductwork passes through walls, floors, or ceilings of finished process rooms, provide stainless steel flange around penetration.

U. Install duct to pitch as indicated on the drawings.

V. Install all automatic dampers furnished by the Temperature Control Contractor or Subcontractor. This Contractor shall score the end of the damper rod. Scoring to be parallel with the damper blade.

W. All ductwork run above the roof shall have all duct joints soldered watertight or sealed watertight in accordance with SMACNA seal Class A requirements utilizing Hardcast, Inc. Iron Grip 601 water based UL classified vinyl acrylic duct sealant or Lindab Spirosafe self-sealing system. Clean all surfaces of dirt, oil and grease before application.

X. All ductwork run above the roof shall be set on prefab equipment support curbs as manufactured by Pate, Thy, Dura-Blok or Vent Products. Curbs shall be sized for ductwork being mounted, complete with minimum 18 gauge galvanized steel construction with integral base plate, continuous welded corner seams, factory installed wood nailer, counter flashing with lag screws as required. See Architectural plans or visit the site for roof deck type and insulation thickness. Equipment support curbs shall be furnished and installed by the Mechanical Contractor.

3.2 INSTALLATION OF EXPOSED DUCTWORK

A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.

B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.

C. Grind welds to provide smooth surface free of burrs, sharp edges, and weld splatter. When welding stainless steel with a No. 3 or 4 finish, grind the welds flush, polish the exposed welds, and treat the welds to remove discoloration caused by welding.

D. Maintain consistency, symmetry, and uniformity in the arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.

E. Repair or replace damaged sections and finished work that does not comply with these requirements.

3.3 RESIDENTIAL STOVE HOOD EXHAUST

A. Install residential stove range hood exhaust ducts without dips and traps that may hold grease and sloped a minimum of 2 percent or 1-inch per foot to drain grease back to the hood.

B. Where welded joints are used with black steel duct, coat all external welded joints and seams with paint. Grind and polish to #3 finish all exposed stainless steel joints and seams.

C. Apply bracing and reinforcement to the outside of the duct to prevent breathing, rattling, vibration or sagging of duct.

D. Install without forming dips, sag or traps which might collect residue by supporting at not greater than 5 foot intervals; fasteners at hangers shall not penetrate the duct. Do not use sheet metal screws on supports; use bolted, riveted or welded connections. Where ductwork is listed, install in accordance with listing.

E. Install fire-rated access panel assemblies at each change in direction. Construct grease tight access doors of the same material and thickness as the duct and as large as possible, up to 24 inches in any dimension. Locate on duct sides for ease of inspection and cleaning at each change in direction, not less than every 10 lineal feet of duct, including risers, and not less than 1-1/2 inches from the bottom of the duct.

F. Insulation or fire protection enclosure shall be removable at each access door and clean out.

G. Do not penetrate fire-rated assemblies except as allowed by applicable building codes and authorities having jurisdiction.

3.4 DRYER VENT DUCTWORK

A. Connection of flexible duct to dryer appliance and vertical rigid ductwork shall be made with Strap-tite duct clamps.

B. Install cleanout access at each vertical riser and any additional cleanouts as may be required by local, state or national codes and regulations.

C. Install permanent signage or label indicating the dryer manufacturer’s maximum equivalent length requirements as required by mechanical code.

D. Furnish and install a roof vent cap with integral backdraft damper at each vent termination.

3.5 FUME HOOD EXHAUST DUCTWORK

A. For round duct less than 36-inch diameter, use slip coupling connection sealed with PCD sealant.

B. Apply duct sealer on male end connectors before insertion, and afterwards to cover the entire joint.

C. Use 316 stainless steel fasteners to provide mechanical strength at all couplings; galvanized mechanical fasteners will not be accepted. Maximum screw spacing shall be 12 inches o. c. with a minimum of 3 equally spaced screws per joint

D. Do not locate screws, rivets, or bolts on the bottom of the duct.

E. Repair any damage to the PVC coating with a PVC aerosol spray or similar PVC product as soon as installation of the piece with a damaged coating is completed.

3.6 DUST COLLECTOR DUCTWORK

A. Install blast gate on all branch duct connections to shop equipment.

B. Blast gates to be welded or riveted in place after final connection to equipment. Refer to Section 233300 "Air Duct Accessories"

C. Dust collector floor sweeps shall be constructed as detailed on plans.

D. Provide access doors and clean-out doors where specified and indicated on the drawings and necessary for routine maintenance and replacement of parts or inspection of items concealed in the ductwork.

E. Construct access and cleanout doors of the same material and thickness as the duct. Size as large as possible, up to 0.5 times the diameter of the ductwork, as measured along its circumference and a maximum of 24 inches. Locate on duct sides for ease of inspection and cleaning at each change in direction, at junctions with vertical ducts, and at devices requiring periodic inspection and maintenance. Locate not less than every 10 lineal feet of duct, including risers. Removable caps may be installed at termination ends on ducts less than 12 inch in diameter.

F. Final duct connections to the equipment to be made by Owner.

3.7 DUCT SEALING

A. Install duct to pitch toward outside air intakes and drain to outside of building. Solder or seal seams to form watertight joints.

B. Fabricate seams and joints liquid-tight with continuous exterior welds or gasketed, bolted flanged connections in following locations:

1. Shower and Locker rooms.
2. Kitchenette vents other high-grease content.
3. AG Lab low exhaust pick-up points.

3.8 HANGER AND SUPPORT INSTALLATION

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."

B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.

1. Where practical, install concrete inserts before placing concrete.
2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches thick.
4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.

C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.

D. Hangers Exposed to View: Threaded rod and angle or channel supports.

E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum interval of 16 feet.

F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.9 CONNECTIONS

A. Make connections to equipment with flexible connectors complying with Section 233300 "Air Duct Accessories."

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.10 PAINTING

A. Paint interior of metal ducts that are visible through registers and grilles and that do not have duct liner. Apply one coat of flat, black, latex paint over a compatible galvanized-steel primer.

B. Paint materials and application requirements are specified in Division 09.

3.11 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Leakage Tests:

1. Comply with SMACNA's "HVAC Air Duct Leakage Test Manual." Submit a test report for each test.
2. Test the following systems:

    a. Ducts with a Pressure Class Higher Than 3-Inch wg: Test representative duct sections totaling no less than 25 percent of total installed duct area for each designated pressure class.
    b. Supply Ducts with a Pressure Class of 3-Inch wg Higher: Test representative duct sections totaling no less than 50 percent of total installed duct area for each designated pressure class.
    c. Return Ducts with a Pressure Class of 3-Inch wg or Higher: Test representative duct sections totaling no less than 50 percent of total installed duct area for each designated pressure class.
    d. Exhaust Ducts with a Pressure Class of 3-Inch wg or Higher: Test representative duct sections totaling no less than 50 percent of total installed duct area for each designated pressure class.
    e. Dust Collector Exhaust Ducts with a Pressure Class of -10 Inch wg or Higher: Test representative duct sections totaling no less than 50 percent of total installed duct area for each designated pressure class.

3. Disassemble, reassemble, and seal segments of systems to accommodate leakage testing and for compliance with test requirements.
4. Test for leaks before applying external insulation.
5. Conduct tests at static pressures equal to maximum design pressure of system or section being tested. If static-pressure classes are not indicated, test system at maximum system design pressure. Do not pressurize systems above maximum design operating pressure.
6. Give seven days' advance notice for testing.

C. Duct System Cleanliness Tests:

1. Visually inspect duct system to ensure that no visible contaminants are present.
2. Test sections of metal duct system, chosen randomly by Owner’s Project Representative. If found integrity of air system’s ductwork has been compromised, Contractor shall have ductwork cleaned according to National Air Duct Cleaners Association (NADCA) Standards by a Certified Regular Member of the NADCA.

D. Duct system will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

3.12 DUCT CLEANING

A. Remove all dirt and foreign matter from the entire duct system and clean diffusers, registers, grilles and the inside of air-handling units before operating fans.

B. Clean duct systems with high power vacuum machines where systems have been used for temporary heat, air-conditioning, or ventilation purposes during construction. Protect equipment that may be harmed by excessive dirt with filters, or bypass during cleaning.

C. If the system has been operated without scheduled filters or if the integrity of temporary closures has been compromised, Contractor shall have ductwork cleaned according to National Air Duct Cleaners Association (NADCA) Standards by a Certified Regular Member of the NADCA.

D. Before turning the installation over to the Owner, Contractor shall certify that the air handling systems have only been operated with scheduled filters in place. Otherwise, Contractor shall present evidence that the ductwork was cleaned as required above.

3.13 START UP

A. Air Balance: Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC."

3.14 DUCT SCHEDULE

A. See drawing schedule for duct pressure, seal and leakage class, and elbow configuration.

B. Fabricate ducts with galvanized sheet steel.

C. Retain applicable subparagraphs in this article to set criteria for pressure class, duct seal-class level, and duct-leakage class; or delete applicable subparagraphs and indicate pressure class, duct seal-class level, and duct-leakage class on Drawings. If retaining duct seal and leakage requirements in this article, retain first paragraph in "Duct Sealing" Article. Both seal class and leakage class are included in this article and either one can be deleted, or both can remain if they are consistent.

D. Intermediate Reinforcement:

1. Galvanized-Steel Ducts: Galvanized steel.
2. Aluminum Ducts: Aluminum.

E. Liner:

1. Return Ducts" and "Minimum Duct Insulation R-Value, Combined Heating and Cooling Supply Supply Air Ducts: Fibrous glass, Type I, 1 inch thick.
2. Return Air Ducts: Fibrous glass, Type I, 1 inch thick.
3. Transfer Ducts: Fibrous glass, Type I, 1 inch thick.

F. Elbow Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."

    a. Velocity 1000 fpm or Lower:

        1) Radius Type RE 1 with minimum 0.5 radius-to-diameter ratio.
        2) Mitered Type RE 4 without vanes.

b. Velocity 1000 to 1500 fpm:

1) Radius Type RE 1 with minimum 1.0 radius-to-diameter ratio.
2) Radius Type RE 3 with minimum 0.5 radius-to-diameter ratio and two vanes.
3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."

c. Velocity 1500 fpm or Higher:

1) Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
2) Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."

2. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."

a. Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
b. Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
c. Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."

3. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "Round Duct Elbows."

a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.

1) Velocity 1000 fpm or Lower: 0.5 radius-to-diameter ratio and three segments for 90-degree elbow.
2) Velocity 1000 to 1500 fpm: 1.0 radius-to-diameter ratio and four segments for 90-degree elbow.
3) Velocity 1500 fpm or Higher: 1.5 radius-to-diameter ratio and five segments for 90-degree elbow.
4) Radius-to Diameter Ratio: 1.5.

b. Round Elbows, 12 Inches and Smaller in Diameter: Stamped or pleated.
c. Round Elbows, 14 Inches and Larger in Diameter: Standing seam or Welded.

G. Branch Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-6, "Branch Connection."

    a. Rectangular Main to Rectangular Branch: 45-degree entry.
    b. Rectangular Main to Round Branch: Spin in.

2. Round and Flat Oval: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees." Saddle taps are permitted in existing duct.

    a. Velocity 1000 fpm or Lower: 90-degree tap.
    b. Velocity 1000 to 1500 fpm: Conical tap.
    c. Velocity 1500 fpm or Higher: 45-degree lateral.

END OF SECTION 23 31 13

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SECTION 23 33 00
AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. For duct silencers, include pressure drop and dynamic insertion loss data. Include breakout noise calculations for high transmission loss casings.

B. Product data to include but not be limited to:

1. Dimensional and weight data
2. Temperature/Pressure ratings
3. Manufacturer’s name and model number
4. Materials of construction
5. Sealant and gasket materials
6. Manufacturer’s installation instructions.
7. Capacities and performance

1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For air duct accessories to include in operation and maintenance manuals.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fusible Links: Furnish quantity equal to 5 percent of amount installed.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTION

A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

2.2 MATERIALS

A. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.

1. Galvanized Coating Designation: G90.
2. Exposed-Surface Finish: Mill phosphatized.

B. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304, and having a No. 2 finish for concealed ducts and finish for exposed ducts.

C. Aluminum Sheets: Comply with ASTM B 209, Alloy 3003, Temper H14; with mill finish for concealed ducts and standard, 1-side bright finish for exposed ducts.

D. Extruded Aluminum: Comply with ASTM B 221, Alloy 6063, Temper T6.

E. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.

F. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.3 MANUAL VOLUME DAMPERS

A. Standard, Steel, Manual Volume Dampers:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Air Balance Inc.; a division of Mestek, Inc.
    b. American Warming and Ventilating; a division of Mestek, Inc.
    c. Flexmaster U.S.A., Inc.
    d. McGill AirFlow LLC.
    e. Nailor Industries Inc.
    f. Pottorff.
    g. Ruskin Company.
    h. Vent Products Company, Inc.

2. Standard leakage rating, with linkage outside airstream.
3. Suitable for horizontal or vertical applications.
4. Frames:

    a. Frame: Hat-shaped, 0.094-inch-thick, galvanized sheet steel.
    b. Mitered and welded corners.
    c. Flanges for attaching to walls and flangeless frames for installing in ducts.

5. Blades:

    a. Multiple or single blade.
    b. Parallel- or opposed-blade design.

c. Stiffen damper blades for stability.
d. Galvanized-steel, 0.064 inch thick.

6. Blade Axles: Galvanized steel.
7. Bearings:

a. Molded synthetic.
b. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.

8. Tie Bars and Brackets: Galvanized steel.

2.4 SMOKE DETECTORS

A. Smoke detectors are furnished and installed by the Electrical Contractor.

2.5 CONTROL DAMPERS

A. Control dampers are specified in Section 23 09 00 for "Instrumentation and Control for HVAC."

2.6 FIRE DAMPERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Greenheck Fan Corporation.
2. Nailor Industries Inc.
3. Pottorff.
4. Prefco; Perfect Air Control, Inc.
5. Ruskin Company.

B. Type: Static; rated and labeled according to UL 555 by an NRTL.

C. Closing rating in ducts up to 4-inch wg static pressure class and minimum 2000-fpm velocity.

D. Fire Rating: 1-1/2 and 3 hours.

E. Frame: Curtain type with blades outside airstream; fabricated with roll-formed, 0.034-inch-thick galvanized steel; with mitered and interlocking corners.

F. Mounting Sleeve: Factory- or field-installed, galvanized sheet steel.

1. Minimum Thickness: 0.05 thick, as indicated, and of length to suit application.
2. Exception: Omit sleeve where damper-frame width permits direct attachment of perimeter mounting angles on each side of wall or floor; thickness of damper frame must comply with sleeve requirements.

G. Mounting Orientation: Vertical or horizontal as indicated.

H. Blades: Roll-formed, interlocking, 0.024-inch-thick, galvanized sheet steel. In place of interlocking blades, use full-length, 0.034-inch-thick, galvanized-steel blade connectors.

I. Horizontal Dampers: Include blade lock and stainless-steel closure spring.

J. Heat-Responsive Device: Replaceable, 165 deg F rated, fusible links.

2.7 COMBINATION FIRE AND SMOKE DAMPERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Air Balance Inc.; a division of Mestek, Inc.
2. Cesco Products; a division of Mestek, Inc.
3. Greenheck Fan Corporation.
4. Nailor Industries Inc.
5. Pottorff.
6. Ruskin Company.

B. Type: Static; Rated and labeled according to UL 555 and UL 555S by an NRTL.

C. Closing rating in ducts up to 4-inch wg static pressure class and minimum 2000-fpm velocity.

D. Fire Rating: 3 hours.

E. Frame: Hat-shaped, 0.094-inch thick, galvanized sheet steel, with welded, or interlocking, gusseted or mechanically attached corners and mounting flange.

F. Heat-Responsive Device: Resettable, 165 deg F, fusible links.

G. Blades: Airfoil 0.063-inch thick, galvanized sheet steel.

H. Leakage: Class II.

I. Rated pressure and velocity to exceed design airflow conditions.

J. Mounting Sleeve: Factory-installed, 0.039-inch galvanized sheet steel; length to suit wall with factory-furnished silicone calking.

K. Damper Motors: two-position action.

L. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in Section 230900 "Instrumentation and Control for HVAC."

1. Electrical Connection: 24 V, single phase, 60 Hz.

M. Accessories:

1. Retain applicable features in subparagraphs below.

2. Auxiliary switches: Open/Closed Indication.

2.8 TURNING VANES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Ductmate Industries, Inc.
2. Duro Dyne Inc.
3. Elgen Manufacturing.
4. METALAIRE, Inc.
5. SEMCO Incorporated.
6. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Manufactured Turning Vanes for Metal Ducts: Curved blades of galvanized sheet steel; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.

C. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 4-3, "Vanes and Vane Runners," and 4-4, "Vane Support in Elbows."

D. Vane Construction: Single wall for ducts up to 48 inches wide and double wall for larger dimensions.

2.9 DUCT-MOUNTED ACCESS DOORS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. American Warming and Ventilating; a division of Mestek, Inc.
2. Ductmate Industries, Inc.
3. Flexmaster U.S.A., Inc.
4. Greenheck Fan Corporation.
5. McGill AirFlow LLC.
6. Nailor Industries Inc.
7. Pottorff.

B. Duct-Mounted Access Doors: Fabricate access panels according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 7-2, "Duct Access Doors and Panels," and 7-3, "Access Doors - Round Duct."

1. Door:

a. Double wall, rectangular.
b. Galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class.
c. Vision panel.
d. Hinges and Latches: 1-by-1-inchbutt or piano hinge and cam latches.

e. Fabricate doors airtight and suitable for duct pressure class.

2. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.
3. Number of Hinges and Locks:

a. Access Doors Less Than 12 Inches Square: No hinges and two sash locks.
b. Access Doors up to 18 Inches Square: Two hinges or Continuous and with two sash locks.
c. Access Doors up to 24 by 48 Inches: Three hinges or Continuous and with two compression latches.

2.10 DUCT ACCESS PANEL ASSEMBLIES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Ductmate Industries, Inc.
2. Flame Gard, Inc.
3. 3M.

B. Labeled according to UL 1978 by an NRTL.

C. Panel and Frame: Minimum thickness 0.0528-inch carbon steel.

D. Fasteners: Carbon steel. Panel fasteners shall not penetrate duct wall.

E. Gasket: Comply with NFPA 96; grease-tight, high-temperature ceramic fiber, rated for minimum 2000 deg F.

F. Minimum Pressure Rating: 10-inch wg, positive or negative.

2.11 FLEXIBLE CONNECTORS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Ductmate Industries, Inc.
2. Duro Dyne Inc.
3. Elgen Manufacturing.
4. Ventfabrics, Inc.
5. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Materials: Flame-retardant or noncombustible fabrics.

C. Coatings and Adhesives: Comply with UL 181, Class 1.

D. Metal-Edged Connectors: Factory fabricated with a fabric strip 3-1/2 inches wide attached to two strips of 2-3/4-inch-wide, 0.028-inch-thick, galvanized sheet steel or 0.032-inch-thick aluminum sheets. Provide metal compatible with connected ducts.

E. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.

1. Minimum Weight: 26 oz./sq. yd.
2. Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.
3. Service Temperature: Minus 40 to plus 200 deg F.

F. Outdoor System, Flexible Connector Fabric: Glass fabric double coated with weatherproof, synthetic rubber resistant to UV rays and ozone.

1. Minimum Weight: 24 oz./sq. yd.
2. Tensile Strength: 530 lbf/inch in the warp and 440 lbf/inch in the filling.
3. Service Temperature: Minus 50 to plus 250 deg F.

2.12 FLASHINGS

A. Flashing and counterflashing for roof curbs will be provided by others.

B. Flashing and curbs for duct and pipe penetrations of roof assemblies to be in accordance with details.

2.13 FLEXIBLE DUCTS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Flexmaster U.S.A., Inc.
2. McGill AirFlow LLC.
3. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Insulated, Flexible Duct: UL 181, Class 1, meeting requirements of NFPA 90A with flame spread of 25 or less and smoke developed rating of 50 or under, black polymer film supported by helically wound, spring-steel wire; fibrous-glass insulation; polyethylene vapor-barrier film with minimum perm rating of 0.05 perm.

1. Pressure Rating:

a. 10-inch wg positive for ducts 4”-12” ID.
b. 6-inch wg positive for ducts 14”-16” ID.
c. 4-inch wg positive for ducts 18”-20” ID.
d. 1-inch wg negative for ducts 4”-12” ID.
e. 0.5-inch wg negative for ducts 14”-20” ID.

2. Maximum Air Velocity: 4000 fpm.
3. Temperature Range: Minus 20 to plus 175 deg F.
4. Insulation R-Value: Comply with ASHRAE/IESNA 90.1 minimum 1” fiberglass insulation blanket with maximum thermal conductance of 0.23 K at 75ºF.

C. Flexible Duct Connectors:

1. Clamps: Nylon strap in sizes 3 through 18 inches, to suit duct size.

2. Non-Clamp Connectors: Liquid adhesive plus tape.

D. Flexible Ductwork Elbow Supports:

1. Available Manufacturers:

a. Thermaflex: Flexflow Elbow

2. In lieu of using die stamped elbows for flexible duct connections to supply air diffusers (as detailed on the drawings), the Contractor may delete the die stamped elbow and directly connect the flexible duct to the diffusers with the use of a flexible ductwork elbow support.
3. Elbow supports shall be constructed of durable composite material and shall be fully adjustable to support flexible ductwork diameter from 6” to 16” in diameter.
4. Elbow supports shall be in UL listed for use in return air plenums.

2.14 BLAST GATES

A. Furnish where indicated full gate style type gates with cast aluminum alloy gate housing and seamless sheet steel metal gate.

2.15 PREFAB INSULATED ROOF CURBS

A. Manufacturers: Pate, Thy or Vent Products.

B. Furnish for each duct penetration through roof.

C. Each complete with 18 ga. galvanized steel construction, continuous mitered and welded

D. corner seams, integral base plate and factory installed wood nailer.

E. Factory insulated with 1-1/2" thick, 3 lb. density rigid fiberglass insulation with built-in cant for roof as required.

F. See architectural plans for roof deck type, pitch and insulation thickness.

2.16 EQUIPMENT SUPPORT CURBS

A. Manufacturers: Pate, Thy or Vent Products.

B. Furnish for each piece of roof-mounted equipment as indicated on the drawings.

C. Curbs shall be sized for equipment being mounted, complete with minimum 18 gauge galvanized steel construction with integral base plate, continuous welded corner seams, factory installed wood nailer, counter flashing with lag screws and built in cant for roof as required.

D. See Architectural plans or visit the site for roof deck type, pitch and insulation thickness.

2.17 DUCT ACCESSORY HARDWARE

A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct-insulation thickness.

B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts.

B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.

C. Install control dampers at inlet of exhaust fans or exhaust ducts as close as possible to exhaust fan, unless otherwise indicated.

D. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.

1. Install steel volume dampers in steel ducts.
2. Install aluminum volume dampers in aluminum ducts.

E. Set dampers to fully open position before testing, adjusting, and balancing.

F. Install test holes at fan inlets and outlets and elsewhere as indicated.

G. Install fire dampers according to UL listing.

H. Connect ducts to duct silencers rigidly.

I. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:

1. On both sides of duct coils.
2. At outdoor-air intakes and mixed-air plenums.
3. At drain pans and seals.
4. Adjacent to and close enough to fire or smoke dampers, to reset or reinstall fusible links. Access doors for access to fire or smoke dampers having fusible links shall be pressure relief access doors and shall be outward operation for access doors installed upstream from dampers and inward operation for access doors installed downstream from dampers.
5. At each change in direction and at maximum 50-foot spacing.
6. Upstream and downstream from turning vanes.

7. Upstream or downstream from duct silencers.
8. Control devices requiring inspection.
9. Elsewhere as indicated.

J. Install access doors with swing against duct static pressure.

K. Access Door Sizes:

1. One-Hand or Inspection Access: 12 by 12 inches.
2. Two-Hand Access: 12 by 12 inches.
3. Head and Hand Access: 18 by 12 inches.
4. Head and Shoulders Access: 21 by 14 inches.
5. Body Access: 25 by 14 inches.
6. Body plus Ladder Access: 25 by 17 inches.

L. Label access doors according to Section 230553 "Identification for HVAC Piping and Equipment" to indicate the purpose of access door.

M. Install flexible connectors to connect ducts to equipment.

N. For fans developing static pressures of 5-inch wg and more, cover flexible connectors with loaded vinyl sheet held in place with metal straps.

O. Connect diffusers to ducts directly or with maximum 60-inch lengths of flexible duct clamped or strapped in place.

P. Install duct test holes where required for testing and balancing purposes.

Q. Access doors constructed with sheet metal screw fasteners will not be accepted

R. Flexible Ductwork:

1. Do not exceed 5 feet in length. Flexible ducts shall be used only to compensate for branch duct and diffuser/grille misalignment. No kinks or bends shall be allowed.
2. Install flexible ductwork with minimum offsets, sag, and trim.
3. Connect with adjustable band and clamp to secure duct to trunk fitting and to distribution unit fitting. Banding shall be nylon straps, fastened under insulation and over the inner lines with a second band securing the insulation and jacket. Sheet metal screws will not be accepted.
4. Seal ends of flex duct with foil duct tape over insulation and jacket.
5. Individual sections of flexible ductwork shall be of one piece construction. Splicing of short sections will not be accepted.
6. Penetration of any partition, wall, or floor with flexible duct will not be accepted.
7. Minimum length of duct trunk fitting for flex duct connection shall be 4 inches.

S. Fire dampers and fire/smoke dampers shall be installed where and when necessary, whether or not indicated on drawings, in compliance with all applicable local, state and insurance codes and requirements, and other authorities having jurisdiction.

T. Manually test each fire damper for proper operation by removing the fusible link. Repair or replace any fire damper that does not close completely. Re-install fusible link after test.

U. Demonstrate re-setting of fire dampers to Owner's representative.

3.2 CONTROL DAMPERS

A. Install dampers in locations indicated on the drawings, as detailed, and according to the manufacturer's instructions. Install blank-off plates or transitions where required for proper mixing of airstreams in mixing plenums. Provide adequate operating clearance and access to the operator. Install an access door adjacent to each control damper for inspection and maintenance.

3.3 SMOKE DETECTORS

A. Installation and wiring of detectors will be by the Electrical Contractor. Install an access door at each detector location.

3.4 BLAST GATES

A. Install blast gates in dust collector’s exhaust ductwork where indicated on the drawings.

3.5 PREFAB INSULATED ROOF CURBS

A. Install roof curbs where ducts pass through roof. This contractor shall furnish the Roofing Contractor with complete roof curb dimensions.

3.6 EQUIPMENT SUPPORT CURBS

A. Install equipment support curbs to support roof-mounted equipment as indicated. This contractor shall furnish the General Contractor with complete curb dimensions.

3.7 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Operate dampers to verify full range of movement.
2. Inspect locations of access doors and verify that purpose of access door can be performed.
3. Operate fire, smoke, and combination fire and smoke dampers to verify full range of movement and verify that proper heat-response device is installed.
4. Inspect turning vanes for proper and secure installation.
5. Operate remote damper operators to verify full range of movement of operator and damper.

END OF SECTION 23 33 00

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SECTION 23 34 00
DUST COLLECTOR EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUBMITTALS

A. Product Data: Include rated capacities, furnished specialties, and accessories for each type of product indicated and include the following:

1. Certified fan performance curves with system operating conditions indicated.
2. Certified fan sound-power ratings.
3. Motor ratings and electrical characteristics, plus motor and electrical accessories.
4. Material thickness and finishes, including color charts.
5. Dampers, including housings, linkages, and operators.
6. Roof curbs.
7. Fan speed controllers.
8. Vibration isolators.

B. Operation and Maintenance Data: For fume exhaust equipment to include in emergency, operation, and maintenance manuals.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. AMCA Compliance: Products shall comply with performance requirements and shall be licensed to use the AMCA-Certified Ratings Seal.

C. NEMA Compliance: Motors and electrical accessories shall comply with NEMA standards.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver fans as factory-assembled unit, to the extent allowable by shipping limitations, with protective crating and covering.

B. Disassemble and reassemble units, as required for moving to final location, according to manufacturer's written instructions.

C. Lift and support units with manufacturer's designated lifting or supporting points.

1.5 COORDINATION

A. Coordinate size and location of structural-steel support members.

B. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

PART 2 - PRODUCTS

2.1 DUST COLLECTORS

A. Available Manufacturers:

B. Basis-of-Design Product: The design is based on the following:

1. Donaldson/Torit Model 24

C. Subject to compliance with requirements, provide the named product or a comparable product by one the following:

1. Dustvent Inc.
2. Aget Manufacturing

D. Construction:

1. Cyclone, cyclone drive, and after-filter shall be constructed of heavy gauge weather-proof steel throughout, continuously welded for air tight integrity.
2. Manufacturer shall provide all required heavy gauge structural steel to support entire dust collection system assembly from the floor.

E. Blower and Motor:

1. Blower shall have 10 gauge steel sides with a 12 gauge steel scroll. Motor mounting plate shall be 3/16-inch steel plate.
2. Motor shall be vertical type, explosion proof, and direct drive. See Section 23 05 13, Electrical Motor Schedule or the Equipment Schedule for voltage and rpm requirements. See Section 23 05 13 for motor minimum efficiency.

F. Pull-thru cyclone fan:

1. Housing: Spark resistant aluminum cast construction. Includes teflon shaft seal to prevent motor shaft sparking.
2. Performance: Refer to Schedule.
3. Impellers: Radial blade type, cast aluminum, spark resistant, statically and dynamically balanced.
4. Fan shall be direct drive.

G. Collector Housing:

1. Preassemble cyclone collector. Ship in major assemblies ready to be connected to after filter with a lined plenum.
2. Maintain airtight integrity with sealed seams, gasketed doors, and fittings.

3. Collector cone shall discharge into collector bin. Drum(s) having capacity of 55 gallon shall collect accumulated dust from the cyclone.
4. Unit shall receive (2) coats of factory finish blue.

H. Discharge Silencer:

1. Provide a discharge silencer for cyclone dust collector.

I. Electrical:

1. General Requirements: Furnish unit with starter and disconnect for cyclone motor and for blower motor mounted in a single weatherproof cabinet.
2. Control Panel: To contain the following:

a. Motor Magnetic Starters (Each Motor)
b. Timer Control Board
c. Main Disconnect
d. Transformer
e. Remote Start Stop Input Connection
f. Magnehelic Pressure Gauge in Cover
g. NEMA 12 Enclosure
h. UL Rated

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install units level and plumb.

B. Support units using restrained elastomeric mounts having a static deflection of 1-inch. Vibration- and seismic-control devices are specified in Section 230548 " Vibration and Seismic Controls for HVAC."

1. Secure vibration and seismic controls to concrete bases using anchor bolts cast in concrete base.

C. Install units with clearances for service and maintenance.

D. Label units according to requirements specified in Section 230553 " Identification for HVAC Piping and Equipment."

3.2 ELECTRICAL:

A. Electrical Contractor shall provide power wiring to control cabinet (which includes main disconnect, starters, and controls) and wire from control cabinet to blower and shaker motors. Electrical Contractor shall furnish, install, and wire a remote start-stop switch for dust collector.

B. Mechanical shall install and wire bin level monitor and alarm.

3.3 CONNECTIONS

A. Duct installation and connection requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors. Flexible connectors are specified in Section 233300 “Air Duct Accessories”.

B. Ground equipment according to Division 26.

C. Connect wiring according to Division 26.

D. Provide safety screen(s) when fan inlet or outlet is exposed.

E. Where fan inlet or outlet ducting has been changed from that shown on the drawings, provide any motor, drive, and/or electrical system changes required to increase static pressure.

F. On units provided with a drain connection, install a drain valve and cap discharge of drain.

3.4 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

1. Verify that shipping, blocking, and bracing are removed.
2. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
3. Verify that cleaning and adjusting are complete.
4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.
5. Adjust belt tension.
6. Verify lubrication for bearings and other moving parts.
7. Verify that manual and automatic volume control dampers in connected ductwork systems are in fully open position.
8. Disable automatic temperature-control operators, energize motor and adjust fan to indicated rpm, and measure and record motor voltage and amperage.
9. Shut unit down and reconnect automatic temperature-control operators.
10. Remove and replace malfunctioning units and retest as specified above.

B. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.5 ADJUSTING

A. Adjust damper linkages for proper damper operation.

B. Adjust belt tension.

C. Lubricate bearings.

END OF SECTION 23 34 00

SECTION 23 34 23
HVAC POWER VENTILATORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 PERFORMANCE REQUIREMENTS

A. Project Altitude: Base fan-performance ratings on actual Project site elevations.

B. Operating Limits: Classify according to AMCA 99.

C. Each fan system shall be capable of delivering 110% of the scheduled airflow at the scheduled static pressure. The fan motor shall not operate into the motor service factor when operating under these conditions.

D. Drive efficiency shall be considered when selecting motors in accordance with manufacturer's recommendations or according to AMCA Publication 203, Appendix L.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. Also include the following:

1. Certified fan performance curves with system operating conditions indicated.
2. Certified fan sound-power ratings.
3. Motor ratings and electrical characteristics, plus motor and electrical accessories.
4. Material thickness and finishes, including color charts.
5. Dampers, including housings, linkages, and operators.
6. Roof curbs.
7. Fan speed controllers.
8. Wiring Diagrams: For power, signal, and control wiring.
9. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For power ventilators to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. AMCA Compliance: Fans shall have AMCA-Certified performance ratings and shall bear the AMCA-Certified Ratings Seal.

1.6 COORDINATION

A. Coordinate size and location of structural-steel support members.

B. Coordinate sizes and locations of concrete bases with actual equipment provided.

C. Coordinate sizes and locations of roof curbs roof penetrations with actual equipment provided.

PART 2 - PRODUCTS

2.1 CENTRIFUGAL ROOF VENTILATORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Greenheck Fan Corporation.
2. Loren Cook Company.
3. Penn.
4. Twin City.

B. Housing: Removable, spun-aluminum, dome top and outlet baffle; square, one-piece, aluminum base with venturi inlet cone.

1. Upblast Units: Provide spun-aluminum discharge baffle to direct discharge air upward, with rain and snow drains.
2. Hinged Subbase: Galvanized-steel hinged arrangement permitting service and maintenance.
3. Nameplate: Include aluminum engraved nameplate with unit manufacturer, model number, and performance data.

C. Direct-Drive Units: Motor mounted in airstream, factory wired to disconnect switch located on outside of fan housing. ECM motor arrangement.

D. Fan Wheels: Aluminum hub and wheel with backward-inclined blades.

1. Resiliently mounted to housing.
2. Fan Shaft: Turned, ground, and polished steel; keyed to wheel hub.
3. Shaft Bearings: Permanently lubricated, permanently sealed, self-aligning ball bearings.
4. Pulleys: Cast-iron, adjustable-pitch motor pulley.
5. Fan and motor isolated from exhaust airstream.
6. Bearings for belt drive units shall be selected for a minimum L50 life in excess of 200,000 hours at maximum cataloged operating speed.

E. Accessories:

1. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.
2. Disconnect Switch: Nonfusible type, with thermal-overload protection mounted outside fan housing, factory wired through an internal aluminum conduit.
3. Bird Screens: Removable, ½-inch mesh, aluminum or brass wire.
4. Motorized Dampers: Parallel-blade dampers mounted in curb base with electric actuator; 24VDC wired to close when fan stops.
5. Bird screens.

F. Roof Curbs: Galvanized steel; mitered and welded corners; 1½-inch- thick, rigid, fiberglass insulation adhered to inside walls; and 1½-inch wood nailer. Size as required to suit roof opening and fan base.

1. Overall Height: 24 inches.
2. Sound Curb: Curb with sound-absorbing insulation.
3. Pitch Mounting: Manufacture curb for roof slope.
4. Metal Liner: Galvanized steel.

2.2 MOTORS

A. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."

1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.

2.3 SOURCE QUALITY CONTROL

A. Certify sound-power level ratings according to AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Factory test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Label fans with the AMCA-Certified Ratings Seal.

B. Certify fan performance ratings, including flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests according to AMCA 210, "Laboratory Methods of Testing Fans for Aerodynamic Performance Rating." Label fans with the AMCA-Certified Ratings Seal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install power ventilators level and plumb.

B. Secure roof-mounted fans to roof curbs with cadmium-plated hardware. See Division 07 for installation of roof curbs.

C. Install units with clearances for service and maintenance.

D. Label units according to requirements specified in Section 230553 "Identification for HVAC Piping and Equipment."

3.2 CONNECTIONS

A. Install ducts adjacent to power ventilators to allow service and maintenance.

B. Ground equipment according to Division 26.

C. Connect wiring according to Division 26.

D. Provide safety screen(s) when inlet or outlet is exposed.

E. Where fan inlet or outlet ducting has been changed from that shown on the drawings, provide any motor, drive, and/or electrical system changes required to increase static pressure.

F. On units provided with a drain connection, install a drain valve and cap discharge of drain.

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Tests and Inspections:

1. Verify that shipping, blocking, and bracing are removed.
2. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
3. Verify that cleaning and adjusting are complete.
4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation.
5. Adjust damper linkages for proper damper operation.
6. Verify lubrication for bearings and other moving parts.
7. Verify that manual and automatic volume control and fire and smoke dampers in connected ductwork systems are in fully open position.
8. Disable automatic temperature-control operators, energize motor and adjust fan to indicated rpm, and measure and record motor voltage and amperage.
9. Shut unit down and reconnect automatic temperature-control operators.
10. Remove and replace malfunctioning units and retest as specified above.

C. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Prepare test and inspection reports.

3.4 ADJUSTING

A. Adjust damper linkages for proper damper operation.

B. Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing procedures.

C. Lubricate bearings.

END OF SECTION 23 34 23

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SECTION 23 34 39
HIGH-VOLUME, LOW-SPEED FANS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes high-volume, low-speed fans.

1.3 DEFINITIONS

A. HVLS - High volume, low speed.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include rated capacities, furnished specialties, and accessories for each fan.
2. Certified fan performance curves with system operating conditions indicated.
3. Certified fan sound-power ratings.
4. Motor ratings and electrical characteristics, plus motor and electrical accessories.
5. Material thickness and finishes, including color charts.
6. Fan speed controllers.

B. Shop Drawings:

1. Include plans, elevations, sections, and mounting details.
2. Include details of equipment assemblies. Show dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include diagrams for power, signal, and control wiring.

C. Delegated-Design Submittal: For each HVLS fan.

1. Include design calculations and details for selecting product mounting components complying with performance requirements, design criteria, and analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
2. Design Calculations: Calculate static and dynamic loading due to equipment weight, operation, and seismic forces required to select mounting components.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Floor plans and details, drawn to scale and coordinated with each other, using input from installers of the items involved.

B. Qualification Data:

1. For Installer: Certificate from HVLS fan manufacturer certifying that Installer has successfully completed prerequisite training administered by manufacturer for proper installation of systems, including but not limited to, equipment, controls, and accessories indicated and furnished for installation.

C. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For HVLS fans to include in emergency, operation, and maintenance manuals.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store products in a clean and dry place.

B. Comply with manufacturer's written rigging and installation instructions for unloading and moving to final installed location.

C. Handle products carefully to prevent damage, breaking, denting, and scoring. Do not install damaged products.

D. Protect products from weather, dirt, dust, water, construction debris, and physical damage.

1. Retain factory-applied coverings on equipment to protect finishes during construction and remove just prior to operating unit.
2. Cover unit openings before installation to prevent dirt and dust from entering inside of units. If required to remove coverings during unit installation, reapply coverings over openings after unit installation and remove just prior to operating unit.

E. Replace installed products damaged during construction.

1.8 WARRANTY

A. Warranty: Manufacturer and Installer agree to repair or replace components of fans that fail in materials or workmanship within specified warranty period.

1. Warranty Period:

a. For Motor, Including Controls: Five (5) years from date of Substantial Completion.
b. For Parts, Including Blades and Hub: Five (5) years from date of Substantial Completion.
c. For Labor: One (1) year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. UL Compliance: Listed and labeled to UL 507.

C. CSA Compliance: Listed and labeled to CSA C22.2, No. 113.

D. AMCA Compliance:

1. Test HVLS fans according to AMCA 230.
2. Certify HVLS fan performance according to AMCA 211.

E. Performance Data: Comply with ANSI 230 test procedure standard, based on five rating points: 20-, 40-, 60-, 80-, and 100-percent of maximum speed. Comply with AMCA 211 for publication of performance data.

2.2 CAPACITIES AND CHARACTERISTICS

A. See schedule on drawings.

2.3 MANUFACTURERS

A. Source Limitations: Obtain HVLS fans from single source from single manufacturer.

B. Basis-of-Design Product: The design is based on the following:

1. MacroAir

C. Subject to compliance with requirements, provide the named product or a comparable product by one the following:

1. Greenheck Fan Corporation, Model DS
2. Entrematic Fans, C-Class
3. Hunter Industrial, Titan HVLS

2.4 HIGH-VOLUME, LOW-SPEED FANS

A. The fan shall be designed to move the maximum amount of free air contained within a given space with the least amount of electrical power (note: free air is defined as that air within a given space at a constant static pressure).

B. Manufacturer to provide the optional airfoil finish in custom powder coated colors per manufacturer's chart for Architect's selection.

C. Airfoils:

1. Each fan shall have a minimum 6 blades with low speed extruded aluminum airfoils and AMCA certified HVLS.
2. Each airfoil shall be of the high-performance design.
3. The foils shall be connected to the hub section of the fan by means of two (2) locking bolts per foil. The locking bolts shall be SAE grade 8 only, 5/16" diameter with 150,000 psi tensile strength.
4. Additionally, the airfoils shall be interlocked with airfoil retainers to prevent an individual airfoil from becoming accidentally disconnected from the hub. The straps shall consist of 1008 steel with a clear zinc chromate finish.

D. Motor:

1. The fan motor shall be 1750 RPM, 460V AC, 60 Hz, 3-Phase, Inverter rated with Class F Insulation, 40°C Ambient-Continuous.

E. Motor Frame:

1. The fan motor frame and mount shall be constructed of no less than 3/16" powder-coated steel.

F. Hub:

1. The fan hub assembly shall be constructed of a precision cast of aluminum zinc magnesium alloy.
2. The hub shall incorporate six (6) safety clips made of 1/4" steel that shall restrain the hub/airfoil assembly in case of shaft failure.

G. Mount:

1. The fan mount shall be designed for quick and secure mounting of the fan from a structure's support beams.
2. The mounting system of the fan shall allow easy removal and relocation, if required.
3. The fan mount shall be constructed of no less than 3/16" powder-coated steel.

H. Safety Cable:

1. The safety cable shall provide an additional means of securing the fan assembly to the building structure.
2. The fan shall include four (4) guy wires attached to the building structure at recommended 45° angles to level and secure frame position.
3. The safety cable shall be 1/4" in diameter and consist of 7 x 19 galvanized steel with swaged Nicopress end loops. The ends shall be secured by 7/16" screw-in shackles.

I. Fan Controller:

1. Each fan controller shall be UL listed as Industrial Control Panels and built pursuant to construction guidelines set forth by UL article 508A and the National Electrical Code.
2. Each fan controller shall include a factory programmed Variable Frequency Drive (VFD) to provide a soft-start for the fan as well as infinite speed control capability for the fan.
3. The VFD shall be sized per the motor's full load amp rating.
4. When more than one fan motor is controlled by a VFD, the size of the VFD shall be based on the maximum current requirements of the motor full load amps.
5. Multiple motor systems shall include a Solid-State Overload relay for each motor.
6. Load reactors shall be included for 575-600V single fan controls and 400-600V multi-fan controls.
7. Each fan controller shall be equipped with an ON/OFF/ON switch, speed control potentiometer, safety disconnect, and properly sized fuse block.
8. The controls shall be housed in a NEMA Type 1 enclosure.

J. Fan Controller Program:

1. Controllers and VFD shall be factory programmed to minimize starting and braking torques.
2. Controller shall integrate HVLS fans with building automation system (BAS) and its BACnet protocols using BACnet MS/TP. Refer to Sections 230924 and 230993 for interface. System shall enable to energized or de-energized though BAS.
3. Each fan shall be Estop compatible for fire and building automated systems (BAS).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions for compliance with requirements for installation tolerances and other conditions affecting HVLS fan performance, maintenance, and operations.

1. Fan locations indicated on Drawings are approximate. Determine exact locations before roughing-in for mounting, control, and electrical connections.

B. Examine roughing-in for mounting location, anchor-bolt sizes, and locations, to verify actual locations for mounting connections before installation of fan.

C. Examine areas for suitable conditions where fan will be installed.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF HIGH-VOLUME LOW-SPEED FANS

A. Install fan according to manufacturer's published instructions.

B. Comply with NECA 1 and NFPA 70.

C. Equipment Mounting:

1. Anchor fan to building structure with manufacturer's recommended mounting bracket as shown in approved delegated design for installed condition.
2. Consult a licensed professional structural engineer for mounting methods and approval for mounting to the structure. Structure must be able to withstand the torque and forces generated by the fan.
3. Comply with requirements for hangers and supports specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."
4. Comply with requirements for vibration isolation devices specified in Section 230548.13 "Vibration Controls for HVAC."

D. Install unit to permit access for maintenance.

E. Install parts and accessories shipped loose.

3.3 ELECTRICAL CONNECTIONS

A. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

B. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

C. Install electrical devices furnished by manufacturer, but not factory mounted, according to NFPA 70 and NECA 1.

D. Install nameplate for each electrical connection, indicating electrical equipment designation and circuit number feeding connection.

1. Nameplate shall be laminated acrylic or melamine plastic signs, as specified in Section 260553 "Identification for Electrical Systems."
2. Nameplate shall be laminated acrylic or melamine plastic signs with a black background and engraved white letters at least 1/2 inch high.

E. Install power wiring to field-mounted electrical devices, furnished by fan manufacturer, but not factory mounted.

3.4 CONTROL CONNECTIONS

A. Connect control wiring to field-mounted control devices.

B. Connect control wiring according to Section 260523 "Control-Voltage Electrical Power Cables."

C. Connect control interlock wiring between HVLS fan and other equipment to provide a complete and functioning system.

D. Connect control wiring between fan unit control interface and control system to provide remote control and monitoring.

E. Install control devices furnished by manufacturer, but not factory mounted.

F. Install control wiring to field-mounted control devices, furnished by fan manufacturer, but not factory mounted.

G. Protect installed units from damage caused by other work.

3.5 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Fan Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. Fan or components will be considered defective if fan or components do not pass tests and inspections.

C. Prepare and submit test and inspection reports.

3.6 STARTUP SERVICE

A. Perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.
2. Verify that fan is secure on mountings and supporting devices and that connections to electrical systems are complete. Verify that proper thermal-overload protection is installed in motors, controllers and switches.
3. Verify proper motor rotation direction and free fan rotation.
4. Check bearing lubrication.
5. Verify proper fan rotation. Set rotation selector to blow vertically downward during heating season, and vertically upward during cooling season.

3.7 ADJUSTING

A. Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC" for air-handling system testing, adjusting, and balancing.

3.8 CLEANING

A. Clean equipment externally; remove coatings applied for protection during shipping and storage, foreign material, and oily residue according to manufacturer's written instructions. Following manufacturer's cleaning procedures, and clean with manufacturer-recommended cleaning products.

3.9 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain HVLS fans.

END OF SECTION 23 34 39

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SECTION 23 36 00
AIR TERMINAL UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section

1.2 ACTION SUBMITTALS

A. Product Data: For each type of the following products, including rated capacities, furnished specialties, sound-power ratings, and accessories.

1. Air terminal units.
2. Liners and adhesives.
3. Sealants and gaskets.

B. Shop Drawings: For air terminal units. Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Wiring Diagrams: For power, signal, and control wiring.
3. Sound Data for radiated, inlet and discharge sound power levels for each octave bands.

1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For air terminal units to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 1.

1.4 QUALITY ASSURANCE

A. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-Up."

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 SHUTOFF, SINGLE-DUCT AIR TERMINAL UNITS

A. Basis-of-Design Product: The design is based on the following:

1. Trane; a business of American Standard Companies.

B. Subject to compliance with requirements, provide the named product or a comparable product by one the following:

1. Environmental Technologies, Inc.
2. Krueger.
3. Nailor Industries Inc.
4. Price Industries.
5. Titus.

C. Configuration: Volume-damper assembly inside unit casing with control components inside a protective metal shroud.

D. Casing: 0.034-inch steel, single wall.

1. Casing Lining: Adhesive attached, 1-inch-thick, coated, 3 lbs/f ft^3 fibrous-glass or 1.5 lbs/ft^3 flexible polyolefin closed cell duct liner complying with ASTM C 1071, and having a maximum flame-spread index of 25 and a maximum smoke-developed index of 50, for both insulation and adhesive, when tested according to ASTM E 84.

a. Cover liner with nonporous foil for fibrous-glass. Foil-scrim-kraft vapor barrier jacket, factory applied to insulation, maximum permeance of .02 perms. All exposed insulation edges shall be covered with metal nosing.

2. Air Inlet: Round stub connection or S-slip and drive connections for duct attachment.
3. Air Outlet: S-slip and drive connections.
4. Access: Removable panels for access to parts requiring service, adjustment, or maintenance; with airtight gasket.
5. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

E. Volume Damper: Galvanized steel with peripheral gasket and self-lubricating bearings.

1. Maximum Damper Leakage: ARI 880 rated, 2 percent of nominal airflow at 3-inch wg inlet static pressure.
2. Damper Position: Normally open.

F. Hydronic Coils:

1. Provide factory mounted hot water reheat coils with the supply air terminal unit. Reference section 238216 for hot water reheat coil specifications.
2. Include manual air vent and drain valve

A. Access Doors

1. Standard access door to be designed and constructed for the pressure class of the duct in which the door is to be installed.
2. Doors in exposed areas shall be hinged type with cam sash lock. Hinges shall be steel full length continuous piano type.
3. Doors in concealed spaces may be secured in place with cam sash latches. For both hinged and non-hinged doors provide sufficient number of camp sash latches to provide air tight seal when door is closed.
4. Do not use hinged doors in concealed spaces if this will restrict access.
5. Use minimum 1” deep 24 gauge galvanized steel double wall access doors with minimum 24 gauge galvanized steel frames.
6. Provide double neoprene gasket that shall provide seals from the frame to the door and frame to the duct.
7. When access doors are installed in insulated ductwork or equipment provide insulated doors with insulation equivalent to what is provided for adjacent ductwork or equipment. Access doors constructed with sheet metal screw fasteners will not be accepted.
8. Air terminal unit shall include factory mounted access door at upstream to hot water reheat coils. Duct access doors shall be as large as air terminal will allows with a minimum size of 6”x6”.

B. Direct Digital Controls:

1. Damper actuator and differential pressure sensor for flow measurement shall be provided with the DDC controller provided for the terminal air box as specified under Section 23 09 00 "Instrumentation and Control for HVAC".
2. Control devices and operational sequences are specified in Section 230900 "Instrumentation and Control for HVAC" and Section 230993 "Sequence of Operations for HVAC Controls."

C. Automatic Temperature-Control Valves, Actuators, and Sensors: Comply with requirements specified in Section 230900 "Instrumentation and Control for HVAC."

2.3 SUPPLY AIR TERMINALS (BUTTERFLY TYPE)

A. Units shall be single duct and pressure independent.

B. Basis-of-Design Product: The design is based on the following:

1. Trane; a business of American Standard Companies (Only).

C. Round duct assembly and damper shall be constructed from a minimum of 22 gauge galvanized steel. Construction to meet UL 181 and NFPA 90A. Casing shall be sealed to limit leakage to a maximum of 15 cfm at 6.0 inches of static pressure.

D. Galvanized steel damper blade shall be mounted to shaft having self-lubricated bearings. Shaft end shall be marked to indicate damper position and shall have a built-in stop to prevent overstroking. Damper blade shall close off against a gasket to limit leakage to 10 cfm at 6.0 inches of differential static pressure. Damper linkage shall be sized to accept at least 40 inch-pounds of torque to the damper shaft. Damper shaft shall be provided with a marking indicating damper position.

E. The round duct assembly shall be equipped with a multi-point flow sensor that shall amplify the measured velocity pressure. Pneumatic tubing from flow sensor to differential pressure transducer shall be UL listed, fire retardant (FR) type. The multi-point flow sensor shall be able to be readily removed for servicing and replacement from the upstream access door.

F. Direct Digital Controls:

1. Damper actuator and differential pressure sensor for flow measurement shall be provided with the DDC controller provided for the terminal air box as specified under Section 23 09 00 "Instrumentation and Control for HVAC".
2. Control devices and operational sequences are specified in Section 230900 "Instrumentation and Control for HVAC" and Section 230993 "Sequence of Operations for HVAC Controls."

2.4 HANGERS AND SUPPORTS

A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.

B. Steel Cables: Galvanized steel complying with ASTM A 603.

C. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.

D. Air Terminal Unit Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

E. Trapeze and Riser Supports: Steel shapes and plates for units with steel casings; aluminum for units with aluminum casings.

2.5 SOURCE QUALITY CONTROL

A. Factory Tests: Test assembled air terminal units according to ARI 880.

1. Label each air terminal unit with plan number, nominal airflow, maximum and minimum factory-set airflows, and ARI certification seal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install air terminal units according to NFPA 90A, "Standard for the Installation of Air Conditioning and Ventilating Systems."

B. Install air terminal units level and plumb. Maintain sufficient clearance for normal service and maintenance.

C. Units shall be suspended from building structure. Units shall not be mounted to adjacent piping or ductwork.

3.2 HANGER AND SUPPORT INSTALLATION

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."

A. Install air terminal units as indicated on project drawings and in accordance with the manufacturer's installation instructions.

B. Hangers Exposed to View: Threaded rod and angle or channel supports.

C. Building Attachments: Powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.

D. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.3 CONNECTIONS

A. Install piping adjacent to air terminal unit to allow service and maintenance.

B. Hot-Water Piping: In addition to requirements in Section 232113 "Hydronic Piping" and Section 232116 Hydronic Piping Specialties," connect heating coils to supply with shutoff valve, strainer, control valve, and union or flange; and to return with balancing valve and union or flange.

C. Connect ducts to air terminal units according to Section 233113 "Metal Ducts."

D. Install Automatic Temperature-Control Valves as required by Section 230900 "Instrumentation and Control for HVAC."

E. Mount air terminal boxes with a minimum 3 feet of straight of rigid ductwork upstream of inlet flow sensor for sizes 12" diameter and below. Provide a minimum of 3X the inlet diameter of straight rigid duct upstream of the inlet flow sensor for inlet sizes above 12" diameter. Match inlet duct diameter with air terminal inlet collar diameter. Flexible duct connection to air terminal inlet collar will not be permitted

F. Provide at least 24" of clearance on controller side of the air terminal unit. The clearance area shall extend the full length of the supply air terminal unit.

3.4 IDENTIFICATION

A. Label each air terminal unit with plan number, nominal airflow, and maximum and minimum factory-set airflows. Comply with requirements in Section 230553 "Identification for HVAC Piping and Equipment" for equipment labels and warning signs and labels.

3.5 ACCESS DOORS

A. Provide duct access doors in duct downstream of the reheat coil. Duct access doors shall be as large as duct allows with a maximum size of 18"x18".

B. Provide access doors for terminal devices with reheat coils at inlet and discharge side of coils.

3.6 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

C. Tests and Inspections:

1. After installing air terminal units and after electrical circuitry has been energized, test for
2. Leak Test: After installation, fill water coils and test for leaks. Repair leaks and retest until no leaks exist.
3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Air terminal unit will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

3.7 ADJUSTING

A. Coordinate adjustment of air terminal units with section 23 05 93 - Testing, Adjusting and Balancing.

3.8 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.
2. Verify that inlet duct connections are as recommended by air terminal unit manufacturer to achieve proper performance.
3. Verify that controls and control enclosure are accessible.
4. Verify that control connections are complete.
5. Verify that nameplate and identification tag are visible.
6. Verify that controls respond to inputs as specified.

3.9 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain air terminal units.

END OF SECTION 23 36 00

SECTION 23 37 13
DIFFUSERS, REGISTERS, AND GRILLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated, include the following:

1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.
2. Diffuser, Register, and Grille Schedule: Indicate drawing designation, room location, quantity, model number, size, and accessories furnished.

PART 2 - PRODUCTS

2.1 CEILING DIFFUSERS

A. Rectangular and Square Ceiling Diffusers:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. A-J Manufacturing Co., Inc.
    b. Carnes.
    c. Hart & Cooley Inc.
    d. Krueger.
    e. METALAIRE, Inc.
    f. Nailor Industries Inc.
    g. Price Industries.
    h. Titus.
    i. Tuttle & Bailey.

2. Devices shall be specifically designed for variable-air-volume flows.
3. Material: See Air Outlets and Inlets Schedule on drawings.
4. Finish: See Air Outlets and Inlets Schedule on drawings.
5. Face Size: See Air Outlets and Inlets Schedule on drawings.
6. Face Style: Plaque.
7. Mounting: See Air Outlets and Inlets Schedule on drawings.
8. Pattern: Fixed.
9. Dampers: See Air Outlets and Inlets Schedule on drawings.

B. Louver Face Diffuser:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. A-J Manufacturing Co., Inc.
    b. Anemostat Products; a Mestek company.
    c. Carnes.
    d. METALAIRE, Inc.
    e. Nailor Industries Inc.
    f. Price Industries.
    g. Titus.
    h. Tuttle & Bailey.

2. Devices shall be specifically designed for variable-air-volume flows.
3. Material: Aluminum.
4. Finish: Baked enamel, white.
5. Face Size: See Drawings.
6. Mounting: Surface.
7. Pattern: Adjustable core style.
8. Accessories:

    a. Square to round neck adaptor.
    b. Adjustable pattern vanes.
    c. Throw reducing vanes.
    d. Equalizing grid.
    e. Plaster ring.
    f. Safety chain.
    g. Wire guard.
    h. Sectorizing baffles.
    i. Operating rod extension.

2.2 REGISTERS AND GRILLES

A. Adjustable Bar Register:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. A-J Manufacturing Co., Inc.
    b. Carnes.
    c. Hart & Cooley Inc.
    d. Krueger.
    e. METALAIRE, Inc.
    f. Nailor Industries Inc.
    g. Price Industries.
    h. Titus.
    i. Tuttle & Bailey.

2. Material: See Air Outlets and Inlets Schedule on drawings.
3. Finish: See Air Outlets and Inlets Schedule on drawings.
4. Frame: See Air Outlets and Inlets Schedule on drawings.
5. Mounting: See Air Outlets and Inlets Schedule on drawings.
6. Damper Type: See Air Outlets and Inlets Schedule on drawings.

B. Fixed Face Register:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. A-J Manufacturing Co., Inc.
    b. Carnes.
    c. Hart & Cooley Inc.
    d. Krueger.
    e. Nailor Industries Inc.
    f. Price Industries.
    g. Titus.
    h. Tuttle & Bailey.

2. Material: See Air Outlets and Inlets Schedule on drawings.
3. Finish: See Air Outlets and Inlets Schedule on drawings.
4. Face Arrangement: 1/2-by-1/2-by-1/2-inch grid core.
5. Frame: See Air Outlets and Inlets Schedule on drawings
6. Mounting: See Air Outlets and Inlets Schedule on drawings.
7. Damper Type: See Air Outlets and Inlets Schedule on drawings.

C. Fixed Face Grille:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. A-J Manufacturing Co., Inc.
    b. Carnes.
    c. Hart & Cooley Inc.
    d. Krueger.
    e. Nailor Industries Inc.
    f. Price Industries.
    g. Titus.
    h. Tuttle & Bailey.

2. Material: See Air Outlets and Inlets Schedule on drawings.
3. Finish: See Air Outlets and Inlets Schedule on drawings.
4. Face Arrangement: 1/2-by-1/2-by-1/2-inch grid core.
5. Core Construction: Removable.
6. Frame: See Air Outlets and Inlets Schedule on drawings.
7. Mounting Frame: See Air Outlets and Inlets Schedule on drawings.
8. Mounting: See Air Outlets and Inlets Schedule on drawings.

2.3 PERFORATED DUCT DIFFUSER

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. United Sheet Metal Series DDF-SP
2. Semco

B. Perforated, spiral, paintable galvanized steel (ASTM-A257), 24 gauge lock seam duct with standing rib. Diffusers shall be constructed of 360 degree perforated (ribbed), round duct having an overall open area of 23 percent. Each duct diffuser to have orifice plates at approximately 1/3 and 2/3 points in order to provide uniform discharge velocity across the length of the duct diffuser.

1. Duct sizes, types, and accessories as shown on drawings and/or as scheduled. Refer to architectural plan for ceiling installation conditions types. It is the responsibility of the contractor to coordinate frame and border of diffusers with general contractor.
2. Custom air diffusion devices will be provided where indicated on the drawings. Material shall be paintable galvanized steel. Diffusers will be designed to provide no more than 50 fpm terminal velocity at a distance of not more than 4 feet along the length of the diffuser and at not more than 0.20 inch wg pressure.
3. Submittals shall include calculations or design program printouts noting the diffuser length, duct diameter, orifice diameters, spacing of orifice plates and the approximate pressure drop.
4. Diffuser type shall be continuous long length perforated duct assembly.

    a. Materials & Applications: Duct and fittings shall be fabricated from A-60 Paintable ASTM A653 and A924.
    b. Fitting Seams: Tack-welded and sealed seams
    c. End Connections: Standard 2” slip connections and Accuflanges on sizes greater than 40” majors.
    d. Elbows: Gored.

2.4 SOURCE QUALITY CONTROL

A. Verification of Performance: Rate diffusers, registers, and grilles according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas where diffusers, registers, and grilles are to be installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install diffusers, registers, and grilles level and plumb.

B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practical. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.

C. Install diffusers, registers, and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.3 PERFORATED DUCT DIFFUSER

A. When perforated duct diffuser sections arrive on-site, contractors shall stand the product on its end to allow oil residue to drain and dry proper prior to installation.

B. Protect perforated ducts during construction against damage or entry of foreign matter to the inside and clean both inside and outside before operation and painting.

C. Contractor shall clean perforated duct diffuser prior to install. Conduct the following:

1. Cleaning (to remove surface contaminants and zinc corrosion products)

    a. Alkaline cleaning, ammonia cleaning, and solvent cleaning are the most common ways of removing dirt from a galvanized surface. As some cleaners may react differently with different paint systems, the paint manufacturer should be consulted for specific details about paint/cleaner interactions.

2. Profiling (to allow good mechanical bonding).

    a. Contractor shall wipe down with mineral spirits or a degreaser, and then wipe down with white vinegar prior to installation. The GC then prime then paint.

D. Contractor shall suspend perforated duct diffuser from gripple wire rope hanging systems with clutcher mechanism.

3.4 ADJUSTING

A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION 23 37 13

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SECTION 23 41 00
PARTICULATE AIR FILTRATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include dimensions; operating characteristics; required clearances and access; rated flow capacity, including initial and final pressure drop at rated airflow; efficiency and test method; fire classification; furnished specialties; and accessories for each model indicated.

1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For each type of filter and rack to include in emergency, operation, and maintenance manuals.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Provide one complete set(s) of filters for each filter bank. If system includes prefilters, provide only prefilters.
2. Provide one container(s) of red oil for inclined manometer filter gage.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. ASHRAE Compliance:

1. Comply with applicable requirements in ASHRAE 62.1, Section 4 - "Outdoor Air Quality"; Section 5 - "Systems and Equipment"; and Section 7 - "Construction and Startup."
2. Comply with ASHRAE 52.1 for arrestance and ASHRAE 52.2 for MERV for methods of testing and rating air-filter units.

C. Comply with NFPA 90A and NFPA 90B.

D. Supply all filters from one manufacturer, unless indicated otherwise.

E. Assemble filter components to form filter banks from one manufacturer.

F. Filter frames and support structures shall be fabricated by equipment manufacturers.

1.6 COORDINATION

A. Coordinate sizes and locations of concrete bases. Cast anchor-bolt inserts into bases.

PART 2 - PRODUCTS

2.1 PLEATED PANEL FILTERS

A. Description: Factory-fabricated, self-supported, extended-surface, pleated, panel-type, disposable air filters with holding frames.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. AAF International.
    b. Airguard.
    c. Camfil Farr.
    d. Filtration Group.
    e. Flanders-Precisionaire.
    f. Purafil, Inc.
    g. Research Products Corp.

B. Filter Unit Class: UL 900, Class 2.

C. Media: Interlaced glass or synthetic fibers coated with nonflammable adhesive.

1. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
2. Media shall be coated with an antimicrobial agent.
3. Separators shall be bonded to the media to maintain pleat configuration.
4. Welded wire grid shall be on downstream side to maintain pleat.
5. Media shall be bonded to frame to prevent air bypass.
6. Support members on upstream and downstream sides to maintain pleat spacing.

D. Filter-Media Frame: Cardboard frame with perforated metal retainer sealed or bonded to the media.

E. Mounting Frames: Welded galvanized steel, with gaskets and fasteners; suitable for bolting together into built-up filter banks.

F. Capacities and Characteristics:

1. See schedule on drawings.
2. MERV Rating: Per scheduled value when tested according to ASHRAE 52.2.

2.2 DISPOSABLE RIGID CARTRIDGE TYPE AIR FILTERS

A. Description: Factory-fabricated, disposable, packaged air filters with media perpendicular to airflow, and with holding frames.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. AAF International.
b. Airguard.
c. Camfil Farr.
d. Filtration Group.
e. Flanders-Precisionaire.
f. Purafil, Inc.
g. Research Products Corp.

B. Filter Unit Class: UL 900, Class 1.

C. Media: 2-inch or 4-inch deep fibrous material constructed so individual pleats are maintained in tapered form under rated-airflow conditions by flexible corrugated aluminum internal supports.

1. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
2. Media shall be coated with an antimicrobial agent.

D. Mounting Frames: Welded galvanized steel, with gaskets and fasteners; suitable for bolting together into built-up filter banks.

E. Capacities and Characteristics:

1. See schedule on drawings.
2. MERV Rating: Per scheduled value when tested according to ASHRAE 52.2.

2.3 FILTER GAGES

A. Diaphragm-type gage with dial and pointer in metal case, vent valves, black figures on white background, and front recalibration adjustment.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Airguard.
b. Dwyer Instruments, Inc.

2. Diameter: 4-1/2 inches.

3. Scale Range for Filter Media Having a Recommended Final Resistance of 0.5- to 1.0-Inch wg or Less: 0- to 1.0-inch wg.

B. Manometer-Type Filter Gage: Molded plastic, with epoxy-coated aluminum scale and logarithmic-curve tube gage with integral leveling gage, graduated to read from 0- to 3.0-inch wg, and accurate within 3 percent of the full scale range.

C. Accessories: Static-pressure tips, tubing, gage connections, and mounting bracket.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Position each filter unit with clearance for normal service and maintenance. Anchor filter holding frames to substrate.

B. Install filters in position to prevent passage of unfiltered air.

C. Install filter gage for each filter bank.

D. Do not operate fan system until filters (temporary or permanent) are in place. Replace temporary filters used during construction and testing with new, clean filters.

E. Install filter-gage, static-pressure taps upstream and downstream from filters. Install filter gages on filter banks with separate static-pressure taps upstream and downstream from filters. Mount filter gages on outside of filter housing or filter plenum in an accessible position. Adjust and level inclined gages.

F. Coordinate filter installations with duct and air-handling-unit installations.

3.2 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Tests and Inspections:

1. Operate automatic roll filters to demonstrate compliance with requirements.
2. Test for leakage of unfiltered air while system is operating.

C. Air filter will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

E. Operate installed air filters and housings to demonstrate compliance with specifications.

F. Correct malfunctioning units at site, then retest to demonstrate compliance; otherwise, remove and replace with new units and proceed with retesting.

G. DO NOT operate fan systems connected to filter banks until filters (temporary or permanent) are in place. Replace filters used during construction. Install new filters at substantial completion.

3.3 CLEANING

A. After completing system installation and testing, adjusting, and balancing of air-handling and air-distribution systems, clean filter housings and install new filter media.

END OF SECTION 23 41 00

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SECTION 23 62 00
AIR COOLED COMPRESSOR AND CONDENSER UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes packaged, refrigerant compressor and condenser units.

1.3 ACTION SUBMITTALS

A. Product Data: For each compressor and condenser unit. Include rated capacities, operating characteristics, and furnished specialties and accessories. Include equipment dimensions, weights and structural loads, required clearances, method of field assembly, components, and location and size of each field connection.
   1. Wiring Diagrams: For power, signal, and control wiring.

B. Field quality-control reports.

C. Warranty: Sample of special warranty.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For compressor and condenser units to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Fabricate and label refrigeration system according to ASHRAE 15, "Safety Standard for Refrigeration Systems."

C. ASHRAE/IESNA 90.1 Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6, "Heating, Ventilating, and Air-Conditioning."

1.6 COORDINATION

A. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 07.

B. Coordinate location of piping and electrical rough-ins.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of compressor and condenser units that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

   a. Compressor failure.
   b. Condenser coil leak.

2. Warranty Period: Five (5) years from date of Substantial Completion.
3. Warranty Period (Compressor Only): Five (5) years from date of Substantial Completion.
4. Warranty Period (Components Other Than Compressor): Five (5) years from date of Substantial Completion.
5. Warranty Period (Condenser Coil Only): Five (5) years from date of Substantial Completion.

1.8 EXTRA MATERIALS

A. Supply one (1) complete charge of lubricating oil in addition to that placed in system.

PART 2 - PRODUCTS

2.1 COMPRESSOR AND CONDENSER UNITS, AIR COOLED, 6 TO 10 TONS

A. Basis-of-Design Product: The design is based on the following:

1. Trane; a business of American Standard Companies.

B. Subject to compliance with requirements, provide the named product or a comparable product by one the following:

1. Aaon HVAC
2. Carrier Corporation; Commercial HVAC Systems.
3. Daikin/McQuay International.
4. YORK; a Johnson Controls company.

C. Description: Factory assembled and tested, air cooled; consisting of casing, compressors, condenser coils, condenser fans and motors, and unit controls.

D. 2-Staged Compressors: Hermetic scroll compressor designed for service with crankcase sight glass, crankcase heater, and backseating service access valves on suction and discharge ports.

1. Capacity Control: Hot-gas bypass.

E. Refrigerant: R-410A.

F. Condenser Coil: Seamless copper-tube, aluminum-fin coil, including subcooling circuit and backseating liquid-line service access valve. Factory pressure test coils, then dehydrate by drawing a vacuum and fill with a holding charge of nitrogen or refrigerant.

G. Condenser Fans: Propeller-type vertical discharge; either directly or belt driven. Include the following:

1. Permanently lubricated, ball-bearing totally enclosed motors.
2. Separate motor for each fan.
3. Dynamically and statically balanced fan assemblies.

H. Operating and safety controls include the following:

1. Manual-reset, high-pressure cutout switches.
2. Automatic-reset, low-pressure cutout switches.
3. Low-oil-pressure cutout switch.
4. Compressor-winding thermostat cutout switch.
5. Three-leg, compressor-overload protection.
6. Control transformer.
7. Magnetic contactors for compressor and condenser fan motors.
8. Timer to prevent excessive compressor cycling.

I. Accessories:

1. Low-voltage thermostat and subbase to control compressor and condenser unit and evaporator fan.
2. Low-Ambient Controller: Cycles condenser fan to permit operation down to 0 deg F.
3. Gage Panel: Package with refrigerant circuit suction and discharge gages.
4. Hot-gas bypass kit.
5. Part-winding-start timing relay, circuit breakers, and contactors.
6. Refrigerant discharge and suction pressure gauges.
7. Oil pressure gauge.

J. Unit Casings: Designed for outdoor installation with weather protection for components and controls and with removable panels for required access to compressors, controls, condenser fans, motors, and drives. Additional features include the following:

1. Steel, galvanized or zinc coated, for exposed casing surfaces; treated and finished with manufacturer's standard paint coating.
2. Perimeter base rail with forklift slots and lifting holes to facilitate rigging.
3. Gasketed control panel door.
4. Nonfused disconnect switch, factory mounted and wired, for single external electrical power connection.
5. Condenser coil hail guard grille.

2.2 MOTORS

A. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."

1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.

2.3 SOURCE QUALITY CONTROL

A. Verification of Performance: Rate compressor and condenser units according to ARI 206/110.

B. Energy Efficiency: Equal to or greater than prescribed by ASHRAE/IESNA 90.1, "Energy Efficient Design of New Buildings except Low-Rise Residential Buildings," Section 6, "Heating, Ventilating, and Air-Conditioning."

C. Test and inspect shell and tube condensers according to ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

D. Testing Requirements: Factory test sound-power-level ratings according to ARI 270.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of compressor and condenser units.

B. Examine roughing-in for refrigerant piping systems to verify actual locations of piping connections before equipment installation.

C. Examine walls, floors, and roofs for suitable conditions where compressor and condenser units will be installed.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install units level and plumb, firmly anchored in locations indicated.

B. Install roof-mounting units on equipment supports specified in Division 07.

C. Equipment Mounting:

1. Comply with requirements for vibration isolation devices specified in Section 230548.13 "Vibration Controls for HVAC."

D. Maintain manufacturer's recommended clearances for service and maintenance.

E. Loose Components: Install electrical components, devices, and accessories that are not factory mounted.

3.3 CONNECTIONS

A. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.

B. Connect precharged refrigerant tubing to unit's quick-connect fittings. Install tubing so it does not interfere with access to unit. Install furnished accessories.

C. Connect refrigerant piping to air-cooled compressor and condenser units; maintain required access to unit. Install furnished field-mounted accessories. Refrigerant piping and specialties are specified in Section 232300 "Refrigerant Piping."

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test. Certify compliance with test parameters.
2. Leak Test: After installation, charge system with refrigerant and oil and test for leaks. Repair leaks, replace lost refrigerant and oil, and retest until no leaks exist.
3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor operation and unit operation, product capability, and compliance with requirements.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
5. Verify proper airflow over coils.

C. Verify that vibration isolation and flexible connections properly dampen vibration transmission to structure.

D. Compressor and condenser units will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports.

3.5 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.
1. Complete installation and startup checks according to manufacturer's written instructions and perform the following:

a. Inspect for physical damage to unit casing.
b. Verify that access doors move freely and are weathertight.
c. Clean units and inspect for construction debris.
d. Verify that all bolts and screws are tight.
e. Adjust vibration isolation and flexible connections.
f. Verify that controls are connected and operational.

B. Lubricate bearings on fan motors.

C. Verify that fan wheel is rotating in the correct direction and is not vibrating or binding.

D. Adjust fan belts to proper alignment and tension, if belts are provided.

E. Start unit according to manufacturer's written instructions and complete manufacturer's startup checklist.

F. Measure and record airflow and air temperature rise over coils.

G. Verify proper operation of condenser capacity control device.

H. Verify that vibration isolation and flexible connections properly dampen vibration transmission to structure.

I. After startup and performance test, lubricate bearings.

J. Shut-down system when initial start-up and testing takes place in winter and machines are to remain inoperative.

K. Repeat start-up and testing operation at beginning of first cooling season.

L. Shut-down system if initial start-up and testing takes place in winter and machines are to remain inoperative. Repeat start-up and testing operation out beginning of first cooling season.

M. Provide cooling season start-up and winter season shut-down for first year of operation.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain compressor and condenser units.

END OF SECTION 23 62 00

SECTION 23 74 13
PACKAGED, OUTDOOR, CENTRAL-STATION AIR-HANDLING UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 ACTION SUBMITTALS

A. Product Data: Include manufacturer's technical data for each RTU, including rated capacities, dimensions, required clearances, characteristics, furnished specialties, and accessories.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Wiring Diagrams: Power, signal, and control wiring.

1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For RTUs to include in operation and maintenance manuals.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fan Belts: One set for each belt-driven fan, if belts provided with unit.
2. Filters: One set of filters for each unit.

1.5 QUALITY ASSURANCE

A. ARI Compliance:

1. Comply with ARI 203/110 and ARI 303/110 for testing and rating energy efficiencies for RTUs.
2. Comply with ARI 270 for testing and rating sound performance for RTUs.

B. ASHRAE Compliance:

1. Comply with ASHRAE 15 for refrigeration system safety.
2. Comply with ASHRAE 33 for methods of testing cooling and heating coils.
3. Comply with applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."

C. ASHRAE/IESNA 90.1 Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."

D. NFPA Compliance: Comply with NFPA 90A and NFPA 90B.

E. UL Compliance: Comply with UL 1995.

F. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to replace components of RTUs that fail in materials or workmanship within specified warranty period.

1. Warranty Period for Compressors: Manufacturer's standard, but not less than five (5) years from date of Substantial Completion.
2. Warranty Period for Gas Furnace Heat Exchangers: Manufacturer's standard, but not less than ten (10) years from date of Substantial Completion.
3. Warranty Period for Solid-State Ignition Modules: Manufacturer's standard, but not less than three (3) years from date of Substantial Completion.
4. Warranty Period for Control Boards: Manufacturer's standard, but not less than three (3) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: The design is based on the following:

1. Trane; American Standard Companies, Inc.

B. Subject to compliance with requirements, provide the named product or a comparable product by one the following:

1. AAON, Inc.
2. Carrier Corporation.
3. Daikin/McQuay International.
4. YORK International Corporation.

2.2 CASING

A. General Fabrication Requirements for Casings: Formed and reinforced foil faced insulated panels fabricated to allow removal for access to internal parts and components, with joints between sections sealed.

B. Exterior Casing Material: Galvanized steel with factory-painted finish, with pitched roof panels and knockouts with grommet seals for electrical and piping connections and lifting lugs.

1. Exterior Casing Thickness: 0.0626 inch thick.

C. Inner Casing Fabrication Requirements:

1. Inside Casing: Galvanized steel, 0.034 inch thick.

D. Casing Insulation and Adhesive: Comply with NFPA 90A or NFPA 90B.

1. Materials: ASTM C 1071, Type I.
2. Thickness: 1 inch.
3. Liner materials shall have air-stream surface coated with an erosion- and temperature-resistant coating or faced with a plain or coated fibrous mat or fabric.
4. Liner Adhesive: Comply with ASTM C 916, Type I.

E. Condensate Drain Pans: Formed sections of stainless-steel sheet, a minimum of 2 inches deep, and complying with ASHRAE 62.1.
1. Drain Connections: Threaded nipple.

F. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

2.3 FANS

A. Direct-Driven Supply-Air Fans: Double width or plenum fans with either forward curved or backward inclined, centrifugal; with permanently lubricated, motor resiliently mounted in the fan inlet. Aluminum or painted-steel wheels, and galvanized- or painted-steel fan scrolls.

B. Condenser-Coil Fan: Propeller, mounted on shaft of permanently lubricated motor.

C. Relief-Air Fan (Power Relief Kit): Forward curved, shaft mounted on permanently lubricated motor.

D. Fan Motor: Comply with requirements in Section 230513 "Common Motor Requirements for HVAC Equipment."

2.4 COILS

A. Supply-Air Refrigerant Coil:

1. Aluminum -plate fin and seamless copper tube in steel casing with equalizing-type vertical distributor.
2. Polymer strip shall prevent all copper coil from contacting steel coil frame or condensate pan.
3. Coil Split: Interlaced.
4. Condensate Drain Pan: Stainless steel formed with pitch and drain connections complying with ASHRAE 62.1.

2.5 REFRIGERANT CIRCUIT COMPONENTS

A. Number of Refrigerant Circuits: Two, Except for 5 ton units.

B. Compressor: Hermetic, scroll, mounted on vibration isolators; with internal overcurrent and high-temperature protection, internal pressure relief, and crankcase heater.

C. Refrigeration Specialties:

1. Refrigerant: R-410A.
2. Expansion valve with replaceable thermostatic element.
3. Refrigerant filter/dryer.
4. Manual-reset high-pressure safety switch.
5. Automatic-reset low-pressure safety switch.
6. Minimum off-time relay.
7. Automatic-reset compressor motor thermal overload.
8. Brass service valves installed in compressor suction and liquid lines.
9. Low-ambient kit high-pressure sensor.

2.6 AIR FILTRATION

A. Minimum arrestance according to ASHRAE 52.1, and a minimum efficiency reporting value (MERV) according to ASHRAE 52.2.

1. Pleated: Minimum 90 percent arrestance, and MERV 13.
2. Reference specification section 234100.

2.7 GAS FURNACE

A. Description: Factory assembled, piped, and wired; complying with ANSI Z21.47 and NFPA 54.

1. CSA Approval: Designed and certified by and bearing label of CSA.

B. Burners: Stainless steel for modulating and Aluminum for two-stage.

1. Fuel: Natural gas.
2. Ignition: Electronically controlled electric spark or hot-surface igniter with flame sensor.

C. Heat-Exchanger and Drain Pan: Stainless steel for modulating and Aluminum for two-stage.

D. Power Vent: Integral, motorized centrifugal fan interlocked with gas valve with vertical extension.

E. Safety Controls:

1. Gas Control Valve: Modulating or 2-stage per schedule.
2. Gas Train: Single-body, regulated, redundant, 24-V ac gas valve assembly containing pilot solenoid valve, pilot filter, pressure regulator, pilot shutoff, and manual shutoff.

2.8 DAMPERS

A. Outdoor-Air Damper: Linked damper blades, for 0 to 25 percent outdoor air, with motorized damper filter.

B. Outdoor- and Return-Air Mixing Dampers: Parallel- or opposed-blade galvanized-steel dampers mechanically fastened to cadmium plated for galvanized-steel operating rod in reinforced cabinet. Connect operating rods with common linkage and interconnect linkages so dampers operate simultaneously.

1. Damper Motor: Modulating with adjustable minimum position.
2. Relief-Air Damper: Gravity actuated or motorized, as required by ASHRAE/IESNA 90.1, with bird screen and hood.
3. Provide low leak dampers per the IECC 2015 code.

C. Outdoor-Air Damper: Linked damper blades, for 0 to 25 percent outdoor air, with motorized damper filter.

2.9 POWER EXHAUST KIT

A. Provide manufacturer's power exhaust kit unit as relief-air fan for rooftop units per schedules. Install per manufacturer's instructions.

B. Provide for separate single connection of power to unit and outside power exhaust kit unit. Provide control-circuit transformer with built-in overcurrent protection. EC shall provide disconnect switch. Refer to Div. 26.

2.10 ELECTRICAL POWER CONNECTION

A. Provide for single connection of power to unit with unit-mounted disconnect switch accessible from outside unit and control-circuit transformer with built-in overcurrent protection.

2.11 CONTROLS

A. Control equipment and sequence of operation are specified in Section 230900 "Instrumentation and Control for HVAC."

B. Basic Unit Controls:

1. Control-voltage transformer.
2. Wall-mounted thermostat or sensor with the following features:

    a. Heat-cool-off switch.
    b. Fan on-auto switch.
    c. Fan-speed switch.
    d. Automatic changeover.
    e. Adjustable deadband.
    f. Exposed set point.

g. Exposed indication.
h. Degree F indication.
i. Unoccupied-period-override push button.
j. Data entry and access port to input temperature set points, occupied and unoccupied periods, and output room temperature, supply-air temperature, operating mode, and status.

C. DDC Controller:

1. Controller shall have volatile-memory backup.
2. Safety Control Operation:

a. Smoke Detectors: Stop fan and close outdoor-air damper if smoke is detected. Provide additional contacts for alarm interface to fire alarm control panel.
b. Firestats: Stop fan and close outdoor-air damper if air greater than 130 deg F enters unit. Provide additional contacts for alarm interface to fire alarm control panel.
c. Fire Alarm Control Panel Interface: Provide control interface to coordinate with Fire Alarm system operating sequence described in Division 28.
d. Low-Discharge Temperature: Stop fan and close outdoor-air damper if supply air temperature is less than 40 deg F.

3. Scheduled Operation: Occupied and unoccupied periods on seven-day clock with a minimum of two programmable periods per day.
4. Unoccupied Period:

a. Heating Setback: 10 deg F.
b. Cooling Setback: System off.
c. Override Operation: Two hours.

5. Supply Fan Operation:

a. Occupied Periods: Run fan continuously.
b. Unoccupied Periods: Cycle fan to maintain setback temperature.

6. Refrigerant Circuit Operation:

a. Occupied Periods: Cycle or stage compressors] to match compressor output to cooling load to maintain room temperature. Cycle condenser fans to maintain maximum hot-gas pressure. Operate low-ambient control kit to maintain minimum hot-gas pressure.

7. Gas Furnace Operation:

a. Occupied Periods: Modulate burner to maintain room temperature.
b. Unoccupied Periods: Cycle burner to maintain setback temperature.

8. Fixed Minimum Outdoor-Air Damper Operation:

a. Occupied Periods: Open to 15 percent.

b. Unoccupied Periods: Close the outdoor-air damper.

9. Economizer Outdoor-Air Damper Operation:

a. Occupied Periods: Open to 15 percent fixed minimum intake, and maximum 100 percent of the fan capacity to comply with ASHRAE Cycle II. Controller shall permit air-side economizer operation when outdoor air is less than 68 deg F. Use mixed-air and outdoor-air temperature to adjust mixing dampers. Start relief-air fan with end switch on outdoor-air damper. During economizer cycle operation, lock out cooling.
b. Unoccupied Periods: Close outdoor-air damper and open return-air damper.
c. Outdoor-Airflow Monitor: Accuracy maximum plus or minus 5 percent within 15 and 100 percent of total outdoor air. Monitor microprocessor shall adjust for temperature, and output shall range from 2- to 10-V dc. Similar to Trane Traq damper device or equal.

10. Carbon Dioxide Sensor Operation:

a. Occupied Periods: Reset minimum outdoor-air ratio down to minimum 10 Insert percent percent to maintain maximum 1024-ppm concentration.
b. Unoccupied Periods: Close outdoor-air damper and open return-air damper.

D. Interface Requirements for HVAC Instrumentation and Control System:

1. Interface relay for scheduled operation.
2. Interface relay to provide indication of fault at the central workstation and diagnostic code storage.
3. Provide BACnet or LonWorks compatible interface for central HVAC control workstation for the following:

a. Adjusting set points.
b. Monitoring supply fan start, stop, and operation.
c. Inquiring data to include outdoor-air damper position, supply- and room-air temperature.
d. Monitoring occupied and unoccupied operations.

2.12 ACCESSORIES

A. Duplex, 115-V, ground-fault-interrupter outlet with 15-A overcurrent protection. Include transformer if required**.** Outlet shall be energized even if the unit main disconnect is open.

B. Low-ambient kit using staged condenser fans for operation down to 35 deg F.

C. Filter differential pressure switch with sensor tubing on either side of filter. Set for final filter pressure loss.

D. Coil guards of painted, galvanized-steel wire.

2.13 ROOF CURBS

A. Materials: Galvanized steel with corrosion-protection coating, watertight gaskets, and factory-installed wood nailer; complying with NRCA standards.

1. Curb Insulation and Adhesive: Comply with NFPA 90A or NFPA 90B.

a. Materials: ASTM C 1071, Type I or II.
b. Thickness: 1 inch.

2. Application: Factory applied with adhesive and mechanical fasteners to the internal surface of curb.

a. Liner Adhesive: Comply with ASTM C 916, Type I.
b. Mechanical Fasteners: Galvanized steel, suitable for adhesive attachment, mechanical attachment, or welding attachment to duct without damaging liner when applied as recommended by manufacturer and without causing leakage in cabinet.
c. Liner materials applied in this location shall have air-stream surface coated with a temperature-resistant coating or faced with a plain or coated fibrous mat or fabric depending on service air velocity.
d. Liner Adhesive: Comply with ASTM C 916, Type I.

B. Curb Height: 18 inches.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of RTUs.

B. Examine roughing-in for RTUs to verify actual locations of piping and duct connections before equipment installation.

C. Examine roofs for suitable conditions where RTUs will be installed.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Equipment Mounting:

1. Comply with requirements for vibration isolation devices specified in Section 230548.13 "Vibration Controls for HVAC."

B. Roof Curb: Install on roof structure or concrete base, level and secure, according to NRCA's "Low-Slope Membrane Roofing Construction Details Manual," Illustration "Raised Curb Detail for Rooftop Air Handling Units and Ducts." Install RTUs on curbs and coordinate roof penetrations and flashing with roof construction specified in Division

07 Section "Roof Accessories." Secure RTUs to upper curb rail, and secure curb base to roof framing or concrete base with anchor bolts.

3.3 CONNECTIONS

A. Install condensate drain, minimum connection size, with trap and indirect connection to nearest roof drain or area drain.

B. Install piping adjacent to RTUs to allow service and maintenance.

1. Gas Piping: Comply with applicable requirements in Section 231123 "Facility Natural-Gas Piping." Connect gas piping to burner, full size of gas train inlet, and connect with union and shutoff valve with sufficient clearance for burner removal and service.

C. Duct installation requirements are specified in other HVAC Sections. Drawings indicate the general arrangement of ducts. The following are specific connection requirements:

1. Install ducts to termination at top of roof curb.
2. Remove roof decking only as required for passage of ducts. Do not cut out decking under entire roof curb.
3. Connect supply ducts to RTUs with flexible duct connectors specified in Section 233300 "Air Duct Accessories."
4. Install return-air duct continuously through roof structure.

D. If objectionable noise or vibration is produced or transmitted to or through the building structure by equipment piping, ducts, or other parts of the work, the Contractor shall rectify such conditions without cost to the Contract. If the item of equipment is judged to produce objectionable noise or vibration, demonstrate without cost to the Contract that the equipment performs within the designated vibration limits specified.

E. Where inlet and outlet ductwork at any fan is changed from that shown on drawings, submit scaled layout of the change and system effect factor calculations, indicating increased static pressure requirements as described in AMCA Publication 201. The Contractor shall be responsible for any motor, drive and/or wiring changes required as result of duct configuration changes at the fan.

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections. Report results in writing.

B. Perform tests and inspections and prepare test reports.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing. Report results in writing.

C. Tests and Inspections:

1. After installing RTUs and after electrical circuitry has been energized, test units for compliance with requirements.
2. Inspect for and remove shipping bolts, blocks, and tie-down straps.
3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Remove and replace malfunctioning units and retest as specified above.

3.5 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

B. Complete installation and startup checks according to manufacturer's written instructions and do the following:

1. Inspect for visible damage to unit casing.
2. Inspect for visible damage to furnace combustion chamber.
3. Inspect for visible damage to compressor, coils, and fans.
4. Inspect internal insulation.
5. Verify that labels are clearly visible.
6. Verify that clearances have been provided for servicing.
7. Verify that controls are connected and operable.
8. Verify that filters are installed.
9. Clean condenser coil and inspect for construction debris.
10. Clean furnace flue and inspect for construction debris.
11. Connect and purge gas line.
12. Remove packing from vibration isolators.
13. Inspect operation of barometric relief dampers.
14. Verify lubrication on fan and motor bearings.
15. Inspect fan-wheel rotation for movement in correct direction without vibration and binding.
16. Adjust fan belts to proper alignment and tension.
17. Start unit according to manufacturer's written instructions.

    a. Start refrigeration system.
    b. Do not operate below recommended low-ambient temperature.
    c. Complete startup sheets and attach copy with Contractor's startup report.

18. Inspect and record performance of interlocks and protective devices; verify sequences.
19. Operate unit for an initial period as recommended or required by manufacturer.
20. Perform the following operations for both minimum and maximum firing. Adjust burner for peak efficiency.

    a. Measure gas pressure on manifold.
    b. Inspect operation of power vents.
    c. Measure combustion-air temperature at inlet to combustion chamber.
    d. Measure flue-gas temperature at furnace discharge.

e. Perform flue-gas analysis. Measure and record flue-gas carbon dioxide and oxygen concentration.
f. Measure supply-air temperature and volume when burner is at maximum firing rate and when burner is off. Calculate useful heat to supply air.

21. Calibrate thermostats.
22. Adjust and inspect high-temperature limits.
23. Inspect outdoor-air dampers for proper stroke and interlock with return-air dampers.
24. Start refrigeration system and measure and record the following when ambient is a minimum of 15 deg F above return-air temperature:

    a. Coil leaving-air, dry- and wet-bulb temperatures.
    b. Coil entering-air, dry- and wet-bulb temperatures.
    c. Outdoor-air, dry-bulb temperature.
    d. Outdoor-air-coil, discharge-air, dry-bulb temperature.

25. Inspect controls for correct sequencing of heating, mixing dampers, refrigeration, and normal and emergency shutdown.
26. Measure and record the following minimum and maximum airflows. Plot fan volumes on fan curve.

    a. Supply-air volume.
    b. Return-air volume.
    c. Relief-air volume.
    d. Outdoor-air intake volume.

27. Simulate maximum cooling demand and inspect the following:

    a. Compressor refrigerant suction and hot-gas pressures.
    b. Short circuiting of air through condenser coil or from condenser fans to outdoor-air intake.

28. Verify operation of remote panel including pilot-light operation and failure modes. Inspect the following:

    a. High-temperature limit on gas-fired heat exchanger.
    b. Low-temperature safety operation.
    c. Filter high-pressure differential alarm.
    d. Economizer to minimum outdoor-air changeover.
    e. Relief-air fan operation.
    f. Smoke and firestat alarms.

29. After startup and performance testing and prior to Substantial Completion, replace existing filters with new filters.

3.6 CLEANING AND ADJUSTING

A. After completing system installation and testing, adjusting, and balancing RTU and air-distribution systems, clean filter housings and install new filters.

3.7 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain RTUs. Refer to Division 01 Section "Demonstration and Training."

END OF SECTION 23 74 13

SECTION 23 81 26
SPLIT-SYSTEM AIR-CONDITIONERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. Include performance data in terms of capacities, outlet velocities, static pressures, sound power characteristics, motor requirements, and electrical characteristics.

B. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

C. Wiring Diagrams: For power, signal, and control wiring.

1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For split-system air-conditioning units to include in emergency, operation, and maintenance manuals.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. ASHRAE Compliance:

1. Fabricate and label refrigeration system to comply with ASHRAE 15, "Safety Standard for Refrigeration Systems."
2. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 4 - "Outdoor Air Quality," Section 5 - "Systems and Equipment," Section 6 - " Procedures," and Section 7 - "Construction and System Start-up."

1.5 COORDINATION

A. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: The design is based on the following:

1. Mitsubishi Electric & Electronics USA, Inc.; HVAC Advanced Products Division.

B. Subject to compliance with requirements, provide the named product or a comparable product by one the following:

1. Carrier Corporation; Home Comfort and HVAC Building & Industrial Systems.
2. Daikin
3. LG Air Conditioning Technologies.
4. SANYO North America Corporation; SANYO Fisher Company.
5. Trane; a business of American Standard companies.

2.2 INDOOR UNITS (5 TONS OR LESS)

A. Wall-Mounted, Evaporator-Fan Components:

1. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins and thermal-expansion valve. Comply with ARI 206/110.
2. Fan: Direct drive, centrifugal.
3. Fan Motors:

    a. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements specified in "Common Motor Requirements for HVAC Equipment."
    b. Multitapped, multispeed with internal thermal protection and permanent lubrication.
    c. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in electrical Sections.
    d. Mount unit-mounted disconnect switches on exterior of unit.

4. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.
5. Condensate Drain Pans:

    a. Fabricated with one percent slope in at least two planes to collect condensate from cooling coils (including coil piping connections, coil headers, and return bends) and humidifiers, and to direct water toward drain connection.

1) Length: Extend drain pan downstream from leaving face to comply with ASHRAE 62.1.

6. Filters: Cleanable

2.3 OUTDOOR UNITS (5 TONS OR LESS)

A. Air-Cooled, Compressor-Condenser Components:

1. Casing: Steel, finished with baked enamel in color selected by Architect, with removable panels for access to controls, weep holes for water drainage, and mounting holes in base. Provide brass service valves, fittings, and gage ports on exterior of casing.
2. Compressor: Hermetically sealed with crankcase heater and mounted on vibration isolation device. Compressor motor shall have thermal- and current-sensitive overload devices, start capacitor, relay, and contactor.

    a. Compressor Type: Scroll.
    b. Refrigerant Charge: R-410A.
    c. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins and liquid subcooler. Comply with ARI 206/110.

3. Fan: Aluminum-propeller type, directly connected to motor.
4. Motor: Permanently lubricated, with integral thermal-overload protection.
5. Refrigeration Components:

    a. Refrigerant circuit components shall include brass external liquid line service valve with service gage port connections, suction line service valve with service gage connection port, service gage port connections on compressor suction and discharge lines, accumulator, pressure relief, and a full charge of refrigerant.

6. Controls and Safeties:
    a. Operating controls and safeties shall be factory selected, assembled, and tested. The minimum control functions shall include the following:

        1) Controls:

            a) Time delay restart to prevent compressor reverse rotation on single-phase scroll compressors.
            b) Automatic restart on power failure.
            c) Safety lockout if any outdoor unit safety is open.
            d) A time delay control sequence provided through the fan coil board, thermostat, or controller.
            e) Automatic outdoor-fan motor protection.

        2) Safeties:

            a) System diagnostics.

b) Compressor motor current and temperature overload protection.
c) High pressure relief.
d) Outdoor fan failure protection.

7. Electrical Requirements:

a. Unit electrical power shall be a single point connection.
b. Unit control voltage to the indoor-fan coil shall be 24 V.
c. All power and control wiring must be installed per NEC and all local building codes.

1) High- and low-voltage terminal block connections.

d. Accessories:

1) Low-Ambient Operation:

a) The control shall be capable of enabling unit operation and start-up with outdoor temperatures to 0 F.
b) Installation of kit shall not require changing the outdoor-fan motor.

2.4 ACCESSORIES

A. Thermostat: Low voltage with subbase to control compressor and evaporator fan.

B. Automatic-reset timer to prevent rapid cycling of compressor.

C. Refrigerant Line Kits: Soft-annealed copper suction and liquid lines factory cleaned, dried, pressurized, and sealed; factory-insulated suction line with flared fittings at both ends.

1. Minimum Insulation Thickness: 1 inch thick.

D. Unit shall be furnished with integral wall-mounting bracket and mounting hardware.

E. Drain Hose: For condensate.

F. Outdoor Unit Support System.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. "Big Foot"; Rector Seal
b. Equivalent as approved.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install units level and plumb.

B. Install evaporator-fan components using manufacturer's standard mounting devices securely fastened to building structure.

C. Install roof-mounted, compressor-condenser components on equipment supports specified in Section Division 07. Anchor units to supports with removable, cadmium-plated fasteners.

D. Equipment Mounting:

1. Comply with requirements for vibration isolation devices specified in Section 230548.13 "Vibration Controls for HVAC."

E. Install and connect precharged refrigerant tubing to component's quick-connect fittings. Install tubing to allow access to unit.

3.2 REFRIGERANT PIPING SIZING

A. The unit manufacturer shall verify the final refrigeration pipe sizing process to ensure conformance to specific unit requirements such as maximum lengths, refrigerant velocities, unloading considerations and proper oil return. This contractor shall provide refrigeration piping drawings from the field which details the way the piping will actually be installed.

3.3 REFRIGERANT PIPING ACCESSORIES

A. Install accessories in accordance with the manufacturer’s written instructions and recommendations.

3.4 EQUIPMENT SUPPORT SYSTEM

A. The condenser stand shall be mounted free standing on the roof surface in a convenient position to facilitate connection of the linesets to the condensers as well as access for maintenance.

B. Condenser stand shall be designed so that the feet and the supporting pads on which they rest do not penetrate the roofing membrane.

C. Condenser stand shall be of modular design to enable the cross members to be lineally adjusted during assembly to accept different configurations of condensers.

D. Condenser stand shall accommodate double decker cross members where space requirements mandate vertical stacking of condensers.

E. Condenser stand shall be fabricated from square steel tubing with a minimum wall thickness of 16 gauge.

F. For loads to a maximum of 660 lbs, cross members shall have a minimum cross section of 1.5” x 1.5“.

G. Condensers shall be secured to the cross bars with pressed steel clamps which shall be bolted to the cross members.

H. Steel clamps shall allow sufficient space for anti-vibration pads to be fitted under the feet of the condenser.

3.5 CONNECTIONS

A. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Where piping is installed adjacent to unit, allow space for service and maintenance of unit.

C. Ground equipment according to Division 26.

D. Electrical Connections: Comply with requirements in Division 26 Sections for power wiring, switches, and motor controls.

3.6 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. Remove and replace malfunctioning units and retest as specified above.

C. Prepare test and inspection reports.

3.7 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.

3.8 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain split system air conditioning units.

END OF SECTION 238126

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SECTION 23 82 16
AIR COILS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following types of air coils:

1. Hot-water reheat coils.
2. Refrigerant.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each air coil. Include rated capacity and pressure drop for each air coil.

B. Field quality-control test reports.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For air coils to include in operation and maintenance manuals.

B. ASHRAE Compliance:

1. Comply with ASHRAE 15 for refrigeration system safety.
2. Comply with ASHRAE 33 for methods of testing cooling and heating coils.
3. Comply with applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."

PART 2 - PRODUCTS

2.1 WATER COILS

A. Basis-of-Design Product: The design is based on the following:

1. Trane; a business of American Standard Companies.

B. Subject to compliance with requirements, provide the named product or a comparable product by one the following:

1. Aerofin Corporation.
2. Coil Company, LLC.

3. Dunham-Bush, Inc.
4. Heatcraft Refrigeration Products LLC; Heat Transfer Division.
5. Super Radiator Coils.
6. USA Coil & Air.

C. Performance Ratings: Tested and rated according to AHRI 410 and ASHRAE 33.

D. Minimum Working-Pressure/Temperature Ratings: 200 psig, 325 deg F.

E. Source Quality Control: Factory tested to 300 psig.

F. Tubes: ASTM B 743 copper, minimum 0.020 inch thick.

G. Fins: Aluminum, minimum 0.006 inch thick. Maximum of 8 aluminum fins per inch.

H. Coil fins may be the continuous serpentine or plate fin type.

I. Headers: Coil headers may be constructed of cast iron, steel, or seamless copper. Where cast iron headers are used, expand tubes into the headers. Where steel or copper headers are used, braze tubes to header.

J. Provide coils with bronze spring turbulators where required to provide the capacities indicated.

K. Frames: Galvanized-steel channel frame, minimum 0.052 inch thick for slip-in or flanged mounting.

2.2 REFRIGERANT COILS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. American-Standard
2. Aerofin Corporation.
3. Bohn
4. Coil Company, LLC.
5. Colmac
6. Dunham-Bush, Inc.
7. Heatcraft Refrigeration Products LLC; Heat Transfer Division.
8. Lennox Industries Inc.
9. Marlo
10. Super Radiator Coils.
11. Trane.
12. USA Coil & Air.

B. Performance Ratings: Tested and rated according to AHRI 410 and ASHRAE 33.

C. Minimum Working-Pressure Rating: 250 psig. Test at 250 psig, dehydrate, purge with inert gas, and seal prior to shipment.

D. Source Quality Control: Factory tested to 450 psig.

E. Tubes: ASTM B 743 copper, minimum 0.020 inch thick or ½-inch.

F. Fins: Aluminum, minimum 0.006 inch thick. Maximum of 10 aluminum fins per inch.

G. Coil fins may be the continuous serpentine or plate fin type.

H. Construct suction header of seamless copper tubing. Use a low pressure drop venturi type distributor to distribute refrigeration equally to multiple circuits.

I. Suction and Distributor Piping: ASTM B 88, Type L copper tube with brazed joints.

J. Intertwined circuiting feeds refrigerant evenly across the coil face under part-load.

K. Frames: Galvanized-steel channel frame, minimum 16 gauge for slip-in or flanged mounting.

L. Refrigerant Type. 1. Refrigerant R410A.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine ducts, plenums, and casings to receive air coils for compliance with requirements for installation tolerances and other conditions affecting coil performance.

B. Examine roughing-in for piping systems to verify actual locations of piping connections before coil installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install coils level and plumb.

B. Install coils in metal ducts and casings constructed according to SMACNA's "HVAC Duct Construction Standards, Metal and Flexible."

C. Install stainless-steel drain pan under each cooling coil.

1. Construct drain pans with connection for drain; insulated and complying with ASHRAE 62.1.
2. Construct drain pans to extend beyond coil length and width and to connect to condensate trap and drainage.
3. Extend drain pan upstream and downstream from coil face.
4. Extend drain pan under coil headers and exposed supply piping.

D. Install moisture eliminators for cooling coils. Extend drain pan under moisture eliminator.

E. Straighten bent fins on air coils.

F. Clean coils using materials and methods recommended in writing by manufacturers, and clean inside of casings and enclosures to remove dust and debris.

3.3 CONNECTIONS

A. Install Automatic Temperature-Control Valves as required by Section 230900 "Instrumentation and Control for HVAC."

B. Piping installation requirements are specified in Section 232113 "Hydronic Piping," and Section 232116 Hydronic Piping Specialties." Drawings indicate general arrangement of piping, fittings, and specialties.

C. Unless otherwise indicated, install union and ball valve on supply-water connection and union and calibrated balancing valve on return-water connection of cabinet unit heater.

D. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

E. Install piping adjacent to coils to allow service and maintenance.

F. For Water coils:

1. For drainage, pitch coils minimum 1/8 inch toward return connections. Install shims, except where coil design includes drainage feature.
2. Support:
    a. Support coil sections on steel channel or double angle frames and secure to casings.
    b. Arrange supports for cooling coils to avoid piercing or short-circuiting drip pans.
    c. Bolt casings to other section, ductwork, or unit casings.
    d. Provide air-tight seal between coil and duct or unit cabinets.
3. Water Supply:
    a. Locate water supply at bottom of coil supply header and return water connection at top to provide self-venting and reverse return arrangement.
    b. Provide air vents at high points complete with stop valve.
    c. Ensure water coils are drainable and make drain connection at low points.
4. Repair or replace coils following purging and tightness testing of coils and piping to eliminate leaks. Retest as specified to demonstrate leakproof performance.
5. For cooling coils, provide trap with clean-out on condensate drain piping. Consult coil manufacturer for trap depth requirements.

G. Connect refrigerant piping according to Section 232300 "Refrigerant Piping."

3.4 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

1. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. Units will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports.

3.5 ADJUSTING

A. Adjust initial temperature set points.

3.6 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain coils.

END OF SECTION 23 82 16

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SECTION 23 82 33
CONVECTORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include rated capacities, operating characteristics, furnished specialties, and accessories.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Color Samples for Initial Selection: For units with factory-applied color finishes.

1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For convectors to include in operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1 HOT-WATER CONVECTORS

A. Basis-of-Design Product: The design is based on the following:

1. Trane; a business of American Standard Companies.

B. Subject to compliance with requirements, provide the named product or a comparable product by one the following:

1. Airtherm; a Mestek company.
2. McQuay International.
3. Rittling.
4. Sterling.
5. Vulcan.

C. Heating Elements: Seamless copper tubing mechanically expanded into evenly spaced aluminum fins and rolled into cast-iron or brass headers with inlet/outlet and air vent; steel side plates and supports. Factory-pressure-test element at minimum 100 psig.

D. Front and Top Panel: Minimum 14 gauge thick steel with exposed corners rounded; removable front panels with tamper-resistant fasteners braced and reinforced for stiffness.

E. Wall-Mounted Back and End Panels: Minimum 0.0428-inch-thick steel.

F. Support Brackets: Locate at maximum 36-inch spacing to support front panel and element.

G. Insulation: 1/2-inch-thick, fibrous glass on inside of the back of the enclosure.

H. Finish: Baked-enamel finish in manufacturer's standard color as selected by Architect.

I. Enclosure Style: Slope top.

1. Front Inlet Grille: Punched louver; painted to match enclosure.

    a. Mill-finish aluminum.
    b. Anodized finish, color as selected by Architect from manufacturer's standard colors.
    c. Painted to match enclosure.

2. Top Outlet Grille: Punched louver; painted to match enclosure.

    a. Mill-finish aluminum.
    b. Anodized finish, color as selected by Architect from manufacturer's standard colors.
    c. Painted to match enclosure.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to receive convectors for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for hydronic-piping connections to verify actual locations before installation of convector.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install convectors level and plumb.

B. Control and isolation valves to be installed in acoustic ceiling above unless otherwise noted on the drawings.

C. Install wall-mounted temperature sensors and switch controls in electrical outlet boxes at heights to match lighting controls. Verify location of temperature sensors and other exposed control sensors with Drawings and room details before installation.

D. Install air-seal gasket between wall and recessed flanges or front cover of fully recessed unit.

E. Center elements under windows or indicated on drawings. Install end caps where units butt against walls.

F. Touch-up marred or scratched surfaces of factory-finished cabinets, using finish materials furnished by manufacturer.

G. Clean dust and debris from each unit as it is installed. Comb out damaged fins where bent or crushed before covering elements with enclosures.

3.3 CONNECTIONS

A. Install Automatic Temperature-Control Valves as required by Section 230900 "Instrumentation and Control for HVAC."

B. Piping installation requirements are specified in Section 232113 "Hydronic Piping" and Section 232116 Hydronic Piping Specialties." Drawings indicate general arrangement of piping, fittings, and specialties.

C. Unless otherwise indicated, install union and ball valve on supply-water connection and union and calibrated balancing valve on return-water connection of convector.

D. Install piping adjacent to convectors to allow service and maintenance.

3.4 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections:

1. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
2. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.

B. Units will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports.

3.5 ADJUSTING

A. Adjust initial temperature set points.

3.6 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain cabinet unit heaters.

END OF SECTION 23 82 33

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SECTION 23 82 39.13
CABINET UNIT HEATERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 DEFINITIONS

A. CWP: Cold working pressure.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include rated capacities, operating characteristics, furnished specialties, and accessories.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include diagrams for power, signal, and control wiring.
4. Color Samples for Initial Selection: For units with factory-applied color finishes.

B. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For cabinet unit heaters to include in emergency, operation, and maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Cabinet Unit-Heater Filters: Furnish one (1) spare filter for each filter installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: The design is based on the following:

1. Trane; a business of American Standard Companies.

B. Subject to compliance with requirements, provide the named product or a comparable product by one the following:

1. Airtherm; a Mestek company.
2. McQuay International.
3. Rittling.
4. Sterling.
5. Vulcan.

2.2 DESCRIPTION

A. Factory-assembled and -tested unit complying with AHRI 440.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.3 PERFORMANCE REQUIREMENTS

A. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."

B. ASHRAE/IESNA 90.1 Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."

2.4 COIL SECTION INSULATION

A. Insulation Materials: ASTM C 1071; surfaces exposed to airstream shall have aluminum-foil facing to prevent erosion of glass fibers for all external panels of cabinet.

1. Thickness: 1/2 inch. All External Panels of Cabinet
2. Thermal Conductivity (k-Value): 0.26 Btu x in./h x sq. ft. at 75 deg F mean temperature.
3. Fire-Hazard Classification: Maximum flame-spread index of 25 and smoke-developed index of 50 when tested according to ASTM E 84.
4. Adhesive: Comply with ASTM C 916 and with NFPA 90A or NFPA 90B.
5. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

2.5 CABINETS

A. Material: Steel with baked-enamel finish with manufacturer's standard paint, in color selected by Architect.

1. Vertical Unit, Exposed Front Panels: Minimum 16 gage galvanized sheet steel, removable panels with channel-formed edges secured with tamperproof cam fasteners.
2. Horizontal Unit, Exposed Bottom Panels: Minimum 16 gage galvanized sheet steel, removable panels secured with tamperproof cam fasteners and safety chain.
3. Recessed Flanges: Steel, finished to match cabinet.

4. Control Access Door: Key operated.
5. Base: Minimum 0.0528-inch- thick steel, finished to match cabinet, 4 inches high with leveling bolts.
6. Extended Piping Compartment: 8-inch- wide piping end pocket.
7. False Back: Minimum 18 gage steel, finished to match cabinet for vertical units.

2.6 FILTERS

A. Minimum Arrestance: According to ASHRAE 52.1 and a minimum efficiency reporting value (MERV) according to ASHRAE 52.2.

1. Pleated: 90 percent arrestance and MERV 7.

2.7 COILS

A. Hot-Water Coil: Copper tube, with mechanically bonded aluminum fins spaced no closer than 0.1 inch and rated for a minimum working pressure of 200 psig and a maximum entering-water temperature of 220 deg F. Include manual air vent and drain.

2.8 CONTROLS

A. Fan and Motor Board: Removable.

1. Fan: Forward curved, double width, centrifugal, directly connected to motor; thermoplastic or painted-steel wheels and aluminum, painted-steel, or galvanized-steel fan scrolls.
2. Motor: Electrically Commutated Motor (ECM), multispeed, resiliently mounted on motor board. Comply with requirements in Section 230513 "Common Motor Requirements for HVAC Equipment."
3. ECM motor controlled for 3 speeds, high-medium-low and off.
4. Wiring Terminations: Connect motor to chassis wiring with plug connection.

B. Control devices and operational sequences are specified in Section 230900 "Instrumentation and Control for HVAC" and Section 230993 "Sequence of Operations for HVAC Controls."

C. Electrical Connection: Factory-wired motors and controls for a single field connection. Provide disconnect Switch: Nonfusible type, with thermal-overload protection mounted exterior of fan housing, factory wired through an internal aluminum conduit.

2.9 CHARACTERISTICS

A. Cabinet:

1. Vertical, Surface Mounted: Downflow.

a. Top: Flat or sloped.
b. Air Inlet: Top, punched louver.
c. Air Outlet: Front, punched louver.

2. Horizontal, Fully Recessed:

a. Air Inlet: Front, punched louver.
b. Air Outlet: Front, punched louver.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to receive cabinet unit heaters for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for piping and electrical connections to verify actual locations before unit-heater installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install cabinet unit heaters level and plumb.

B. Install cabinet unit heaters to comply with NFPA 90A.

C. Control and isolation valves to be installed in acoustic ceiling above unless otherwise noted on the drawings.

D. Install wall-mounted temperature sensors and switch controls in electrical outlet boxes at heights to match lighting controls. Verify location of temperature sensors and other exposed control sensors with Drawings and room details before installation.

E. Install air-seal gasket between wall and recessed flanges or front cover of fully recessed unit.

F. Install new filters in each cabinet unit within two weeks of Substantial Completion.

G. Touch-up marred or scratched surfaces of factory-finished cabinets, using finish materials furnished by manufacturer.

H. Clean dust and debris from each unit as it is installed. Comb out damaged fins where bent or crushed before covering elements with enclosures.

3.3 CONNECTIONS

A. Install Automatic Temperature-Control Valves as required by Section 230900 "Instrumentation and Control for HVAC."

B. Piping installation requirements are specified in Section 232113 "Hydronic Piping," and Section 232116 Hydronic Piping Specialties." Drawings indicate general arrangement of piping, fittings, and specialties.

C. Unless otherwise indicated, install union and ball valve on supply-water connection and union and calibrated balancing valve on return-water connection of cabinet unit heater.

D. Install piping adjacent to machine to allow service and maintenance.

E. Comply with safety requirements in UL 1995.

F. Ground equipment and connect wiring according to Division 26.

3.4 FIELD QUALITY CONTROL

A. Perform the following tests and inspections.

1. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
2. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.

B. Units will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports.

3.5 ADJUSTING

A. Adjust initial temperature set points.

3.6 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain cabinet unit heaters.

END OF SECTION 23 82 39.13

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SECTION 23 82 39
UNIT HEATERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 ACTION SUBMITTALS

A. Product Data: Include rated capacities, operating characteristics, furnished specialties, and accessories for each product indicated.

B. Field quality-control reports.

1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For cabinet unit heaters to include in emergency, operation, and maintenance manuals.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

PART 2 - PRODUCTS

2.1 PROPELLER UNIT HEATERS

A. Basis-of-Design Product: The design is based on the following:

1. Trane; a business of American Standard Companies.

B. Subject to compliance with requirements, provide the named product or a comparable product by one the following:

1. Airtherm; a Mestek company.
2. McQuay International
3. Modine Mfg. Co.
4. Rittling.
5. Sterling.
6. Vulcan.

C. Description: An assembly including casing, coil, fan, and motor in vertical and horizontal discharge configuration with adjustable discharge louvers.

D. Cabinet: Removable panels for maintenance access to controls.

E. Cabinet Finish: Manufacturer's standard baked enamel applied to factory-assembled and -tested propeller unit heater before shipping.

F. Discharge Louver: Adjustable fin diffuser for horizontal units and conical diffuser for vertical units.

G. General Coil Requirements: Test and rate hot-water propeller unit heater coils according to ASHRAE 33.

H. Hot-Water Coil: Copper tube, minimum 0.025-inch wall thickness, with mechanically bonded aluminum fins spaced no closer than 0.1 inch and rated for a minimum working pressure of 200 psig and a maximum entering-water temperature of 325 deg F, with manual air vent. Test for leaks to 350 psig underwater.

I. Fan: Propeller type with aluminum wheel directly mounted on motor shaft in the fan venturi.

J. Fan Motors: Comply with requirements in Section 230513 "Common Motor Requirements for HVAC Equipment."

1. Motor Type: Permanently lubricated.

K. Control devices and operational sequences are specified in Section 230900 "Instrumentation and Control for HVAC" and Section 230993 "Sequence of Operations for HVAC Controls."

L. Electrical Connection: Factory-wired motors and controls for a single field connection. Provide disconnect Switch: Nonfusible type, with thermal-overload protection mounted exterior of fan housing, factory wired through an internal aluminum conduit.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to receive unit heaters for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Examine roughing-in for piping and electrical connections to verify actual locations before unit heater installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install propeller unit heaters level and plumb.

B. Suspend propeller unit heaters from structure with all-thread hanger rods and elastomeric hangers. Hanger rods and attachments to structure are specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment." Vibration hangers are specified in Section 230548 "Vibration Controls for HVAC Piping and Equipment."

C. Install wall-mounting temperature sensors and switch controls in electrical outlet boxes at heights to match lighting controls. Verify location of temperature sensors and other exposed control sensors with Drawings and room details before installation.

D. Touch-up marred or scratched surfaces of factory-finished cabinets, using finish materials furnished by manufacturer.

E. Clean dust and debris from each unit as it is installed. Comb out damaged fins where bent or crushed before covering elements with enclosures.

3.3 CONNECTIONS

A. Install Automatic Temperature-Control Valves as required by Section 230900 "Instrumentation and Control for HVAC."

B. Piping installation requirements are specified in Section 232113 "Hydronic Piping," and Section 232116 Hydronic Piping Specialties." Drawings indicate general arrangement of piping, fittings, and specialties.

C. Unless otherwise indicated, install union and ball valve on supply-water connection and union and calibrated balancing valve on return-water connection of unit heater.

D. Install piping adjacent to machine to allow service and maintenance.

E. Comply with safety requirements in UL 1995.

F. Ground equipment and connect wiring according to Division 26.

3.4 FIELD QUALITY CONTROL

A. Perform the following tests and inspections.

1. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
2. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.

B. Units will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports.

3.5 ADJUSTING

A. Adjust initial temperature set points.

3.6 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain unit heaters.

END OF SECTION 23 82 39

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SECTION 25 00 00
BUILDING AUTOMATION SYSTEM (BAS) INTEGRATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This section describes the Systems Integration scope of work for the project. This section also coordinates the responsibilities of the Mechanical and Electrical trade contractors pertaining to control products or systems, furnished by each trade that will be integrated by this Division.

B. All labor, material, equipment and software not specifically referred to herein or on the plans, that is required to meet the functional intent of this specification, shall be provided without additional cost to the Owner.

1.3 SYSTEM DESCRIPTION

A. It is the Owner's express goal to implement an open, Wide Area Networked (WAN) Building Automation System (BAS) system that will allow products from various suppliers to be integrated into a unified system in order to provide flexibility for expansion, maintenance, and service of the system. The Graphic User Interface (GUI) shall be Web based and shall provide a common operating platform for all integrated control systems. The work and products provided by the System Integrator are defined in Division 25 and are based on the Tridium "N4" Niagara Framework (or "Niagara"), developed by Tridium. Niagara provides a software infrastructure that integrates diverse systems and devices (regardless of manufacturer, communication standard or software) into a unified platform that can be easily managed in real time over the Internet using a standard Web browser.

1. Systems developed on the Sun Microsystems with Niagara AX JAVA Framework platform are unacceptable.

B. The Building Automation System (BAS) shall be comprised of Network Area Controllers (NAC) within each facility. The NAC shall connect to the Owner's local or Wide Area Network, depending on configuration. Access to the system, either locally in each building, or remotely from a central site or sites, shall be accomplished through standard Web browsers, via the Internet and/or local area network. Each NAC shall communicate to LonMark/LonTalk (ILC) and/or BACnet (IBC) controllers and other open and legacy protocol systems/devices provided under Division 23 or Division 26.

1.4 SYSTEM DESCRIPTION

A. Six (6) copies of shop drawings of the entire control system shall be submitted and shall consist of a complete list of equipment and materials, including manufacturers catalog data sheets and installation instructions. Shop drawings shall also contain complete

wiring and schematic diagrams, software descriptions, calculations, and any other details required to demonstrate that the system has been coordinated and will properly function as a system. Terminal identification for all control wiring shall be shown on the shop drawings. A complete written Sequence of Operation shall also be included with the submittal package. Division 23 and 26 contractors shall provide shop drawings for their portions of work. Division 23 and 26 contractors supplying products and systems, as part of their packages shall provide catalog data sheets, wiring diagrams and point lists to the Division 25 contractor for proper coordination of work.

B. Submittal shall also include a trunk cable schematic diagram depicting operator workstations, control panel locations and a description of the communication type, media and protocol. Though the Division 23 and 26 contractors shall provide these diagrams for their portions of work, the Systems Integrator shall be responsible for integrating those diagrams into the overall trunk cable schematic diagrams for the entire Wide Area Network (WAN).

C. Submittal shall also include a complete point list of all points to be connected to the BAS by the System Integrator. Division 23 and 26 contractors shall provide a point list of their portions of the work. The Division 25 submittal should focus on the integration of those points into the BAS including any point mapping, addressing, or database configuration information.

D. Submittal shall also include a copy of each of the graphics developed for the Graphic User Interface including a flowchart (site map) indicating how the graphics are intended to be linked to one another for both the standard tree navigation structure and any “hot spot” or directly links from one graphic to another. The graphics are intended to be 80% - 90% complete at this stage with the only remaining changes to be based on review comments from the A/E design team and/or Owner.

E. Upon completion of the work, provide a complete set of ‘as-built’ drawings and application software on compact disk. Drawings shall be provided as AutoCAD™ compatible files. Six copies of the ‘as-built’ drawings shall be provided in addition to the documents on compact disk. Division 23 and 25 contractors shall provide as-builts for their portions of work. The Division 25 contractor shall be responsible for as-builts pertaining to overall BAS architecture and network diagrams.

1.5 SPECIFICATION NOMENCLATURE

A. Acronyms and other terms used in this specification are defined as follows:

1. AI: Analog Input.
2. AO: Analog Output.
3. ASCII: American Standard Code for Information Interchange.
4. BACnet: A data communication protocol for building automation and control networks. The rules governing this protocol are defined in ASHRAE/ANSI Standard 135.
5. BAS: Building Automation System.
6. BI: Binary Input.
7. BMP: The standard bit-mapped graphics format used in the Windows environment. By convention, graphics files in the BMP format end with a “.BMP” extension.

8. BO: Binary Output.
9. Bridge: A device that connects two local-area networks (LANs), or two segments of the same LAN that use the same protocol, such as Ethernet or Token-Ring.
10. Client: The client part of a client-server architecture. Typically, a client is an application that runs on a personal computer or workstation and relies on a server to perform some operations. Clients rely on servers for resources, such as files, devices, and even processing power.
11. Client/Server Architecture: A network architecture in which each computer or process on the network is either a client or a server. Servers are powerful computers or processes dedicated to managing disk drives (file servers), printers (print servers), or network traffic (network servers). Clients are personal computers or workstations on which users run applications. Client-server architectures are sometimes called two-tier architectures.
12. DDC: Direct Digital Control. The digital algorithms and pre-defined arrangements included in the control system software to provide direct closed-loop control for the designated equipment and controlled variables. Inclusive of Proportional, Derivative and Integral control algorithms together with target values, limits, logical functions, arithmetic functions, constant values, timing considerations and the like.
13. DDE: Dynamic Data Exchange.
14. Ethernet: A local area network (LAN) technology that is probably the most prevalent in the world today due to its common usage in standard office networks. Due to its transmission speeds (10 Mbps) or Fast Ethernet (100 Mbps), most BAS control manufacturers offer Ethernet as an option for connecting their workstations and system controllers on the LAN. Ethernet can be implemented over several different types of network media including unshielded twisted-pair (UTP), coaxial cable, and fiber optic cable. (Ethernet is also known as ISO8802-3).
15. Firewall: A system designed to prevent unauthorized access to or from a private network. Firewalls can be implemented in both hardware and software, or a combination of both. Firewalls are frequently used to prevent unauthorized Internet users from accessing private networks connected to the Internet, especially intranets. All messages entering or leaving the intranet pass through the firewall, which examines each message and blocks those that do not meet the specified security criteria.
16. Furnish: The term “Furnish” and its derivatives when used in this Division shall mean supply at the Contractor’s cost to the designated third party trade contractor for installation. The Contractor shall connect furnished items to the system, calibrate, test, verify, warrant and document.
17. GIF: Graphics Interchange Format. A bit-mapped graphics file format. GIF supports color and various resolutions. It also includes data compression, but because it is limited to 256 colors, it is more effective for scanned images such as illustrations rather than color photos. By convention, graphics files in the GIF format end with a “.GIF” extension.
18. GUI: Graphical User Interface.
19. HCS: HVAC Control System.
20. Hub: A common connection point for devices in a network. Hubs are commonly used to connect segments of a LAN. A hub contains multiple ports. When a packet arrives at one port, it is copied to the other ports so that all segments of the LAN can see all packets.

21. HTML: HyperText Markup Language. An internet programming language that defines the internet pages we look at and provides a common model for data representation.
22. HTTP: HyperText Transfer Protocol, the underlying protocol used by the World Wide Web. HTTP defines how messages are formatted and transmitted, and what actions Web servers and browsers should take in response to various commands.
23. IBC: Interoperable BACnet Controller.
24. ILC: Interoperable LonWorks Controller.
25. Install: The term “Install” and its derivatives when used in this Division shall mean receive at the jobsite and mount.
26. Integration: The ability to link disparate control system devices into a cohesive Building Automation System.
27. Interoperability: The ability of disparate control system devices to work together toward a common objective through the exchange of information.
28. Intranet: A network based on TCP/IP protocols (an internet) belonging to an organization, accessible only by the organization's members, employees, or others with authorization. An intranet's Web sites look and act just like any other Web sites, but the firewall surrounding an intranet fends off unauthorized access.
29. IP: Internet Protocol. IP specifies the format of packets, also called datagrams, and the addressing scheme. Most networks combine IP with a higher-level protocol called Transmission Control Protocol (TCP), which establishes a virtual connection between a destination and a source.
30. JPEG: Joint Photographic Experts Group. JPEG is a glossy compression technique for color images. Although it can reduce files sizes to about 5% of their normal size, some detail is lost in the compression. By convention, graphics files in the JPEG format end with a “.JPG” extension.
31. LAN: Local Area Network. A computer network that spans a relatively small area. Most LANs are confined to a single building or group of buildings. However, one LAN can be connected to other LANs over any distance via the Internet, telephone lines, and radio waves. A system of LANs connected in this way is called a wide-area network (WAN).
32. LonMark: A set of protocol rules and practices that has been developed and approved by a group of manufacturers that use the “Neuron” processor chip developed by the Echelon Corporation. LonMark is also the mark awarded to devices which implement the profile for their specific device type.
33. LonTalk: A local area network (LAN) technology created by the Echelon Corporation. Its speed is scaleable (32Kbps to 1.25Mbps) and is comparable to MS/TP on the low end and ARCNET on the high end. LonTalk will typically be used for application specific controller networks. LonTalk can be implemented over several different types of network media including unshielded twisted-pair (UTP) or Free Topology (FTT-10a), coaxial cable, fiber optic cable, radio frequency (RF), and infrared (IR). (LonTalk is also known as EIA-709.1)
34. LonWorks: An encompassing term that includes the LonTalk communications protocol, devices that use the LonTalk protocol (LonMark devices) and the network on which the devices reside.
35. MSTP: Master Slave Token Passing. A local area network (LAN) technology created by ASHRAE and unique to BACnet. Its speed (approximately 76Kbps) is slower than Ethernet and ARCNET, but it is the lowest cost LAN option for BACnet. The maximum delay before a device is able to transmit a message can be determined. Many BAS control manufacturers utilize MSTP for their

application specific controller networks. MSTP is implemented using EIA-485 signaling and can be used in a master-slave mode, a peer-to-peer token passing mode, or a combination of the two.

36. Media: The physical network wiring that is used to transmit data. Typical media includes unshielded twisted-pair (UTP) wiring, coaxial cables, and fiber optic cables.
37. NAC: Network Area Controller.
38. ODBC: Open DataBase Connectivity. A standard database access method developed by Microsoft Corporation. The goal of ODBC is to make it possible to access any data from any application, regardless of which database management system (DBMS) is handling the data. ODBC manages this by inserting a middle layer, called a database driver, between an application and the DBMS. The purpose of this layer is to translate the application's data queries into commands that the DBMS understands. For this to work, both the application and the DBMS must be ODBC-compliant -- that is, the application must be capable of issuing ODBC commands and the DBMS must be capable of responding to them. Since version 2.0, the standard supports SAG SQL.
39. OLE: Object Linking and Embedding. OLE is a compound document standard developed by Microsoft Corporation. It enables you to create objects with one application and then link or embed them in a second application. Embedded objects retain their original format and links to the application that created them.
40. OOT: Object Oriented Technology
41. OPC: Object Linking and Embedding (OLE) for Process Control. This is a communication protocol utilizing Microsoft Windows NT client/server technology and Component Object Module (COM) and Distributed COM software architecture. It uses Ethernet TCP/IP message transportation.
42. Peer-to-Peer Architecture: A type of network in which each workstation has equivalent capabilities and responsibilities. This differs from client/server architectures, in which some computers are dedicated to serving the others. Peer-to-peer networks are generally simpler, but they usually do not offer the same performance under heavy loads.
43. PICS: Product Interoperability Compliance Statement
44. POT: Portable Operator’s Terminal
45. Protocol: An agreed-upon format for transmitting data between two devices. The protocol determines; 1) the type of error checking to be used, 2) data compression method, if any, 3) how the sending device will indicate that it has finished sending a message, and 4) how the receiving device will indicate that it has received a message.
46. Provide: The term “Provide” and its derivatives when used in this Division shall mean to furnish, install in place, connect, calibrate, test, verify, warrant, document and supply the associated required services ready for operation.
47. Router: A device utilized to join two or more networks together. A router has the capability of joining together networks that use different Local Area Network (LAN) technologies such as a BACnet Ethernet LAN with a BACnet MSTP LAN. The router forwards data packets along networks and use headers and forwarding tables to determine the best path for forwarding the packets.
48. Server: A computer or device on a network that manages network resources. For example, a file server is a computer and storage device dedicated to storing files. Any user on the network can store files on the server. A print server is a computer that manages one or more printers, and a network server is a computer

that manages network traffic. A database server is a computer system that processes database queries.

49. SQL: Structured Query Language. SQL is a standardized query language for requesting information from a database. Historically, SQL has been the favorite query language for database management systems running on minicomputers and mainframes. Increasingly, however, SQL is being supported by PC database systems because it supports distributed databases (databases that are spread out over several computer systems). This enables several users on a local-area network to access the same database simultaneously.
50. TCP: Transmission Control Protocol. TCP is one of the main protocols in TCP/IP networks. Whereas the IP protocol deals only with packets, TCP enables two hosts to establish a connection and exchange streams of data. TCP guarantees delivery of data and also guarantees that packets will be delivered in the same order in which they were sent.
51. TCP/IP: Transmission Control Protocol/Internet Protocol. The suite of communications protocols used to connect hosts on the Internet. TCP/IP uses several protocols, the two main ones being TCP and IP. TCP/IP is used by the Internet, making it the de facto standard for transmitting data over networks
52. Thick Client: In a “thick” client/server architecture, the client does the majority of the processing.
53. Thin Client: In a “thin” client/server architecture, most of the processing is handled by the server and all the browser has to do is process the display.
54. UPS: Uninterruptible Power Supply.
55. Virtual Point: A point of information that is generated as a software value rather than the value being generated by an actual hardware device.
56. WAN: Wide Area Network. A computer network that spans a relatively large geographical area.
57. WBI: Web Browser Interface.
58. XIF File: The external interface file created in Neuron C defining the LonMark product’s network variables, message tags, and hardware related parameters.
59. XML: Extensible Markup Language. A technology for moving structured data across the internet or a corporate network. Unlike HTML, XML documents include more than just raw data by including a definition of the data structure, so the receiving computer knows what information is contained in which fields.

1.6 DIVISION OF WORK

A. The Division 23 and 26 contractors shall be responsible for all controllers (ILC and IBC), control devices, control panels, controller programming, controller programming software, controller input/output and power wiring and controller network wiring.

B. The Division 25 contractor shall be responsible for the Network Area Controllers (NAC), software and programming of the NAC, graphical user interface software (GUI), development of all graphical screens, Web browser pages, setup of schedules, logs and alarms, LonWorks network management, connection of the NAC to the local or Wide Area Network, and any licensing required to ensure connectivity to other NAC on the Manawa School District’s Wide Area Network.

C. The Owner shall be responsible for providing and maintaining the Ethernet backbone and all necessary connectors, repeaters, bridges, hubs, and routers as is standard practice within their facilities. The Owner will provide Ethernet drops within five feet of

the equipment provided by Division 25 that requires network connection as defined on diagrams developed specifically for this project. It is anticipated that there will be one open RJ-45 jack located in each mechanical room to facilitate the connection of a Portable Operator's Terminal to the Ethernet backbone for purposes of troubleshooting and maintenance of the mechanical room equipment.

D. The Owner shall be responsible for providing and maintaining any desktop computers, laptop computers, and servers required as part of this system integration including operating system software. Any specifications for such equipment defined in this Division shall be considered minimum requirements. The Division 25 Contractor shall be responsible for providing and installing any application software necessary to meet the functional intent of this specification.

1.7 RELATED WORK SPECIFIED ELSEWHERE

A. Division 23, Mechanical:

1. Providing control devices and systems including but not limited to:

    a. Interoperable BACnet Controllers and programming.
    b. Control panels, devices and wiring.
    c. Local controller and control device networks.
    d. Independent system Portable Operator Terminals.

B. Division 26, Electrical:

1. Providing motor starters and disconnect switches (unless otherwise noted)
2. Power wiring and conduit (unless otherwise noted)
3. Provision, installation and wiring of smoke detectors (unless otherwise noted)
4. Providing control devices and systems including but not limited to:

    a. Interoperable BACnet Controllers and programming.
    b. Control panels, devices and wiring.
    c. Local controller and control device networks.
    d. Independent system Portable Operator Terminals.

1.8 CODES AND STANDARDS

A. All work, materials, and equipment shall comply with the rules and regulations of all codes and ordinances of the local, state, and federal authorities. Such codes, when more restrictive, shall take precedence over these plans and specifications. As a minimum, the installation shall comply with the current editions in effect 30 days prior to receipt of bids of the following codes. Systems or products not currently offering the following approvals are not acceptable.

1. Underwriters Laboratories UL-926; Energy Management Systems (Canada and the U.S.)
2. Occupational Safety and Health Act (OSHA)
3. National Fire Protection Association (NFPA) Standards
4. National Electric Code (NEC)
5. International Building Code (IBC)

6. International Mechanical Code (IMC)
7. International Plumbing Code
8. Institute of Electrical and Electronic Engineers (IEEE)
9. ANSI/ASHRAE Standard 135 – BACnet (where specified)
10. LonMark Interoperability Association's "LonMark" Certification (where specified)
11. Federal Communications Commission (FCC) including Part 23, Radio Frequency

1.9 SOFTWARE LICENSE AGREEMENT

A. The Owner shall sign a copy of the manufacturer's standard software and firmware licensing agreement as a condition of this contract. Such license shall grant use of all programs and application software to Owner as defined by the manufacturer's license agreement, but shall protect manufacturer's rights to disclosure of trade secrets contained within such software.

B. The Owner shall be the named license holder of all software associated with any and all incremental work on the project(s). The Owner shall be named in the "orgid" of all software licenses. The Owner shall be free to direct the modification of the "orgid" in any software license, regardless of supplier, by Tridium, Inc. Any NACs provided shall be compatible with any and all vendors Niagara based tools.

1.10 OWNERSHIP OF MATERIAL

A. The Owner shall receive ownership of all job specific software configuration documentation, data files, and application-level software developed for the project. This shall include all custom, job specific software code and documentation for all configuration and programming that is generated for a given project and/or configured for use within Network Area Controllers, Web server(s), and any related LAN/WAN/Intranet and Internet connected routers and devices. Any and all required IDs and passwords for access to any component or software program shall be provided to the Owner.

1.11 JOB CONDITIONS

A. Cooperation with Other Trades: Coordinate the Work of this section with that of other sections to ensure that the Work will be carried out in an orderly fashion. It shall be this Contractor's responsibility to check the Contract Documents for possible conflicts between his Work and that of other crafts in equipment location, pipe, duct and conduit runs, electrical outlets and fixtures, air diffusers, and structural and architectural features.

1.12 QUALITY ASSURANCE

A. All equipment, installation, and wiring shall comply with acceptable industry specifications and standards for performance, reliability, and compatibility and be executed in strict adherence to local codes and standard practices

PART 2 - PRODUCTS

2.1 GENERAL

A. The Building Automation System (BAS) shall be comprised of a network of interoperable, stand-alone digital controllers, a computer system, graphical user interface software, printers, network devices and other devices as specified herein.

B. The installed system shall provide secure password access to all features, functions and data contained in the overall BAS.

2.2 OPEN, INTEROPERABLE, INTEGRATED ARCHITECTURES

A. The intent of this specification is to provide a peer-to-peer networked, stand-alone, distributed control system with the capability to integrate the ANSI/ASHRAE Standard 135 BACnet communication protocol in one open, interoperable system.

B. The supplied computer software shall employ object-oriented technology (OOT) for representation of all data and control devices within the system. In addition, adherence to industry standards including ANSI/ASHRAE™ Standard 135, BACnet to assure interoperability between all system components is required. For each BACnet device, the device supplier must provide a PICS document showing the installed device's compliance level. Minimum compliance shall include the ability to support data read and write functionality. Physical connection of BACnet devices shall be via Ethernet or RS-485 MSTP.

C. All components and controllers supplied under this Division shall be true "peer-to-peer" communicating devices. Components or controllers requiring "polling" by a host to pass data shall not be acceptable.

D. The supplied system must incorporate the ability to access all data using standard Microsoft. Internet Explorer Web browsers without requiring proprietary operator interface and configuration programs. An Open DataBase Connectivity (ODBC) or Structured Query Language (SQL) compliant server database is required for all system database parameter storage. This data shall reside on a supplier-installed server for all database access. Systems requiring proprietary database and user interface programs shall not be acceptable. The system shall support the archiving of historical data to optional databases including Oracle, MS SQL, and IBM DB2.

E. A hierarchical topology is required to assure reasonable system response times and to manage the flow and sharing of data without unduly burdening the Owner's internal Intranet network. Systems employing a "flat" single tiered architecture shall not be acceptable.

F. Maximum acceptable response times for devices and Graphic User Interfaces connected directly to the BAS network shall be as shown in the following table:

G. Maximum acceptable response time from any alarm occurrence (at the point of origin) to the point of annunciation shall not exceed 60 seconds for remote or dial-up connected user interfaces.

2.3 NETWORKS

A. The Local Area Network (LAN) shall be a 10/100 Megabits/sec Ethernet network supporting BACnet, XML, HTTP, for maximum flexibility for integration of building data

with enterprise information systems and providing support for multiple Network Area Controllers (NACs), user workstations and, if specified, a local server. Coordinate with the Owner for connection to the LAN/WAN.

B. Local area network minimum physical and media access requirements:

1. Ethernet; IEEE standard 802.3.
2. e; 10 Base-T, UTP-8 wire, category 5.
3. Minimum throughput; 10 Mbps, with ability to increase to 100 Mbps.

2.4 NETWORKS ACCESS

A. Remote Access:
1. For Local Area Network installations, provide access to the LAN from a remote location, via the Internet. The Owner shall provide a connection to the Internet to enable this access via high speed cable modem, asynchronous digital subscriber line (ADSL) modem, ISDN line, T1 Line or via the Owner's Intranet to a corporate server providing access to an Internet Service Provider (ISP). Owner agrees to pay monthly access charges for connection and ISP.

2.5 NETWORK AREAS CONTROLLER (NAC)

A. The Division 25 contractor shall supply one or more Network Area Controllers (NAC) as part of this contract. The number of Network Area Controllers required is dependent on the type and quantity of devices provided under Divisions 25 and 26. It is the responsibility of the Division contractor to coordinate with the Division 23 and 26 contractors to determine the quantity and type of devices.

B. The NAC shall provide the interface between the LAN or WAN and the field control devices, and provide global supervisory control functions over the control devices connected to the NAC. It shall be capable of executing application control programs to provide:

1. Calendar functions.
2. Scheduling.
3. Trending.
4. Alarm monitoring and routing.
5. Time synchronization.
6. Integration of LonWorks controller data and BACnet controller data.
7. Network Management functions for all LonWorks based devices.

C. The Network Area Controller must provide the following hardware features as a minimum:

1. One Ethernet Port 10/100 Mbps.
2. One RS-232 port.
3. One RS-485 port.
4. One LonWorks Interface Port – 78KB FTT-10A.
5. Battery Backup.
6. Flash memory for long term data backup (Any NAC that utilizes a hard disk drive shall not be acceptable).

7. The NAC must be capable of operation over a temperature range of 0°C to 50°C (32°F to 122°F).
8. The NAC must be capable of withstanding storage temperatures of between 0°C and 70°C (32°F and 238°F).
9. The NAC must be capable of operation over a humidity range of 5% to 95% RH, noncondensing.

D. The NAC shall provide multiple user access to the system and support for ODBC or SQL. A database resident on the NAC shall be an ODBC-compliant database or must provide an ODBC data access mechanism to read and write data stored within it.

E. The NAC shall support standard Microsoft Internet Explorer Web browser access via the Intranet/Internet. It shall support a minimum of 26 simultaneous users.

F. Event Alarm Notification and actions

1. The NAC shall provide alarm recognition, storage; routing, management, and analysis to supplement distributed capabilities of equipment or application specific controllers.
2. The NAC shall be able to route any alarm condition to any defined user location whether connected to a local network or remote via dial-up telephone connection, or wide-area network.
3. Alarm generation shall be selectable for annunciation type and acknowledgement requirements including but limited to:

    a. To alarm.
    b. Return to normal.
    c. To fault.

4. Provide for the creation of a minimum of eight of alarm classes for the purpose of routing types and or classes of alarms, i.e.: security, HVAC, Fire, etc.
5. Provide timed (schedule) routing of alarms by class, object, group, or node.
6. Provide alarm generation from binary object “runtime” and /or event counts for equipment maintenance. The user shall be able to reset runtime or event count values with appropriate password control.

G. Control equipment and network failures shall be treated as alarms and annunciated.

H. Alarms shall be annunciated in any of the following manners as defined by the user:

1. Screen message text
2. Email of the complete alarm message to multiple recipients. Provide the ability to route and email alarms based on:

    a. Day of week.
    b. Time of day.
    c. Recipient.

3. Pagers via paging services that initiate a page on receipt of email message.
4. Graphic with flashing alarm object(s).
5. Printed message, routed directly to a dedicated alarm printer.

6. Audio messages.

I. The following shall be recorded by the NAC for each alarm (at a minimum):

1. Time and date.
2. Location (building, floor, zone, office number, etc.).
3. Equipment (air handler #, accessway, etc.).
4. Acknowledge time, date, and user who issued acknowledgement.
5. Number of occurrences since last acknowledgement.

J. Alarm actions may be initiated by user defined programmable objects created for that purpose.

K. Defined users shall be given proper access to acknowledge any alarm, or specific types or classes of alarms defined by the user.

L. A log of all alarms shall be maintained by the NAC and/or a server (if configured in the system) and shall be available for review by the user.

M. Provide a “query” feature to allow review of specific alarms by user defined parameters.

N. A separate log for system alerts (controller failures, network failures, etc.) shall be provided and available for review by the user.

O. An Error Log to record invalid property changes or commands shall be provided and available for review by the user.

2.6 DATA COLLECTION AND STORAGE

A. The NAC shall have the ability to collect data for any property of any object and store this data for future use.

B. The data collection shall be performed by log objects, resident in the NAC that shall have, at a minimum, the following configurable properties:

1. Designating the log as interval or deviation.
2. For interval logs, the object shall be configured for time of day, day of week and the sample collection interval.
3. For deviation logs, the object shall be configured for the deviation of a variable to a fixed value. This value, when reached, will initiate logging of the object.
4. For all logs, provide the ability to set the maximum number of data stores for the log and to set whether the log will stop collecting when full, or rollover the data on a first-in, firstout basis.
5. Each log shall have the ability to have its data cleared on a time-based event or by a user-defined event or action.

C. All log data shall be stored in a relational database in the NAC and the data shall be accessed from a server (if the system is so configured) or a standard Web browser.

D. All log data, when accessed from a server, shall be capable of being manipulated using standard SQL statements.

E. All log data shall be available to the user in the following data formats:

1. HTML.
2. XML.
3. Plain Text.
4. Comma or tab separated values.

F. Systems that do not provide log data in HTML and XML formats at a minimum shall not be acceptable.

G. The NAC shall have the ability to archive its log data either locally (to itself), or remotely to a server or other NAC on the network. Provide the ability to configure the following archiving properties, at a minimum:

1. Archive on time of day.
2. Archive on user-defined number of data stores in the log (buffer size).
3. Archive when log has reached its user-defined capacity of data stores.
4. Provide ability to clear logs once archived.

2.7 AUDIT LOG

A. Provide and maintain an Audit Log that tracks all activities performed on the NAC. Provide the ability to specify a buffer size for the log and the ability to archive log based on time or when the log has reached its user-defined buffer size. Provide the ability to archive the log locally (to the NAC), to another NAC on the network, or to a server. For each log entry, provide the following data:

1. Time and date.
2. User ID.
3. Change or activity: i.e., Change setpoint, add or delete objects, commands, etc.

2.8 DATABASE BACKUP AND STORAGE

A. The NAC shall have the ability to automatically backup its database. The database shall be backed up based on a user-defined time interval.

B. Copies of the current database and, at the most recently saved database shall be stored in the NAC. The age of the most recently saved database is dependent on the user-defined database save interval.

C. The NAC database shall be stored, at a minimum, in XML format to allow for user viewing and editing, if desired. Other formats are acceptable as well, as long as XML format is supported.

2.9 SQL DATABASE SUPPORT

A. In addition to the standard databases provided as part of the Niagara Framework, the BAS shall have the capability to archive all data (such as log data, alarms, alerts and audit histories) to a Microsoft SQL Server database. This will enable the Owner with an SQL Server to utilize this resource for data archive storage as well as for other

applications to have access to energy use or other data that is captured by the Network Area Controllers.

2.10 GRAPHICAL USER INTERFACE SOFTWARE

A. A. Operating System:

1. The GUI shall run on Microsoft Windows 10 Professional.

B. The GUI shall employ browser-like functionality for ease of navigation. It shall include a tree view (similar to Windows Explorer) for quick viewing of, and access to, the hierarchical structure of the database. In addition, menu-pull downs, and toolbars shall employ buttons, commands and navigation to permit the operator to perform tasks with a minimum knowledge of the HVAC Control System and basic computing skills. These shall include, but are not limited to, forward/backward buttons, home button, and a context sensitive locator line (similar to a URL line), that displays the location and the selected object identification.

C. Real-Time Displays. The GUI, shall at a minimum, support the following graphical features and functions:

1. Graphic screens shall be developed using any drawing package capable of generating a GIF, BMP, or JPG file format. Use of proprietary graphic file formats shall not be acceptable. In addition to, or in lieu of a graphic background, the GUI shall support the use of scanned pictures.
2. Graphic screens shall have the capability to contain objects for text, real-time values, animation, color spectrum objects, logs, graphs, HTML or XML document links, schedule objects, hyperlinks to other URL's, and links to other graphic screens.
3. Graphics shall support layering and each graphic object shall be configurable for assignment to a layer. A minimum of six layers shall be supported.
4. Modifying common application objects, such as schedules, calendars, and set points shall be accomplished in a graphical manner.

    a. Schedule times will be adjusted using a graphical slider, without requiring any keyboard entry from the operator.
    b. Holidays shall be set by using a graphical calendar, without requiring any keyboard entry from the operator.

5. Commands to start and stop binary objects shall be done by right-clicking the selected object and selecting the appropriate command from the pop-up menu. No entry of text shall be required.
6. Adjustments to analog objects, such as set points, shall be done by right-clicking the selected object and using a graphical slider to adjust the value. No entry of text shall be required.

D. System Configuration. At a minimum, the GUI shall permit the operator to perform the following tasks, with proper password access:

1. Create, delete or modify control strategies.
2. Add/delete objects to the system.

3. Tune control loops through the adjustment of control loop parameters.
4. Enable or disable control strategies.
5. Generate hard copy records or control strategies on a printer.
6. Select points to be capable of generating an alarm and define the alarm state.
7. Select points to be trended over a period of time and initiate the recording of values automatically.

E. On-Line Help. Provide a context sensitive, on-line help system to assist the operator in operation and editing of the system. On-line help shall be available for all applications and shall provide the relevant data for that particular screen. Additional help information shall be available through the use of hypertext. All system documentation and help files shall be in

1. HTML format.

F. Security. Each operator shall be required to log on to that system with a user name and password in order to view, edit, add, or delete data. System security shall be selectable for each operator. The system administrator shall have the ability to set passwords and security levels for all other operators. Each operator password shall be able to restrict the operators' access for viewing and/or changing each system application, full screen editor, and object. Each operator shall automatically be logged off of the system if no keyboard or mouse activity is detected. This auto log-off time shall be set per operator password. All system security data shall be stored in an encrypted format.

G. System Diagnostics. The system shall automatically monitor the operation of all workstations, printers, modems, network connections, building management panels, and controllers. The failure of any device shall be annunciated to the operator.

H. Alarm Console:

1. The system will be provided with a dedicated alarm window or console. This window will notify the operator of an alarm condition, and allow the operator to view details of the alarm and acknowledge the alarm. The use of the Alarm Console can be enabled or disabled by the system administrator.
2. When the Alarm Console is enabled, a separate alarm notification window will supercede all other windows on the desktop and shall not be capable of being minimized or closed by the operator. This window will notify the operator of new alarms and unacknowledged alarms. Alarm notification windows or banners that can be minimized or closed by the operator shall not be acceptable.

2.11 WEB BROWSER CLIENTS

A. The system shall be capable of supporting an unlimited number of clients using a standard Web browser such as Internet Explorer™ or Netscape Navigator™. Systems requiring additional software (to enable a standard Web browser) to be resident on the client machine, or manufacture-specific browsers shall not be acceptable.

B. The Web browser software shall run on any operating system and system configuration that is supported by the Web browser. Systems that require specific machine requirements in terms of processor speed, memory, etc., in order to allow the Web browser to function with the BAS, shall not be acceptable.

C. The Web browser shall provide the same view of the system, in terms of graphics, schedules, calendars, logs, etc., and provide the same interface methodology as is provided by the Graphical User Interface. Systems that require different views or that require different means of interacting with objects such as schedules, or logs, shall not be permitted.

D. The Web browser client shall support at a minimum, the following functions:
   1. User log-on identification and password shall be required. If an unauthorized user attempts access, a blank web page shall be displayed. Security using Tridium "N4" authentication and encryption techniques to prevent unauthorized access shall be implemented.
   2. Graphical screens developed for the GUI shall be the same screens used for the Web browser client. Any animated graphical objects supported by the GUI shall be supported by the Web browser interface.
   3. HTML programming shall not be required to display system graphics or data on a Webpage. HTML editing of the Web page shall be allowed if the user desires a specific look or format.
   4. Storage of the graphical screens shall be in the Network Area Controller (NAC), without requiring any graphics to be stored on the client machine. Systems that require graphics storage on each client are not acceptable.
   5. Real-time values displayed on a Web page shall update automatically without requiring a manual "refresh" of the Web page.
   6. Users shall have administrator-defined access privileges. Depending on the access privileges assigned, the user shall be able to perform the following:

      a. Modify common application objects, such as schedules, calendars, and set points in a graphical manner.

         1) Schedule times will be adjusted using a graphical slider, without requiring any keyboard entry from the operator.
         2) Holidays shall be set by using a graphical calendar, without requiring any keyboard entry from the operator.

      b. Commands to start and stop binary objects shall be done by right-clicking the selected object and selecting the appropriate command from the pop-up menu. No entry of text shall be required.
      c. View logs and charts
      d. View and acknowledge alarms
      e. Setup and execute SQL queries on log and archive information

   7. The system shall provide the capability to specify a user's (as determined by the log-on user identification) home page. Provide the ability to limit a specific user to just their defined home page. From the home page, links to other views, or pages in the system shall be possible, if allowed by the system administrator.
   8. Graphic screens on the Web Browser client shall support hypertext links to other locations on the Internet or on Intranet sites, by specifying the Uniform Resource Locator (URL) for the desired link.

2.12 SERVER FUNCTIONS AND HARDWARE

A. A central server shall be provided and maintained by the Owner. The server shall support all Network Area Controllers (NAC) connected to the Owner's network whether local or remote.

B. Local connections shall be via an Ethernet LAN. Remote connections can be via ISDN, ADSL, T1 or dial-up connection.

C. It shall be possible to provide access to all Network Area Controllers via a single connection to the server. In this configuration, each Network Area Controller can be accessed from a remote Graphical User Interface (GUI) or from a standard Web browser (WBI) by connecting to the server.

D. The server shall provide the following functions, at a minimum:

1. Global Data Access: The server shall provide complete access to distributed data defined anywhere in the system.
2. Distributed Control: The server shall provide the ability to execute global control strategies based on control and data objects in any NAC in the network, local or remote.
3. The server shall include a master clock service for its subsystems and provide time synchronization for all Network Area Controllers (NAC)
4. The server shall accept time synchronization messages from trusted precision Atomic Clock Internet sites and update its master clock based on this data.
5. The server shall provide scheduling for all Network Area Controllers and their underlying field control devices.
6. The server shall provide demand limiting that operates across all Network Area Controllers. The server must be capable of multiple demand programs for sites with multiple meters and or multiple sources of energy. Each demand program shall be capable of supporting separate demand shed lists for effective demand control.
7. The server shall implement the BACnet Command Prioritization scheme (26 levels) for safe and effective contention resolution of all commands issued to Network Area Controllers. Systems not employing this prioritization shall not be accepted.
8. Each Network Area Controller supported by the server shall have the ability to archive its log data, alarm data and database to the server, automatically. Archiving options shall be user-defined including archive time and archive frequency.
9. The server shall provide central alarm management for all Network Area Controllers supported by the server. Alarm management shall include:

    a. Routing of alarms to display, printer, email and pagers
    b. View and acknowledge alarms
    c. Query alarm logs based on user-defined parameters

10. The server shall provide central management of log data for all Network Area Controllers supported by the server. Log data shall include process logs, runtime and event counter logs, audit logs and error logs. Log data management shall include:

    a. Viewing and printing log data.

b. Exporting log data to other software applications.
c. Query log data based on user-defined parameters.

E. Server Hardware Requirements: The server hardware platform shall have the following requirements.

1. The server shall be an IBM compatible, Pentium based computer with the following minimum configuration

a. 3.0 GHz processing speed.
b. 2.0 GB RAM.
c. 250-Gigabyte hard drive 7200 RPM.
d. 48X DVD-CDRW combination drive.
e. 2-parallel ports.
f. 2-asynchronous serial ports.
g. 2-USB ports.
h. 25” flat panel color monitor, 1280 x 1024 optimal preset resolution, 25 ms response time.
i. 104 key keyboard.
j. optical or laser mouse with scroll wheel.

2. Connection to the BAS network shall be via an Ethernet network interface card, 10/100 Mbps.
3. The server operating system shall be Microsoft Windows 10 Professional.
4. Include Microsoft Internet Explorer 11.0 or later.
5. A system printer shall be provided by the Owner. Printer shall be inkjet or laser type with a minimum 1200 x 1200-dpi resolution and rated for 14 PPM print speed minimum. The printer shall be capable of printing wide format (11”x25”) paper.
6. For dedicated alarm printing, the Owner shall provide a dot matrix printer, either 80 or 132 column width. The printer shall have a parallel port interface.

2.13 SYSTEM PROGRAMMING

A. The Graphical User Interface software (GUI) shall provide the ability to perform system programming and graphic display engineering as part of a complete software package. Access to the programming functions and features of the GUI shall be through password access as assigned by the system administrator.

B. A library of control, application, and graphic objects shall be provided to enable the creation of all applications and user interface screens. Applications are to be created by selecting the desired control objects from the library, dragging or pasting them on the screen, and linking them together using a built in graphical connection tool. Completed applications may be stored in the library for future use. Graphical User Interface screens shall be created in the same fashion. Data for the user displays is obtained by graphically linking the user display objects to the application objects to provide “real-time” data updates. Any real-time data value or object property may be connected to display its current value on a user display. Systems requiring separate software tools or processes to create applications and user interface displays shall not be acceptable.

C. Programming Methods:

1. Provide the capability to copy objects from the supplied libraries, or from a user-defined library to the user's application. Objects shall be linked by a graphical linking scheme by dragging a link from one object to another. Object links will support one-to-one, many-toone, or one-to-many relationships. Linked objects shall maintain their connections to other objects regardless of where they are positioned on the page and shall show link identification for links to objects on other pages for easy identification. Links will vary in color depending on the type of link; i.e., internal, external, hardware, etc.
2. Configuration of each object will be done through the object's property sheet using fill-in the blank fields, list boxes, and selection buttons. Use of custom programming, scripting language, or a manufacturer-specific procedural language for configuration will not be accepted.
3. The software shall provide the ability to view the logic in a monitor mode. When on-line, the monitor mode shall provide the ability to view the logic in real time for easy diagnosis of the logic execution. When off-line (debug), the monitor mode shall allow the user to set values to inputs and monitor the logic for diagnosing execution before it is applied to the system.
4. All programming shall be done in real-time. Systems requiring the uploading, editing, and downloading of database objects shall not be allowed.
5. The system shall support object duplication within an Owner's database. An application, once configured, can be copied and pasted for easy re-use and duplication. All links, other than to the hardware, shall be maintained during duplication.

2.14 COLOR GRAPHICS

A. The Web browser GUI shall make extensive use of color in the graphic pane to communicate information related to setpoints and comfort. Animated graphics controls shall be used to enhance usability. The GUI workstation software shall graphically display in 1024 by 768 pixels 24 bit True Color. Graphics shall be navigated through a tree view (similar to Windows Explorer) for quick viewing of, and access to, the hierarchical structure of the system. As a minimum, the following color graphics shall be developed:

1. WAN Graphic: System entry screen with links to all Building Graphics for buildings connected to the BAS Wide Area Network. WAN Graphic shall show locations of controlled buildings in relation to local landmarks. (Operator sign-on and password shall be required.)
2. Building Graphic: Building entry screen providing links to each Floor Plan Graphic and mechanical rooms. (Operator sign-on and password into each building may be required depending upon Owner security requirements and final system network architecture.)
3. HVAC Floor Plan Graphic: HVAC Floor Plan Graphics shall show heating and cooling zones throughout the buildings in a range of colors, which provide a visual display of temperature relative to their respective setpoints. Color floor plans shall utilize a contiguous band of colors, each corresponding to actual zone temperatures relative to the desired heating and cooling setpoints. The ideal temperature shall be shown as a green color band. Temperatures slightly warmer than ideal shall be shown in yellow, and even warmer temperature band shall be shown in orange. Temperatures slightly cooler than ideal shall be light blue, and even cooler temperatures shall be shown as dark blue. All alarm colors shall be

in red. The colors shall be updated dynamically as a zone's actual comfort condition changes or the setpoint is changed. The operator shall be able to select a zone on the graphic with the mouse and be automatically navigated to the HVAC Zone Graphic (Single) for that zone without the operator having to select the zone from the tree navigation structure.

4. HVAC System Graphic: The HVAC System Graphic shall show the system mechanical components through the use of a pictorial representation. Selected I/O points being controlled or monitored for each piece of equipment shall be displayed with the appropriate engineering units. Animation shall be used for rotation or moving mechanical components to enhance usability.
5. HVAC Zone Graphic (Single): The HVAC Zone Graphic (Single) shall show the zone mechanical components through the use of a pictorial representation. Selected I/O points being controlled or monitored for each piece of equipment shall be displayed with the appropriate engineering units. Animation shall be used for rotation or moving mechanical components to enhance usability. The HVAC Zone Graphic (Single) is intended to provide data on the final HVAC conditioning equipment for the zone whether that is a VAV box, or a piece of unitary HVAC equipment.
6. HVAC Zone Graphic (Multiple): The HVAC Zone Graphic (Multiple) shall show all of the zone I/O points being controlled or monitored for each zonal system being served by an HVAC system in a tabular format. (i.e., Data for each VAV box being served by a single air handler). The datas all be displayed with the appropriate engineering units.
7. Central Plant Graphics: Central Plant Graphics shall be provided for all central systems including chillers, boilers, cooling towers, etc. The Central Plant Graphics shall show the plant mechanical components through the use of a pictorial representation. Selected I/O points being controlled or monitored for each piece of equipment shall be displayed with the appropriate engineering units. Animation shall be used for rotation or moving mechanical components to enhance usability.
8. Lighting Floor Plan Graphic: Integrated lighting controls shall include Lighting Floor Plan Graphics. These shall show the current status of controlled lighting zones throughout the buildings in a range of colors, which provide a visual display of current status of the lighting in the zone. A lighting zone in which the lights are “On” shall be shown in yellow, whereas, as zone in which the lighting is “Off” shall be shown as black. Zones that do not have integrated controls through the BAS shall be shown as grey. The colors shall be updated dynamically as the lighting status or method of control changes. The operator shall be able to select a zone on the graphic with the mouse and be automatically navigated to the Lighting Zone Graphic for that zone without the operator having to select the zone from the tree navigation structure.
9. Lighting Zone Graphic: The Lighting Zone Graphic shall indicate the I/O points being controlled or monitored for each controlled lighting zone with the appropriate engineering units. The Lighting Zone Graphic is intended to provide the operator interface for control for the zone. The current status of the lighting in the zone shall be displayed along with the occupancy status if available. The entity or device providing the current control signal shall be indicated whether that is a time schedule, occupancy sensor, local manual override, remote operator override, etc. Depending upon the complexity of lighting control schemes, it may be acceptable to eliminate the Lighting Zone Graphic and provide these functions as part of the Lighting Floor Plan Graphic.

10. Tenant Access Interface Graphic: Tenant Access Interface Graphics shall be developed to allow an extremely simplified and limited interface into specific areas and features of the BAS with an appropriate sign-on and password. These graphics are intended to be a means of access by tenants for control and adjustment of a limited number of number of BAS features such as HVAC or lighting schedule adjustment, space temperature setpoint changes, etc. The Division 25 Contractor shall work with the Owner to define the specific features and functions of this interface. The graphic should rely heavily on the use of pictorial images of items, such as a standard thermostat, in order to make it easy for a non-standard BAS user to navigate.

B. All graphics, with the exception of the Tenant Access Interface Graphic, shall include a direct link to the programmed sequence of operations for that particular system. This link for the sequence of operations shall be selectable from the graphic without the operator having to select the sequence from the tree navigation structure. This sequence of operations shall be stated clearly and concisely through the use of words and shall be in addition to any graphic depiction or programming tool depiction of the programmed sequence.

2.15 LONWORKS NETWORK MANAGEMENT

A. The Graphical User Interface software (GUI) shall provide a complete set of integrated LonWorks network management tools for working with LonWorks networks. These tools shall manage a database for all LonWorks devices by type and revision, and shall provide a software mechanism for identifying each device on the network. These tools shall also be capable of defining network data connections between LonWorks devices, known as “binding”. Systems requiring the use of third party LonWorks network management tools shall not be accepted.

B. Network management shall include the following services: device identification, device installation, device configuration, device diagnostics, device maintenance and network variable binding.

C. The network configuration tool shall also provide diagnostics to identify devices on the network, to reset devices, and to view health and status counters within devices.

D. These tools shall provide the ability to “learn” an existing LonWorks network, regardless of what network management tool(s) were used to install the existing network, so that existing LonWorks devices and newly added devices are part of a single network management database.

E. The network management database shall be resident in the Network Area Controller (NAC), ensuring that anyone with proper authorization has access to the network management database at all times. Systems employing network management databases that are not resident, at all times, within the control system, shall not be accepted.

2.16 OBJECT LIBRARIES

A. A standard library of objects shall be included for development and setup of application logic, user interface displays, system services, and communication networks.

B. The objects in this library shall be capable of being copied and pasted into the user's database and shall be organized according to their function. In addition, the user shall have the capability to group objects created in their application and store the new instances of these objects in a user-defined library.

C. In addition to the standard libraries specified here, the supplier of the system shall maintain an on-line accessible (over the Internet) library, available to all registered users to provide new or updated objects and applications as they are developed.

D. All control objects shall conform to the control objects specified in the BACnet specification.

E. The library shall include applications or objects for the following functions, at a minimum:

1. Scheduling Object. The schedule must conform to the schedule object as defined in the BACnet specification, providing 7-day plus holiday & temporary scheduling features and a minimum of 10 on/off events per day. Data entry to be by graphical sliders to speed creation and selection of on-off events.
2. Calendar Object. The calendar must conform to the calendar object as defined in the BACnet specification, providing 12-month calendar features to allow for holiday or special event data entry. Data entry to be by graphical "point-and-click" selection. This object must be "linkable" to any or all scheduling objects for effective event control.
3. Duty Cycling Object. Provide a universal duty cycle object to allow repetitive on/off time control of equipment as an energy conserving measure. Any number of these objects may be created to control equipment at varying intervals.
4. Temperature Override Object. Provide a temperature override object that is capable of overriding equipment turned off by other energy saving programs (scheduling, duty cycling etc.) to maintain occupant comfort or for equipment freeze protection.
5. Start-Stop Time Optimization Object. Provide a start-stop time optimization object to provide the capability of starting equipment just early enough to bring space conditions to desired conditions by the scheduled "occupied" time. Also, allow equipment to be stopped before the scheduled "unoccupied" time just far enough ahead to take advantage of the building's "flywheel" effect for energy savings. Provide automatic tuning of all start/stop time object properties based on the previous day's performance.
6. Demand Limiting Object. Provide a comprehensive demand-limiting object that is capable of controlling demand for any selected energy utility (electric, oil, and gas). The object shall provide the capability of monitoring a demand value and predicting (by use of a sliding window prediction algorithm) the demand at the end of the user defined interval period (1-60 minutes). This object shall also accommodate a utility meter time sync pulse for fixed interval demand control. Upon a prediction that will exceed the user defined demand limit (supply a minimum of 6 per day), the demand limiting object shall issue shed commands to either turn off user specified loads or modify equipment set points to effect the desired energy reduction. If the list of equipment to be shed is not enough to reduce the demand to below the setpoint, a message shall be displayed on the users screen (as an alarm) instructing the user to take manual actions to maintain the desired demand. The shed lists are specified by the user and shall be selectable to be shed in either a fixed or rotating order to control which

equipment is shed the most often. Upon suitable reductions in demand, the demand-limiting object shall restore the equipment that was shed in the reverse order in which it was shed. Each object to be shed shall have a minimum and maximum shed time property to effect both equipment protection and occupant comfort.

F. The library shall include control objects for the following functions. All control objects shall conform to the objects as specified in the BACnet specification.

1. Analog Input Object - Minimum requirement is to comply with the BACnet standard for data sharing. Allow high, low and failure limits to be assigned for alarming. Also, provide a time delay filter property to prevent nuisance alarms caused by temporary excursions above or below the user defined alarm limits.
2. Analog Output Object - Minimum requirement is to comply with the BACnet standard for data sharing.
3. Binary Input Object - Minimum requirement is to comply with the BACnet standard for data sharing. The user must be able to specify either input condition for alarming. This object must also include the capability to record equipment run-time by counting the amount of time the hardware input is in an “on” condition. The user must be able to specify either input condition as the “on” condition.
4. Binary Output Object - Minimum requirement is to comply with the BACnet standard for data sharing. Properties to enable minimum on and off times for equipment protection as well as interstart delay must be provided. The BACnet Command Prioritization priority scheme shall be incorporated to allow multiple control applications to execute commands on this object with the highest priority command being invoked. Provide sixteen levels of priority as a minimum. Systems not employing the BACnet method of contention resolution shall not be acceptable.
5. PID Control Loop Object - Minimum requirement is to comply with the BACnet standard for data sharing. Each individual property must be adjustable as well as to be disabled to allow proportional control only, or proportional with integral control, as well as proportional, integral and derivative control.
6. Comparison Object - Allow a minimum of two analog objects to be compared to select either the highest, lowest, or equality between the two linked inputs. Also, allow limits to be applied to the output value for alarm generation.
7. Math Object - Allow a minimum of four analog objects to be tested for the minimum or maximum, or the sum, difference, or average of linked objects. Also, allow limits to be applied to the output value for alarm generation.
8. Custom Programming Objects - Provide a blank object template for the creation of new custom objects to meet specific user application requirements. This object must provide a simple BASIC-like programming language that is used to define object behavior. Provide a library of functions including math and logic functions, string manipulation, and e-mail as a minimum. Also, provide a comprehensive on-line debug tool to allow complete testing of the new object. Allow new objects to be stored in the library for reuse.
9. Interlock Object - Provide an interlock object that provides a means of coordination of objects within a piece of equipment such as an air handler or other similar types of equipment. An example is to link the return fan to the supply fan such that when the supply fan is started, the return fan object is also started automatically without the user having to issue separate commands or to

link each object to a schedule object. In addition, the control loops, damper objects, and alarm monitoring (such as return air, supply air, and mixed air temperature objects) will be inhibited from alarming during a user-defined period after startup to allow for stabilization. When the air handler is stopped, the interlocked return fan is also stopped, the outside air damper is closed, and other related objects within the air handler unit are inhibited from alarming thereby eliminating nuisance alarms during the off period. Temperature Override Object - Provide an object whose purpose is to provide the capability of overriding a binary output to an "On" state in the event a user specified high or low limit value is exceeded. This object is to be linked to the desired binary output object as well as to an analog object for temperature monitoring, to cause the override to be enabled. This object will execute a Start command at the Temperature Override level of start/stop command priority unless changed by the user.

10. Composite Object - Provide a container object that allows a collection of objects representing an application to be encapsulated to protect the application from tampering, or to more easily represent large applications. This object must have the ability to allow the user to select the appropriate parameters of the "contained" application that are represented on the graphical shell of this container.

G. The object library shall include objects to support the integration of devices connected to the Network Area Controller (NAC). At a minimum, provide the following as part of the standard library included with the programming software:

1. LonMark/LonWorks devices. These devices shall include, but not be limited to, devices for control of HVAC, lighting, access, and metering. Provide LonMark manufacturer specific objects to facilitate simple integration of these devices. All network variables defined in the LonMark profile shall be supported. Information (type and function) regarding network variables not defined in the LonMark profile shall be provided by the device manufacturer.
2. For devices not conforming to the LonMark standard, provide a dynamic object that can be assigned to the device based on network variable information provided by the device manufacturer. Device manufacturer shall provide an XIF file and documentation for the device to facilitate device integration.
3. For BACnet devices, provide the following objects at a minimum:

    a. Analog In.
    b. Analog Out.
    c. Analog Value.
    d. Binary.
    e. Binary In.
    f. Binary Out.
    g. Binary Value.
    h. Multi-State In.
    i. Multi-State Out.
    j. Multi-State Value.
    k. Schedule Export.
    l. Trend Export.
    m. Device.

4. For each BACnet object, provide the ability to assign the object a BACnet device and object instance number.
5. For BACnet devices, provide the following support at a minimum

    a. Segmentation.
    b. Segmented Request.
    c. Segmented Response.
    d. Application Services.
    e. Read Property.
    f. Read Property Multiple.
    g. Write Property.
    h. Write Property Multiple.
    i. Confirmed Event Notification.
    j. Unconfirmed Event Notification.
    k. Acknowledge Alarm.
    l. Get Alarm Summary.
    m. Who-has.
    n. I-have.
    o. Who-is.
    p. I-am.
    q. Subscribe COV.
    r. Confirmed COV notification.
    s. Unconfirmed COV notification.
    t. Media Types.
    u. Ethernet.
    v. BACnet IP Annex J.
    w. MSTP.
    x. BACnet Broadcast Management Device (BBMD) function.
    y. Routing.

2.17 LONWORKS SYSTEM INTEGRATION

A. The preferred means of integrating data from a third-party product into the BAS will be a BACnet interface. In the event that this communication protocol is unavailable as an option for integration of new or existing legacy systems, integration of device data via LonWorks may be acceptable.

B. Controls shall be microprocessor based Interoperable LonMark or LonWorks Controllers (ILC). Where possible, all Interoperable LonWorks Controllers shall bear the applicable LonMark interoperability logo on each product delivered.

C. HVAC control shall be accomplished using LonMark based devices where the application has a LonMark profile defined. Where LonMark devices are not available for a particular application, devices based on LonWorks shall be acceptable. For each LonWorks device that does not have LonMark certification, the device supplier must provide an XIF file for the device to the Division 25 contractor. Publicly available specifications for the Applications Programming Interface must be provided to the Division 25 contractor for each LonWorks / LonMark controller defining the programming or setup of each device. The Division 23 contractor shall provide all programming, documentation and programming tools necessary to set up and configure the supplied devices per the specified sequences of operation.

D. The Division 23 contractor shall run the LonWorks network trunk to the nearest Network Area Controller (NAC). Coordinate locations of the NAC with the Division 25 contractor to ensure that maximum network wiring distances, as specified by the LonWorks wiring guidelines, are not exceeded. A maximum of 40 devices shall be connected to a NAC and must be installed using the appropriate trunk termination device. If more than one NAC is present on the project, the number of network devices shall be split equally among them. All LonWorks and LonMark devices must be supplied using FTT-10A LonWorks communications transceivers.

E. The Network Area Controller (NAC), supplied by the Division 25 contractor, will provide all scheduling, alarming, trending, and network management for the LonMark / LonWorks based devices.

F. The ILCs shall communicate with the NAC at a baud rate of not less than 78.8K baud. The ILC shall provide LED indication of communication and controller performance to the technician, without cover removal.

G. All ILCs shall be fully application programmable and shall at all times maintain their LonMark certification, if so certified. All control sequences within or programmed into the ILC shall be stored in non-volatile memory, which is not dependent upon the presence of a battery, to be retained.

H. The Division 23 contractor supplying the ILC's shall provide documentation for each device, with the following information at a minimum:

1. Network Variable Inputs (nvi's); name and type 2. Network Variable Outputs (nvo's); name and type.
2. Network configuration parameters (nci, nco); name and type.
3. It is the responsibility of the Division 23 contractor to ensure that the proper Network Variable Inputs and Outputs (nvi and nvo) are provided in each ILC, as required by the point charts. The supplier of any programmable ILC shall provide one copy of the manufacturer's programming tool, with documentation, to the Owner.

I. It is the responsibility of the Division 23 contractor to ensure that the proper Network Variable Inputs and Outputs (nvi and nvo) are provided in each ILC, as required by the point charts.

J. The supplier of any programmable ILC shall provide one copy of the manufacturer's programming tool, with documentation, to the Owner.

2.18 MODBUS SYSTEM INTEGRATION

A. The preferred means of integrating data from a third-party product into the BAS will be a BACnet interface. In the event that this communication protocol is unavailable as an option for integration of existing legacy systems, integration of device data via Modbus may be acceptable.

B. The Network Area Controller shall support the integration of device data from Modbus RTU, ASCII, or TCP control system devices. The connection to the Modbus system shall be via an RS-232, RS-485, or Ethernet IP as required by the device.

C. Provide the required objects in the library, included with the Graphical User Interface programming software, to support the integration of the Modbus system data into the BAS. Objects provided shall include at a minimum:

1. Read/Write Modbus AI Registers.
2. Read/Write Modbus AO Registers.
3. Read/Write Modbus BI Registers.
4. Read/Write Modbus BO Registers.

D. All scheduling, alarming, logging and global supervisory control functions, of the Modbus system devices, shall be performed by the Network Area Controller.

E. The equipment system vendor that provided the equipment utilizing Modbus shall ensure that the existing system's database is setup to make all data to be integrated into the BAS available at the interface. Any modifications to the existing system database to accomplish this shall be the responsibility of the equipment system vendor that provided the equipment utilizing Modbus.

A. The BAS supplier shall provide a Modbus system communications driver. The equipment system vendor that provided the equipment utilizing Modbus shall provide documentation of the system's Modbus interface and shall provide factory support at no charge during system commissioning.

2.19 OPC SYSTEM INTEGRATION

A. The preferred means of integrating data from a third-party product into the BAS will be a BACnet interface. In the event that this communication protocol is unavailable as an option for integration of existing legacy systems, integration of device data via OPC may be acceptable.

B. The Network Area Controller shall act as an OPC client and shall support the integration of device data from OPC servers. The connection to the OPC server shall be Ethernet IP as required by the device. The OPC client shall support third party OPC servers compatible with the Data Access 1.0 and 2.0 specifications.

C. Provide the required objects in the library, included with the Graphical User Interface programming software, to support the integration of the OPC system data into the BAS. Objects provided shall include at a minimum:

1. Read/Write OPC AI Object.
2. Read/Write OPC AO Object.
3. Read/Write OPC BI Object.
4. Read/Write OPC BO Object.
5. Read/Write OPC Date/Time Input Object.
6. Read/Write OPC Date/Time Output Object.
7. Read/Write OPC String Input Object.
8. Read/Write OPC String Output Object.

D. All scheduling, alarming, logging and global supervisory control functions, of the OPC system devices, shall be performed by the Network Area Controller.

E. The equipment system vendor that provided the equipment utilizing OPC shall ensure that the existing system's database is setup to make all data to be integrated into the BAS available at the interface. Any modifications to the existing system database to accomplish this shall be the responsibility of the equipment system vendor that provided the equipment utilizing OPC.

F. The BAS supplier shall provide an OPC client communications driver. The equipment system vendor that provided the equipment utilizing OPC shall provide documentation of the system's OPC server interface and shall provide factory support at no charge during system commissioning.

2.20 LEGACY SYSTEM INTEGRATION THROUGH CUSTOM DRIVER

A. The Network Area Controller shall support the integration of device data from the existing control system. The connection to the existing system shall be via an RS-232 connection between the Network Area Controller and the existing control system.

B. The Owner, and/or the existing control system representative shall ensure that the existing system's database is setup to make all data to be integrated into the BAS available at the RS-232 port. Any modifications to the existing system database to accomplish this shall be the responsibility of the Owner.

C. Provide the required objects in the library, included with the Graphical User Interface programming software, to support the integration of the existing system data into the BAS.

D. Objects provided shall include at a minimum:

1. Legacy System Generic AI Object.
2. Legacy System Generic AO Object.
3. Legacy System Generic BO Object.
4. Legacy System Generic BI Object.

E. All scheduling, alarming, logging and global supervisory control functions (demand limiting, etc.), of the existing system devices, shall be performed by the Network Area Controller.

F. Integration of the existing system's schedules, alarms, logs, etc. is neither required nor desired.

G. The BAS supplier shall provide a legacy system communications driver. The Owner shall provide documentation of the existing system's protocol to facilitate the development of this driver. Costs for the development of the driver are to be arranged between the Owner and the BAS supplier and are not included as part of this contract.

H. The Tridium system integrator provide renaming strategies to standardize the variable for legacy devices and new devices.

PART 3 - EXECUTION

3.1 INSTALLATION

A. All work described in this section shall be performed by system integrators or contractors that have a successful history in the design and installation of integrated control systems. The installing office shall have a minimum of five years of integration experience and shall provide documentation in the submittal package verifying the company's experience.

B. Install system and materials in accordance with manufacturer's instructions, and as detailed on the project drawing set. The project plans shall be thoroughly examined for control device and equipment locations. Any discrepancies, conflicts, or omissions shall be reported to the Owner for resolution before rough-in work is started.

C. The Contractor shall inspect the site to verify that equipment may be installed as shown. Any discrepancies, conflicts, or omissions shall be reported to the Owner for resolution before rough-in work is started.

D. Drawings of BAS network are diagrammatic only and any apparatus not shown, but required to make the system operative to the complete satisfaction of the Owner shall be furnished and installed without additional cost.

3.2 EQUIPMENT PROTECTION

A. The Contractor shall protect all work and material from damage by its work or employees, and shall be liable for all damage thus caused.

B. The Contractor shall be responsible for its work and equipment until finally inspected, tested, and accepted. The Contractor shall protect any material that is not immediately installed.

3.3 WIRING

A. All electrical control wiring and power wiring to the NAC and any other equipment or devices provided by the Division 25 Contractor shall be the responsibility of the Division 25 contractor. The Owner shall provide all power wiring to any computers, servers, routers, hubs, switches, and bridges provided by the Owner.

1. The Owner shall be responsible for providing and maintaining the Ethernet backbone as is standard practice within their facilities. The Owner will provide Ethernet drops within five feet of the equipment provided by Division 25 that requires network connection as defined on diagrams developed specifically for this project. It is anticipated that there will be one open RJ-45 jack located in each mechanical room to facilitate the connection of a Portable Operator's Terminal to the Ethernet backbone for purposes of troubleshooting and maintenance of the mechanical room equipment.

B. All wiring shall be in accordance with the Project Electrical Specifications (Division 26), the National Electrical Code and any applicable local codes. All BAS wiring shall be installed in the conduit types specified in the Project Electrical Specifications (Division 26). Where BAS plenum rated cable wiring is allowed it shall be run parallel to or at right

angles to the structure, properly supported and installed in a neat and workmanlike manner.

3.4 WARRANTY

A. Equipment, materials and workmanship incorporated into the work shall be warranted for a period of one year from the time of system acceptance.

B. Within this period, upon notice by the Owner, any defects in the work provided under this section due to faulty materials, methods of installation or workmanship shall be promptly (within 48 hours after receipt of notice) repaired or replaced by the Division 25 contractor at no expense to the Owner

3.5 WARRANTY ACCESS

A. The Owner shall grant to the Division 25 contractor, reasonable access to the BAS during the warranty period.

3.6 CHECKOUT AND TESTING

A. The Division 23 and Division 26 contractors are to coordinate the Checkout and Testing of their systems with the Division 25 System Integrator such that each has a representative present during the activities.

B. The Checkout and Testing process shall utilize checklists and forms developed by the Division 23 and Division 26 contractors and previously defined under the section titled “Submittal” in Division 23 and Division 26 to document the testing results. The approved checklists and forms shall be completed for all points and systems during Checkout and Testing.

C. The Division 23 and Division 26 contractors and the Division 25 contractor shall perform tests to verify proper performance of components, routines, and points provided under their Division. Repeat tests until proper performance results. Do not delay tests so as to prevent delay of occupancy permits or building occupancy.

D. Division 23 and Division 26 Start-up Testing: All testing listed in this article shall be performed by the Division 23 and Division 26 contractors and shall make up part of the necessary verification of an operating control system. This testing shall be completed before the Owner’s Representative is notified of the system Demonstration. For all control devices and programming provided by the Division 23 and Division 26 contractors, the contractors shall:

1. Furnish all labor and test apparatus required to calibrate and prepare for service all instruments, controls, and accessory equipment furnished under this specification.
2. Verify that all control wiring is properly connected and free of all shorts and ground faults and verify that terminations are tight.
3. Enable the control systems and verify calibration of all input devices individually. Perform calibration procedures per manufacturers’ recommendations or as otherwise specified.

4. Verify that all binary output devices (relays, solenoid valves, two-position actuators and control valves, magnetic starters, etc.) operate properly and that the normal positions are correct.
5. Verify that all analog output devices (electric/pneumatic transducers, actuators, etc.) are functional, that start and span are correct, and that direction and normal positions are correct. The Division 23 contractor shall check all control valves and automatic dampers to ensure proper action and closure. The Division 23 contractor shall make any necessary adjustments to valve stem and damper blade travel.
6. Verify that the system adheres to the sequences of operation. Simulate and observe all modes of operation by overriding and varying inputs and schedules.
7. Tune all DDC loops.

A. Division 25 Start-up Testing: All testing listed in this article shall be performed by the Division 25 contractor and shall make up part of the necessary verification of an operating control system. This testing shall be completed before the Owner's Representative is notified of the system Demonstration. For all control devices and programming provided under Division 25, the contractor shall:

1. Furnish all labor and test apparatus required to calibrate and prepare for service all instruments, controls, and accessory equipment furnished under this specification.
2. Verify that all control wiring is properly connected and free of all shorts and ground faults and verify that terminations are tight.
3. Verify that any global control strategies and application programs resident within the Network Area Controllers adhere to the sequences of operation. Simulate and observe all modes of operation by overriding and varying inputs and schedules.
4. Alarms and Interlocks:

    a. Check each alarm separately by including an appropriate signal at a value that will trip the alarm.
    b. Interlocks shall be tripped using field contacts to check the logic, as well as to ensure that the fail-safe condition for all actuators is in the proper direction.
    c. Interlock actions shall be tested by simulating alarm conditions to check the initiating value of the variable and interlock action.

3.7 DEMONSTRATION

A. The Division 23 and Division 26 contractors and Division 25 contractor are to coordinate the Demonstration of the system such that each Division has a representative present during the activities.

B. Prior to acceptance, the control system shall undergo a series of performance tests to verify operation and demonstrate compliance with this specification. The Demonstration shall occur after the Division 23, Division 26, and Division 25 contractors have completed their tests as defined under "Checkout and Testing". The Owner's Representative shall be present to observe and review the Demonstration.

C. The Demonstration process shall utilize the forms and follow the processes previously defined as part of the Division 23 and Division 26 contractor submittals. The approved checklists and forms shall be completed for all systems as part of the Demonstration.

D. The Division 23 and Division 26 contractors shall provide at least two persons equipped with two-way communication, and shall demonstrate actual field operation of each control and sensing point for all modes of operation including, but not limited to; day, night, occupied, unoccupied, fire/smoke alarm, seasonal changeover, and power failure modes. The purpose is to demonstrate the calibration, response, and action of every point/object and system. Any test equipment required to prove the proper operation shall be provided by and operated by the Division 23, Division 26, and Division 25 contractors.

E. As each control input and output is checked, a log shall be completed showing the date, technician's initials, and any corrective action taken or needed.

F. Demonstrate compliance with sequences of operation through all modes of operation.

G. Additionally, the following items shall be demonstrated:

1. DDC Loop Response. The Division 25 contractor shall supply trend data output in a graphical form showing the step response of each DDC loop. The test shall show the loop's response to a change in setpoint, which represents a change of actuator position of at least 25% of its full range. The sampling rate of the trend shall be from 10 seconds to 3 minutes, depending on the speed of the loop. The trend data shall show for each sample the setpoint, actuator position, and controlled variable values. Any loop that yields unreasonably under-damped or over-damped control shall require further tuning by the appropriate Division 23 or Division 26 contractor.
2. Demand Limiting. The Division 25 contractor shall supply a trend data output showing the action of any demand-limiting algorithm. The data shall document the action on a minute-by-minute basis over at least a 30-minute period. Included in the trend shall be building kW, demand limiting setpoint, and the status of sheddable equipment outputs.
3. Optimum Start/Stop. The Division 25 contractor shall supply a trend data output showing the capability of the algorithm. The hour-by-hour trends shall include the output status of all optimally started and stopped equipment, as well as temperature sensor inputs of affected areas.
4. Operational logs for each system that indicate all setpoints, operating points, valve positions, mode, and equipment status shall be submitted to the engineer and Owner’s Representative. These logs shall cover three 48-hour periods and have a sample frequency of not more than 10 minutes. The logs shall be provided in a printed graphical format.

H. Any tests that fail to demonstrate the operation of the system shall be repeated at a later date. The Division 23, Division 26, and Division 25 contractors shall be responsible for any necessary repairs or revisions to the hardware or software they each have provided to successfully complete all tests.

3.8 SYSTEM ACCEPTANCE

A. All tests described in this specification shall be performed to the satisfaction of the Owner's Representative prior to the acceptance of the control system. Any tests that cannot be performed due to circumstances beyond the control of the contractor may be exempt from the completion requirements if stated as such in writing by the Owner's Representative. Such tests shall then be performed as part of the warranty.

B. The system shall not be accepted until all forms and checklists completed as part of the demonstration are submitted and approved by the Owner's Representative.

3.9 OPERATOR INSTRUCTION, TRAINING

A. During system commissioning and at such time acceptable performance of the BAS hardware and software has been established, the Division 23 and 26 contractors shall provide on-site operator instruction to the Owner's operating personnel. Operator instruction shall be done during normal working hours and shall be performed by a competent representative familiar with the system hardware, software and accessories. Operator instruction and training shall be as defined in the Division 23 and Division 26 project specifications.

B. Upon the first installation of the BAS GUI, the Division 25 contractor shall provide 40 hours of instruction to the Owner's designated personnel on the operation of the BAS and describe its intended use with respect to the programmed functions specified. Operator orientation of the BAS shall include, but not be limited to; the overall operation program, equipment functions (both individually and as part of the total integrated system), commands, systems generation, advisories, and appropriate operator intervention required in responding to the system's operation.

C. The training shall be in three sessions as follows:

1. Initial Training: One day session (8 hours) after system is started up and at least one week before first acceptance test. Manual shall have been submitted at least two weeks prior to training so that the Owners' personnel can start to familiarize themselves with the system before classroom instruction begins.
2. First Follow-Up Training: Two days (16 hours total) approximately two weeks after initial training, and before formal acceptance. These sessions will deal with more advanced topics and answer questions.
3. Warranty Follow-Up: Two days (16 hours total) in no less than 4 hour increments, to be scheduled at the request of the Owner during the one year warranty period. These sessions shall cover topics as requested by the Owner such as; how to add additional points, create and gather data for trends, graphic screen generation or modification of control routines.

3.10 RECORD DOCUMENTATION

A. Three copies of the Operation & Maintenance manuals for work provided under this Division shall be provided to the Owner upon completion of the project. These manuals shall be updated each time changes are made to the system. The entire Operation & Maintenance manual shall be furnished in three-ring binders with adequate indexing and also on compact disc media, and shall include the following:

1. Table of contents.

2. As-built system record drawings. Record drawings in AutoCAD format shall represent the as-built condition of the system and incorporate all information supplied with the approved submittals. These shall include sequences of operation and a complete I/O point summary.
3. Manufacturer's product data sheets for all products including software.
4. System operator's manuals.
5. Complete network diagrams that also indicate connections to all control systems included in the BAS Wide Area Network.
6. Wiring termination schedules.
7. Archive copy of all controller databases (on compact disk only).

3.11 SEQUENCES OF OPERATION

A. Summary:

1. The Division 25 contractor shall refer to this item under Division 23 or Division 26 to determine what level of control the Network Area Controller, must provide, which is the responsibility of this Division. It is the responsibility of the Division 25 contractor to coordinate control functions, such as scheduling and supervisory-level control with the Division 23 or Division 26 contractor. An example of supervisory-level control might be Demand Limiting or Optimum Start/Stop.

3.12 POINT LISTS

A. Summary:

1. The Division 25 contractor shall refer to this item under Division 23 or Division 26 to determine what data in the local controllers must be integrated into the Network Area Controller, which is the responsibility of this Division. It is the responsibility of the Division 25 contractor to coordinate control functions, such as scheduling and supervisory-level global control with the Division 23 or Division 26 contractor.

END OF SECTION 25 00 00

SECTION 26 05 00
COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to all Sections of divisions 26, 27, and 28.

1.2 DESCRIPTION

A. Work to be performed under the sections of Divisions 26, 27, and 28 includes all labor, materials, and equipment required to install complete electrical systems as described in these specifications and as shown on the drawings. This section includes information common to two or more technical specification sections or items that are of a general nature, not conveniently fitting into other technical sections.

B. Before submitting a bid, the Contractor shall examine the drawings and specifications, visit the work site, and be informed of local conditions, all federal, state and local ordinances, regulations and all other pertinent items which may affect cost, schedule, and completion of this project.

C. Drawings accompanying these specifications are a part of these specifications. Drawings are intended to show general arrangement, design, and extent of work and are diagrammatic. Drawings are not intended to show exact locations except where dimensions are shown. Any substantial differences existing between drawings and conditions in the field shall be submitted to the Engineer for consideration before proceeding with work. Electrical work is shown on plans using standard industry symbols.

D. Before ordering materials or doing work, the Contractor shall verify all measurements pertaining to work scope and assume installation responsibility for complete and fully functional electrical systems.

E. The electrical work included in all other divisions of this specification and related documents is the responsibility of the contractor performing the division 26, 27, and 28 work unless specifically noted otherwise.

1.3 REFERENCED STANDARDS

A. Abbreviations of standards organizations referenced in this and other sections are as follows:

1.	ANSI	American National Standards Institute
2.	ASTM	American Society for Testing and Materials
3.	EPA	Environmental Protection Agency
4.	ETL	Electrical Testing Laboratories, Inc.

5.	IBC	International Building Code
6.	IEEE	Institute of Electrical and Electronics Engineers
7.	IES	Illuminating Engineering Society
8.	ISA	Instrument Society of America
9.	NBS	National Bureau of Standards
10.	NEC	National Electric Code
11.	NECA	National Electrical Contractors Association
12.	NEMA	National Electrical Manufacturers Association
13.	NESC	National Electrical Safety Code
14.	NFPA	National Fire Protection Association
15.	UL	Underwriters Laboratories Inc.

1.4 QUALITY ASSURANCE

A. Manufacturer references used herein are intended to establish a level of quality and performance requirements unless more explicit restrictions are stated to apply.

B. Where equipment or accessories are used, which differ in arrangement, configuration, dimensions, ratings, or engineering parameters from those indicated on the contract documents, the contractor is responsible for all costs involved in integrating the equipment or accessories into the system and the assigned space and for obtaining the performance from the system into which these items are placed.

C. All materials shall be listed by and shall bear the label of an approved electrical testing laboratory. If none of the approved electrical testing laboratories has published standards for a particular item, then other national independent testing standards, subject to approval by the Engineer, shall apply and such items shall bear those labels. Where one of the approved electrical testing laboratories has an applicable system listing and label, the entire system shall be so labeled. The Contractor shall not modify new equipment in such a way as to nullify the Testing Laboratories label. All equipment and materials shall be used or installed in accordance with any instruction included in the listing by the laboratory.

1.5 DEFINITIONS

A. Activation: Nomenclature used by some manufacturers for a service fitting.

B. ATS: Acceptance Testing Specifications

C. BACnet: A networking communication protocol that complies with ASHRAE 135.

D. BAS: Building Automation System.

E. CCT: Correlated Color Temperature.

F. CPT: Control Power Transformer.

G. CRI: Color-Rendering Index.

H. Data Bus: Two wires used to communicate with bus connected devices.

I. Delegated-Design Submittals: Documents, including drawings, calculations, and material and product specifications prepared as a responsibility of Contractor to obtain acceptance by Owner and authorities having jurisdiction.

J. EMI: Electromagnetic Interference.

K. EMT: Electrical Metallic Tubing.

L. Ethernet: Local area network based on IEEE 802.3 standards.

M. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

N. FMG: Factory Mutual Group.

O. GFCI: Ground-Fault Circuit Interrupter.

P. GRC: Galvanized Rigid Steel Conduit.

Q. IBC: International Building Code.

R. IMC: Intermediate Metal Conduit.

S. Nominal: Nominal discharge current.

T. Jacket: A continuous nonmetallic outer covering for conductors or cables.

U. LAN: Local Area Network; sometimes plural as “LANs”.

V. LED: Light-Emitting Diode.

W. LLF: Light Loss Factor; the product of all factors that contribute to light loss in the system.

X. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or remote-control, signaling and power-limited circuits.

Y. Lumen: Measured output of lamp and luminaire, or both.

Z. Luminaire: Complete lighting fixture, including ballast housing if integral.

AA. MCCB: Molded-Case Circuit Breaker.

BB. MCOV: Maximum Continuous Operating Voltage.

CC. MCP: Motor-Circuit Protector.

DD. Mode(s), also Modes of Protection; The pair of electrical connections where the VPR applies.

EE. Monitoring: Acquisition, processing, communication, and display of equipment status data, metered electrical parameter values, power quality evaluation data, event and alarm signals, tabulated reports, and event logs.

FF. MOV: Metal-Oxide Varistor; an electronic component with a significant non-ohmic current-voltage characteristic.

GG. MPPT: Maximum Power Point Tracking.

HH. MPPT Control: Maximum Power Point Tracking control: MPPT software control of inverter in a renewable energy system allows the ac output power to be proportional to the dc input voltage.

II. NC: Normally Closed.

JJ. NETA ATS: Acceptance Testing Specification.

KK. NiCd: Nickel Cadmium.

LL. NO: Normally Open.

MM. OCPD: Overcurrent Protective Device.

NN. Pigtail: Short lead used to connect a device to a branch-circuit conductor.

OO. Plenum: A space forming part of the air distribution system to which one or more air ducts ae connected. An air duct is a passageway, other than a plenum, for transporting air to or from heating, ventilating, or air-conditioning equipment.

PP. Pole: Luminaire support structure, including tower used for large area illumination.

QQ. PROVIDE: For the purpose of this specification and drawings “PROVIDE” means – Furnish, Assemble, Install and Wire as required by Code and specified on the documents, and manufacturer recommendations

RR. PT: Potential Transformer.

SS. RFI: Radio-Frequency Interference.

TT. RMC: Rigid Metal Conduit.

UU. SCCR: Short-Circuit Current Rating.

VV. SPD: Surge Protective Device.

WW. SPDT: Single Pole, Double Throw.

XX. SVR: Suppressed Voltage Rating.

YY. UTP: Unshielded Twisted Pair.

ZZ. VFD: Variable-Frequency Drive or Motor Controller.

1.6 REGULATORY REQUIREMENTS

A. All work and materials are to conform in every detail to applicable rules and requirements of local codes and regulations, the National Electrical Code (NFPA 70), other applicable National Fire Protection Association codes, and current manufacturing standards (including NEMA) and any additional local modifications enacted by the Local Authority Having Jurisdiction. Contractor shall be responsible to verify what if any local modifications are in place or enacted by the Local Authority Having Jurisdiction.

B. All work shall be installed in accordance with NECA standards of installation.

C. All work shall conform where applicable to the Williams-Steiger Occupational Safety and Health Act of 1970 (OSHA), Part 1910, “Occupational Safety and Health Standards.” This shall include any local or state modifications enacted by the Authority having Jurisdiction.

1.7 OMISSIONS

A. No later than ten (10) days before bid opening, the Contractor shall call to the attention of the Engineer any materials or apparatus the Contractor believes to be inadequate and to any necessary items of work omitted.

1.8 SUBMITTALS

A. Refer to Division 01 for Submittal requirements.

B. Submit for all equipment and systems as indicated in the respective specification sections, marking each submittal with that specification section number. Mark general catalog sheets and drawings to indicate specific items being submitted and proper identification of equipment by name or number, as indicated in the contract documents. Failure to do this may result in the submittal(s) being returned to the Contractor for correction and resubmission. Failing to follow these instructions does not relieve the Contractor from the requirement of meeting the project schedule.

C. On request, the Contractor shall furnish additional drawings, illustrations, catalog data, performance characteristics, etc. to clarify intent of construction or operations.

D. Submittals shall be grouped to include complete submittals of related systems, products, and accessories in a single submittal. Mark dimensions and values in units to match those specified. Include wiring diagrams of electrically powered equipment.

E. The submittals must be approved before fabrication.

1.9 PROJECT/SITE CONDITIONS

A. Install Work in locations shown on Drawings, unless prevented by Project conditions.

B. Prepare drawings showing proposed rearrangement of work to meet Project conditions, including changes to work specified in other Sections. Obtain written permission of Engineer before proceeding.

C. Tools, materials, and equipment shall be confined to areas designated by the Construction Manager.

1.10 WORK SEQUENCE AND SCHEDULING

A. See the General Conditions of the Contract, Scheduling and Coordination of Work, and Time for Completion of the Project, and General Requirements, Mutual Responsibility for additional requirements.

1.11 WORK BY OTHER TRADES

A. Every attempt has been made to indicate in this trade's specifications and drawings all work required of this Contractor. However, there may be additional specific paragraphs in other trade specifications and addenda, and additional notes on drawings for other trades which pertain to this Trade's work, and thus those additional requirements are hereby made a part of these specifications and drawings.

B. Electrical details on drawings for equipment to be provided by others is based on preliminary design data only. This Contractor shall lay out the electrical work and shall be responsible for its correctness to match equipment actually provided by others.

1.12 OPERATING AND MAINTENANCE INSTRUCTIONS

A. Refer to Division 01, General Requirements, Operating and Maintenance Instructions for additional requirements.

1.13 TRAINING

A. Instruct Owner’s personnel in the proper operation and maintenance of systems and equipment provided as part of this project; video record all training sessions. Use the Operating and Maintenance manuals during this instruction. Demonstrate startup and shutdown procedures for all equipment. All training to be during normal working hours.

B. The requirement for recording training sessions may be deleted on some projects but not the requirement for the training itself.

C. Refer to other sections in Divisions 26, 27, and 28 for specific section and equipment training requirements.

1.14 RECORD DRAWINGS

A. A set of prints shall be kept at the job site upon which all changes and deviations from the original design are to be recorded daily. All changes shall be clearly marked. These drawings shall indicate as a minimum, all changes made to the drawings, changes in

circuiting, equipment location, accurate locations of embedded conduit, and all other significant changes and deviations from the original design.

B. The daily record of changes shall be the responsibility of the Contractor's field representative. No arbitrary mark-ups will be permitted.

C. At the completion of the project, the Contractor shall submit the marked-up record drawings to the Owner prior to request for final payment.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Reference applicable sections within Divisions 26, 27, and 28.

PART 3 - EXECUTION

3.1 WORK INCLUDED

A. The scope of work shall include all work, including all labor, materials and equipment, testing required to install a complete electrical system as indicated in the project Manual. The Project Manual consists of the bidding documents, the contract, specifications, contract drawings and all subsequent addenda and modifications. The contractor shall furnish and install all necessary materials, apparatus and devices to complete the electrical equipment and systems installation herein specified, except such parts as are specifically exempted herein.

B. All work items shown on the drawings is within the scope of work and shall be provided as indicated. Only items that are clearly indicated as being provided by others or under a separate contract shall be out of scope.

C. In general, the specifications indicate the requirements and quality for products required and the executions for those products. Only items that are clearly indicated as being provided by others or under a separate contract shall be out of scope.

D. If there is any discrepancy between the drawings and the specifications, it is the contractor's responsibility to notify the Engineer for resolution, prior to procuring equipment or starting work.

E. Coordinate and verify all equipment being supplied by equipment supplier and other trades. Verify equipment size, motor HP, dimensions, locations, etc. as all are subject to change.

F. Contractor shall verify all door swings and the location of all cabinets, diffusers, HVAC, plumping, process and building equipment before installing electrical equipment, fixtures, outlets and conduit.

G. The Contractor shall provide all plywood backboards and supports for all electrical equipment as indicated on the drawings and as required or specified.

H. All permits and inspection fees required to complete the work shall be paid for by the Contractor unless noted otherwise.

I. All electrical equipment and fixtures shall be installed in complete accordance with the manufacturers' recommendations.

J. Contractor shall provide all motor connections as shown on the drawings and as specified herein.

3.2 CONCRETE

A. All concrete work required for the proper installation of electrical equipment including transformers, switchgear and other equipment pads shall be provided by others.

3.3 SITE WORK

A. The Contractor shall provide excavation and backfill for all electrical underground work as indicated on the drawings and as required. The Contractor shall perform this work and provide compaction as specified in Division 2. Finish grading and final restoration shall be by the General Contractor.

3.4 BUILDING ACCESS

A. Arrange for the necessary openings in the building to allow for admittance of all apparatus. When the building access was not previously arranged, and must be provided by this contractor, restore any opening to its original condition after the apparatus has been brought into the building.

3.5 EQUIPMENT ACCESS

A. Install all piping, conduit, ductwork, and accessories to permit access to equipment for maintenance. Coordinate the exact location of wall and ceiling access panels and doors with the General Contractor, making sure that access is available for all equipment and specialties. Where access is required in plaster or drywall walls or ceilings, furnish the access doors to the General Contractor and reimburse the General Contractor for installation of those access doors.

3.6 COORDINATION

A. The Contractor shall cooperate with other trades in locating work in a proper manner. Should it be necessary to raise or lower or move longitudinally any part of the electrical work to better fit the general installation, such work shall be done at no extra cost, provided such decision is reached prior to actual installation. The Contractor shall check location of electrical outlets with respect to other installations before installing.

B. The Contractor shall verify that all devices are compatible for the surfaces on which they will be used. This includes, but is not limited to, light fixtures, panelboards, devices, etc. and recessed or semi-recessed heating units installed in/on architectural surfaces.

C. Coordinate all work with other trades prior to installation. Any installed work that is not coordinated and that interferes with another trades work shall be removed or relocated at the installing contractor's expense.

3.7 HOUSEKEEPING AND CLEAN UP

A. Refer to Division 01, General Requirements, and Cleaning for additional requirements.

B. The Contractor shall clean up and remove from the premises, on a daily basis, all debris and rubbish resulting from its work and shall repair all damage to new and existing equipment resulting from its work. When job is complete, the Contractor shall remove all tools, excess material and equipment, etc., from the site.

END OF SECTION 26 05 00

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SECTION 26 05 02
ELECTRICAL DEMOLITION AND ALTERATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this section.

1.2 COORDINATION

A. Coordinate sequencing with Owner and other Contractors. Coordinate scope of work with all other Contractors and the Owner at the project site. Schedule removal of equipment and electrical service to avoid conflicts.

1.3 SUMMARY

A. Electrical Demolition

B. The drawings are intended to indicate the scope of work required and do not indicate every box, conduit, or wire that must be removed. The Contractor shall visit the site prior to submitting a bid and verify existing conditions.

1.4 CONTINUITY OF EXISTING SERVICES AND SYSTEMS

A. No outages shall be permitted on existing systems except at the time and during the interval specified by the Owner. The Owner will require written approval. Any outage must be scheduled when the interruption causes the least interference with normal Government schedules and business routines. The Owner shall be notified at a minimum of 14 days prior to disruption of existing services. No extra costs will be paid to the Contractor for such outages which must occur outside of regular weekly working hours.

B. This Contractor shall restore any circuit interrupted as a result of this work to proper operation as soon as possible. Note that facility operations are on a seven-day week schedule.

C. Prior to demolition or alteration of structures, the following shall be accomplished:

1. Owner release of structure.
2. Disconnection of electrical.
3. Electrical services rerouted or shut off outside area of demolition.
4. Notify utilities prior to razing operations to permit them to disconnect and remove or relocate equipment that served existing facilities.
5. Contractor shall notify Architect/Engineer of existing code violations observed while performing his work. If corrective action needs to be taken that changes the scope of the work, corrective action to proceed only after approved by Architect/Engineer.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. Materials and equipment for patching and extending work as specified in the individual Sections.

PART 3 - EXECUTION

3.1 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

A. Repair adjacent construction and finishes damaged during demolition and extension work. Patch openings to match existing surrounding finishes.

B. Maintain access to existing electrical installations which remain active.

C. Regulatory Requirements: Comply with governing EPA notification regulations before beginning demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

D. Contractor is responsible for all costs incurred in repair, relocations, or replacement of any cables, conduits, or other services if damaged without proper investigation.

3.2 CLEANING AND REPAIR

A. Clean and repair existing materials and equipment that remain or are to be reused.

3.3 PCB BALLAST REMOVAL

A. If the Contractor discovers the presence of PCB ballasts, he shall cease work immediately and notify Construction Manager. All non-PCB ballasts shall be removed by Electrical Contractor.

3.4 ASBESTOS REMOVAL

A. If this Contractor shall discover the presence of asbestos material, he shall cease work immediately and notify Construction Manager.

3.5 INSTALLATION

A. Install relocated materials and equipment under the provisions of Division 26 Specifications.

END OF SECTION 26 05 02

SECTION 26 05 19
LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Building wires and cables rated 600 V and less.
2. Connectors, splices, and terminations rated 600 V and less.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

1.4 PROJECT CONDITIONS

A. Wire and cable routing where shown on Drawings is approximate unless dimensioned. Route wire and cable as required to meet Project Conditions.

B. Where wire and cable routing is not shown, and destination is only indicated, determine exact routing and lengths required.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Alcan Products Corporation; Alcan Cable Division.
2. American Insulated Wire Corp.
3. General Cable Corporation.
4. Senator Wire & Cable Company.
5. Southwire Company.
6. AFC Cable Systems, Inc.

B. Aluminum and Copper Conductors: Comply with NEMA WC 70.

C. Conductor Insulation: Comply with NEMA WC 70 for Types THHN/THWN, XHHW-2 and SO.

D. Multi-conductor Cable: Comply with NEMA WC 70 for Type SO with ground wire.

2.2 CONNECTORS AND SPLICES

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. AFC Cable Systems, Inc.
2. Hubbell Power Systems, Inc.
3. O-Z/Gedney; EGS Electrical Group LLC.
4. 3M; Electrical Products Division.
5. Tyco Electronics Corp.
6. Thomas & Betts.

B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

C. Spring wire connectors: Corrosion-resistant, live-action spring in insulated shell, rated 105°C.

D. Connectors and lugs: Circumferential compression (non-indenter) type.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders:

1. Conductor: Copper or aluminum for feeders 100 Amps and larger. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
2. Insulation: Type XHHW-2 insulation for feeders larger than #2 AWG; Type THHN/THWN insulation for feeders #2 AWG and smaller.

B. Special Requirements for Aluminum Conductors

1. It is the responsibility of the contractor to increase the size of the conduit, wire gutter, or enclosure, if necessary, to accommodate the aluminum conductors and meet allowable code requirements.
2. It is the responsibility of the contractor to increase the size of the aluminum conductor to match the ampacity of the copper conductor circuit shown on the Drawings.
3. The contractor shall submit a feeder schedule to the Engineer for all conductor substitutions indicating the aluminum conductor wire size and the conduit size. The contractor shall not begin the installation until written approval is granted by the Engineer.

4. All aluminum conductors shall terminate on a mechanical screw-type connector or mechanical compression-type connector. Connector shall be dual rated (AL7CU or AL9CU) and Listed by UL for use with aluminum and copper conductors and sized to accept aluminum conductors of the required ampacity. When using compression-type connectors, the lugs shall be marked with wire size, die index, number and location of crimps and shall be suitably color-coded. Using a suitable stripping tool, remove insulation from the required length of the conductor. Wire brush the conductor and apply a Listed joint compound. Tighten or crimp the connection per the connector manufacturer's recommendation. Wipe off any excess joint compound.
5. When terminating aluminum conductors to copper bus, prepare a mechanical screw-type or compression-type connection. Bolts shall be plated or galvanized medium carbon steel; heat treated, quenched and tempered equal to current ASTM standard or SAE grade 5. Nuts shall conform to current ANSI standards. Washers shall be steel, Type A plain, standard wide series conforming to current ANSI standards. Belleville conical spring washers shall be of hardened steel, cadmium plated or silicone bronze. Lubricate and tighten the hardware per manufacturer's recommendations.
6. No copper-to-aluminum transitions permitted when splicing onto existing copper feeders.

C. Branch Circuits:

1. Conductor: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
2. Insulation: Type XHHW-2 insulation for branch circuits larger than #2 AWG; Type THHN/THWN insulation for branch circuits #2 AWG and smaller.
3. Motors and equipment connections subject to vibration: Copper. No. 12 AWG and larger, stranded conductor, single conductor.
4. Use stranded conductor, single conductor, No. 14 minimum for control wiring.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Exposed Feeders: Single conductors in raceway.

B. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspaces: Single conductors in raceway.

C. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Single conductors in raceway.

D. Branch Circuits Concealed above Ceilings, in Walls, and Partitions: Single conductors in raceway.

E. Branch Circuits Concealed in Concrete, below Slab-on-Grade, and Underground: Single conductors in raceway.

F. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.

G. Class 1 Control Circuits: Single conductors in raceway.

H. Class 2 Control Circuits: Single conductors in raceway.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. All conductors shall be sized to prevent excessive voltage drop at rated circuit ampacity. As a minimum use 10 AWG conductors for 20 ampere, 120-volt branch circuit home runs longer than 100 feet (30 m), and for 20 ampere, 277-volt branch circuit home runs longer than 200 feet (61 m).

B. No conductor less than 10 AWG shall be installed in exterior underground conduit.

C. Conceal cables in finished walls, above ceilings, and in floors, unless otherwise indicated.

D. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

E. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

F. Install exposed conduits parallel and perpendicular to surfaces of exposed structural members and follow surface contours where possible.

G. Neatly train and lace wiring inside boxes, equipment, and panelboards.

H. Support cables according to Division 26 Section "Hangers and Supports for Electrical Systems."

I. Identify and color-code conductors and cables according to Division 26 Section "Identification for Electrical Systems."

3.4 FEEDER REQUIREMENTS

A. Contractor shall provide lugs, compression fittings, auxiliary wireways, etc., of adequate size for termination of feeder sizes as indicated on drawings. Feeder sizes indicated may be oversized for voltage drop in some cases. Contractor shall coordinate with equipment manufacturer for proper lug sizes.

B. Extend feeders at full capacity from origin to termination.

C. Feeders shall be continuous, without splices in so far as, practical. All feeder splices not specifically indicated on drawings must be approved by engineer in writing before splicing any cable.

D. Each conduit raceway shall contain only those conductors constituting a single feeder circuit.

E. Where multiple raceways are used for a single feeder, each raceway shall contain a conductor of each phase and neutral, if used, and a grounding conductor.

F. Where feeder conductors are run in parallel, conductors shall be of same length, same material, circular-mil area, insulation type, and terminated in same manner.

G. Where parallel feeder conductors are run in separate raceways, raceways shall have same physical characteristics.

H. Feeders shall follow most accessible routes, concealed in construction in finished areas, exposed to the minimum temperature gradient and to minimum temperature fluctuation.

I. Confine feeders to insulated portions of building, unless otherwise shown.

J. Trapped runs without facilities for continuous drainage are not acceptable.

K. Do not draw conductors into conduits until building is enclosed and watertight and until work which may cause cable damage has been completed.

L. Feeders shall be sized for a maximum voltage drop of 2%.

3.5 BRANCH CIRCUIT REQUIREMENTS

A. Do not use wire smaller than No. 12 AWG (unless otherwise noted) for branch circuit wiring, including motor circuits.

B. All emergency 20-amp, 120-volt and 277-volt branch circuits serving receptacles, equipment, and lighting shall be No. 10 AWG minimum.

C. Size home runs for normal power 120V branch circuits based on the overall circuit length to the furthest outlet. The following requirements shall be followed:

1. 0 to 100 ft. circuit length: Size home run at #12 AWG minimum to first outlet.
2. 101 to 200 ft. circuit length: Size home run at #10 AWG minimum to first outlet.
3. 201 to 300 ft. circuit length: Size home run at #8 AWG minimum to first outlet.
4. For other branch circuits, size conductors so that voltage drop does not exceed 3%.

D. All 120 volt and 277-volt branch circuits shall have a dedicated neutral conductor for each circuit. Use of common neutrals for any branch circuit 120-volt or 277-volt shall not be acceptable.

E. The plans show a circuit number for each device or light. This is done for clarity. No more than three 120V or 277 current carrying conductors shall be allowed in a single home run raceway without derating as required per NEC.

F. For isolated ground receptacle circuits, provide a dedicated isolated ground conductor for each circuit.

G. Any branch circuit protected by a GFCI circuit breaker shall be provided with a dedicated grounding conductor.

H. Wire Color – General:

1. Solid colored insulation is required for all THHN/THWN-2 wire. For other wire types use colored wire or identify wire with colored tape at all terminals, splices and boxes. Wire shall be colored as indicated below.
2. Use black and red for single phase circuits at 120/240 volts, use Phase A black, Phase B red and Phase C blue for circuits at 120/208 volts single or three phase, and use
3. Use Phase A brown, Phase B orange and Phase C yellow for circuits at 277/480 volts single or three phase.
4. Note: This includes fixture whips except for Listed whips mounted by the fixture manufacturer on the fixture and Listed as a System.
5. All switch legs shall be the same color as their associated circuit. Traveler conductors run between 3- and 4-way switches shall be colored pink or purple.
6. Neutral Conductors: White for 120/208V and 120/240V systems, Gray for 277/480V systems. Where there are two or more neutrals in one conduit, each shall be individually identified with a different stripe.

3.6 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

B. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than un-spliced conductors.

C. Use oxide inhibitor in each splice and tap conductor for aluminum conductors.

D. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

E. Clean conductor surfaces before installing lugs and connectors.

F. Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise.

G. Use compression connectors for conductor splices and taps, 6 AWG and larger. Use compression tool designed for the size and type of connector being compressed. Tape uninsulated conductors and connector with electrical tape to 150% of insulation rating of conductor.

H. Use insulated spring wire connectors with plastic caps for copper conductor splices and taps, 8 AWG and smaller.

I. Where oversized conductors are called for (due to voltage drop, etc.) provide/install lugs as required to match conductors, or provide/install splice box, and splice to reduce conductor size to match lug size.

3.7 MOTOR AND EQUIPMENT WIRING

A. Furnish and install motor circuits in accordance with schedules on drawings and code requirements, from source of supply to associated motor starter, and from starter to motor terminal box, including necessary and required intermediate connections.

B. Conductor and conduit size for motor branch circuits, if shown on drawings, are sized for motor requirement only. Contractor may, at his option, include associated control conductors in same conduit providing the conduit size is adjusted to meet code requirements for percentage of fill.

C. Motors shall have proper size wire per applicable codes and nameplate ratings. Verify ratings of motors before installing wiring.

D. Obtain manufacturer's wiring diagrams of electrical equipment furnished with equipment and do not proceed to wire equipment without this information.

E. Before installing raceways and pulling wire to any mechanical equipment, verify electrical characteristics with final submittal on equipment to assure proper number and AWG of conductors. (As for multiple speed motors, different motor starter arrangements, etc.).

F. Make equipment connections with flexible conduit or liquid-tight flexible metallic conduit. Properly ground non-current carrying metal parts of equipment. Where cord connections or receptacles are required, provide type "S" rubber jacketed cord, 600-volt, heavy duty service of sizes and lengths required, and receptacle as applicable.

G. Coordinate work with the other trades such that the operation of mechanical equipment will be as described in mechanical specifications.

H. Unless otherwise indicated on drawings or in specifications, motors shall be furnished, set in place, and connected to driven equipment and prepared for operation as specified in other sections. Provide final connection and proper phase relationship to achieve proper motor rotation.

3.8 MC and MC-LED CABLES; COPPER CONDUCTORS

A. Compliance requirements:

1. UL-44, 66,83,1479,1569, 1581,2556
2. Federal Specification A-A59544;
3. IEEE 1202
4. NEC 70
5. ARRA 2009

B. Metal Clad Cable – a factory assembly of one or more insulated circuit conductors with or without optical fiber members enclosed in an armor of interlocking metal tape or a corrugated metallic (steel) sheath.

C. MC-LED- a factory assembly of color coded two conductors and a green equipment grounding conductor cabled together with an individually-jacketed twisted pair od color-coded (purple/gray) 16 AWG twisted jacketed pair with 600V insulation. The National Electrical Code (NEC) and UL 1569 permits electric light and power circuits conductors

in an MC Cable with class 2 and class 3 circuits in accordance with NEC Section 725.136(I)(1).

D. Lighting (Power or Class 1) - Solid or Stranded 12-10 AWG soft, uncoated copper per ASTM-B3.

E. Class 2 and Class 3 - Solid 16 AWG soft, uncoated copper per ASTM-B3.

F. Cable with class 2 and class 3 circuits in accordance with NEC Section 725.136(I)(1). The entire assembly is wrapped with separator tape containing the information print legend. Interlocked aluminum or galvanized steel armor is applied over the entire assembly. MC-LED is also available in PVC Jacketed for Wet and Damp Locations.

G. All conductors shall be cabled together with separator tape containing the identification print legend to form the cable core.

H. Use of MC Cable will be permitted on this project for installation of branch circuits for lighting and power, control circuits and signal circuits in sizes #18 AWG thru #6 AWG for copper conductors. All home runs shall be installed in conduit.

I. Installation of MC Cable shall be in accordance with NEC Article 330.

J. Uses permitted will be limited to interior branch wiring only. Exterior use, direct burial and applications in wet locations will not be acceptable. Additional “not permitted” uses as identified in NEC Article 330.12.

K. Utilize set-screw connectors for connections C cable to boxes, cabinets or other equipment. Push-in-box connectors will not be acceptable.

L. There shall be no sharp edges in the fitting or on the armor that could damage conductor’s insulation.

M. Insulated bushings shall be provided at each termination.

N. Provide supports every 6’ on center.

O. The bending requirements for interlocked armor MC cables shall not exceed “seven times the external diameter of the metallic sheath” per NEC Article 330-24.

P. Shared neutrals will not be allowed.

Q. Equipment grounding conductor shall be provided with each run. The equipment grounding conductor shall be insulated and may be sectioned, when sectioned – all sections shall be identical.

R. When installed in parallel MC cables shall provide an adequate path for equipment grounding as required by NEC Article 250 -122.

3.9 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Division 26 Section "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.10 FIRESTOPPING

A. Fire stopping by others. Coordinate all fire stopping requirements with fire stopping contractor. Refer to Specification Section 078400 for additional fire stopping requirements.

3.11 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

B. Tests and Inspections:

1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors.
2. Visual and Mechanical Inspection

    a. Compare cable data with drawing and specifications
    b. Inspect exposed sections of cables for physical damage and correct connection in accordance with single-line diagram.
    c. Inspect bolted electrical connections for high resistance. Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data.
    d. Inspect compression-applied connectors for correct cable match and indentation.
    e. Inspect for correct contractor identification and phase arrangements.
    f. Inspect jacket insulation and condition.

3. Electrical Tests:

    a. Perform insulation-resistance test on each conductor with respect to ground and adjacent conductors. Applied potential shall be 500 volts dc for 300 volt rated cable and 1000 volts dc for 600 volt rated cable. Test duration shall be one minute.
    b. Perform continuity tests to insure correct cable connection.

4. Test Reports: Prepare a written report to record the following:

    a. Test procedures used.
    b. Test results that comply with requirements.
    c. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.
    d. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION 26 05 19

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SECTION 26 05 26
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes methods and materials for grounding systems and equipment

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100 by a testing agency acceptable to authorities having jurisdiction and marked for intended use.

B. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 - PRODUCTS

2.1 CONDUCTORS

A. Insulated Conductors: Copper or tinned-copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

B. Bare Copper Conductors:

1. Solid Conductors: ASTM B 3.
2. Stranded Conductors: ASTM B 8.
3. Tinned Conductors: ASTM B 33.
4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch in diameter.
5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
6. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

C. Grounding Bus: Predrilled rectangular bars of 1/4 inches annealed copper, minimum 4 by 36 inches in main electrical rooms and minimum 4 by 10 inches in all other areas, with 9/32-inch holes spaced 1-1/8 inches apart. Stand-off insulators for mounting shall comply with UL 891, 600 V. Lexan or PVC, impulse tested at 5000 V.

2.2 CONNECTORS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Panduit: Irreversible compression connectors.
2. Erico: Welded connectors.

B. Listed and labeled by a NRTL acceptable to authorities having jurisdiction for applications in which used, and for specific types, sizes, and combinations of conductors and other items connected.

C. Bolted Connectors for Pipes: Copper or copper alloy, bolted pressure-type, with at least two bolts.

1. Pipe Connectors: Clamp type, sized for pipe.

D. Welded Connectors: Exothermic-welding kits, low-emission, electric-starting types and of types recommended by kit manufacturer for materials being joined and installation conditions.

E. Compression Connectors: Irreversible type meeting IEEE standard 837-2002 and UL listed.

F. Bus-bar Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

2.3 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel, sectional type; 3/4 inch diameter by10 feet.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger, unless otherwise indicated.

B. Underground Grounding Conductors: Install bare copper conductor, No. 2/0 AWG minimum.

1. Bury at least 24 inches below grade.

C. Grounding Bus: Install in all electrical and telecom rooms, in rooms housing service equipment, and elsewhere as indicated.

1. Install bus bar on insulated spacers 1 inch, minimum, from wall 18 inches above finished floor, unless otherwise indicated.

D. Conductor Terminations and Connections:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
2. Underground Connections: Welded connectors.
3. Connections to Structural Steel: Welded connectors.
4. Aboveground Accessible Connections: Irreversible compression or welded connectors.
5. Connections in areas that may be a fire hazard to use welded connectors: Irreversible compression connectors.

3.2 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with all feeders and branch circuits. Terminate each end on suitable lug, bus or bushing.

B. Bond equipment grounding terminal bars of the normal and emergency electrical system panelboards that serve the same patient area with an insulated continuous copper conductor not smaller than 8 AWG.

C. Signal and Communication Equipment:

1. Telecommunication Rooms / Closets: Terminate grounding conductor on a copper grounding bus.
2. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.
3. Bond all cable tray, metallic conduits, and equipment racks with minimum 6 AWG to copper bus bar.

3.3 INSTALLATION

A. Install Products in accordance with manufacturer's instructions and NECA 331.

B. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

C. Ground Rods: Drive rods until tops are 12 inches below finished floor or final grade, unless otherwise indicated.

1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating, if any.

D. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance, except where routed through short lengths of conduit.

1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts. Bond together metal siding not attached to grounded structure and bond to grounding electrode system.
2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install so vibration is not transmitted to rigidly mounted equipment.
3. Use exothermic-welded connectors for outdoor locations, but if a disconnect-type connection is required, use a bolted clamp.

E. Grounding and Bonding for Piping:

1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes, using a bolted clamp connector or by bolting a lug-type connector to a pipe flange, using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

F. Grounding and Bonding for dry type transformers:

1. Step-down transformer secondaries shall be grounded to the nearest electrical room ground bus bar. Also, bond the grounded conductor of the transformer to the nearest available point of the interior metal water piping system in the area served by the transformer in accordance with NEC Article 250-104.

G. Grounding for Steel Building Structure:

1. Install a driven ground rod at base of each corner column and at intermediate exterior columns at distances not more than 60 feet apart.
2. Install insulated copper grounding conductor in conduit from main electrical service copper bus bar to building structural steel.

H. Ufer Ground (Concrete-Encased Grounding Electrode): Fabricate according to NFPA 70; use a minimum of 20 feet of bare copper conductor sized the same as building grounding electrode conductor and shall not be smaller than 4 AWG.

1. If concrete foundation is less than 20 feet long, coil excess conductor within base of foundation.
2. Locate at or near bottom of footing with minimum 2 inches concrete encasement.
3. Bond grounding conductor to reinforcing steel in at least four locations and to anchor bolts. Extend grounding conductor below grade and connect to building's grounding grid or to grounding electrode external to concrete.

3.4 TERMINATIONS AND CONNECTIONS

A. Make terminations and connections so galvanic action or electrolysis possibility is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.

B. Exothermic-Welded Connections: Comply with manufacturer's written instructions. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable.

C. Equipment Grounding Conductor Terminations: For No. 8 AWG and larger, use pressure-type grounding lugs. No. 10 AWG and smaller grounding conductors may be terminated with winged pressure-type connectors.

D. Noncontact Metal Raceway Terminations: If metallic raceways terminate at metal housings without mechanical and electrical connection to housing, terminate each conduit with a grounding bushing. Connect grounding bushings with a bare grounding conductor to grounding bus or terminal in housing. Bond electrically noncontinuous conduits at entrances and exits with grounding bushings and bare grounding conductors, unless otherwise indicated.

E. Test Wells: Use exothermic welded connections.

F. Compression-Type Connections: Use hydraulic compression tools to provide correct circumferential pressure for compression connectors. Use tools and dies recommended by connector manufacturer. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on grounding conductor.

G. Moisture Protection: If insulated grounding conductors are connected to ground rods or grounding buses, insulate entire area of connection and seal against moisture penetration of insulation and cable.

3.5 LABELING

A. Comply with requirements in Division 26 Section "Identification for Electrical Systems" Article for instruction signs. The label or its text shall be green.

B. Install labels at the telecommunications bonding conductor and grounding equalizer and at the grounding electrode conductor where exposed.

1. Label Text: "If this connector or cable is loose or if it must be removed for any reason, notify the facility manager."

3.6 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, at ground test wells, and at individual ground rods. Make tests at ground rods before any conductors are connected.

    a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than

natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.

b. Perform tests by fall-of-potential method according to IEEE 81.

B. Grounding system will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

D. Report measured ground resistances that exceed the following values:

1. Power and Lighting Equipment or System with Capacity More Than 1000 kVA: 3 ohms.

E. Excessive Ground Resistance: If resistance to ground exceeds specified values above, provide additional grounding electrodes to meet values above.

END OF SECTION 26 05 26

SECTION 26 05 29
HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. IMC: Intermediate metal conduit.

C. RMC: Rigid metal conduit.

1.3 PERFORMANCE REQUIREMENTS

A. Design supports for multiple raceways capable of supporting combined weight of supported conduit systems and their contents.

B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

C. Provide materials, sizes, and types of anchors, fasteners and supports to carry the loads of equipment and conduit. Consider weight of wire in conduit when selecting products. For empty conduits, include weight of 5 type XHHW wires of maximum permissible size.

1.4 QUALITY ASSURANCE

A. Comply with NFPA 70.

1.5 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

B. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 07 Section "Roof Accessories."

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Cooper B-Line, Inc.; a division of Cooper Industries.
    b. ERICO International Corporation.
    c. Thomas & Betts Corporation.
    d. Unistrut; Tyco International, Ltd.
    e. Hilti Inc.

2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
3. Channel Dimensions: Selected for applicable load criteria.
4. Fittings and Accessories: Products of channel and angle manufacturer and designed for use with those items.
5. Fitting and Accessory Materials: Same as channels and angles, except metal items may be stainless steel.
6. Rated Strength: Selected to suit applicable load criteria.

B. Raceway and Cable Supports: As described in NECA 1 and NECA 101.

C. Conduit and Cable Support Devices: Steel and malleable-iron hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

D. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron in non- corrosive areas and fiberglass or stainless steel in corrosive areas.

E. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized in non-corrosive.

F. Raceway and Cable Supports: As described in NECA 1 and NECA 101.

G. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

1. Power-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used. Approval from structural engineer shall be obtained prior to the use of power-actuated fasteners.

    a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

        1) Hilti Inc.
        2) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.

3) MKT Fastening, LLC.
4) Simpson Strong-Tie Co., Inc.; MasterSet Fastening Systems Unit.

2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened port land cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.

   a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

      1) Cooper B-Line, Inc.; a division of Cooper Industries.
      2) Empire Tool and Manufacturing Co., Inc.
      3) Hilti Inc.
      4) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
      5) MKT Fastening, LLC.

3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
6. Toggle Bolts: All-steel springhead type.
7. Hanger Rods: Galvanized threaded steel.

2.2 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

B. Materials: Comply with requirements in Division 05 Section "Metal Fabrications" for steel shapes and plates.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter and except where support spacing requirements exceed NFPA 70 requirements.

B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch in diameter.

C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.

1. Secure raceways and cables to these supports with two-bolt conduit clamps for conduits 1 ¼ inch and larger, single-bolt conduit clamps for conduits 1 inch and smaller and as approved by an agency acceptable to the authority having jurisdiction.

3.2 SUPPORT INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.

B. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.

C. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:

1. To Wood: Fasten with lag screws or through bolts.
2. To New Concrete: Bolt to concrete inserts.
3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
4. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches thick.
5. To Steel: Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts; Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69
6. To Light Steel: Sheet metal screws.
7. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate.

D. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

E. Do not fasten supports to pipes, ducts, mechanical equipment, and conduit.

F. Obtain permission from Structural Engineer before drilling or cutting structural members.

G. Fabricate supports from structural steel or steel channel. Rigidly weld members or use hexagon head bolts to present neat appearance with adequate strength and rigidity. Use spring lock washers under all nuts.

H. Install surface mounted cabinets and panelboards with minimum of four anchors.

I. In wet and damp locations use steel channel supports to stand cabinets and panelboards one inch off wall.

3.3 LIGHTING FIXTURES

A. Lay-in Ceiling Lighting Fixtures Supports: Use grid as a support element.

1. Install ceiling support system rods or wires, independent of the ceiling suspension devices, for each fixture. Locate not more than 6 inches from lighting fixture corners.
2. Support Clips: Fasten to lighting fixtures and to ceiling grid members at or near each fixture corner with clips that are UL listed for the application.
3. Fixtures of Sizes Less Than Ceiling Grid: Install as indicated on reflected ceiling plans or center in acoustical panel, and support fixtures independently with at least two 3/4-inch metal channels spanning and secured to ceiling tees.

B. Suspended Lighting Fixture Support:

1. Pendants and Rods: Where longer than 48 inches, brace to limit swinging.
2. Stem-Mounted, Single-Unit Fixtures: Suspend with twin-stem hangers and swivel aligners.
3. Verify stem/pendant/rod length.
4. Continuous Rows: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of fixture chassis, including one at each end.

C. Install channel supports across main grid runners or grid supports, securely tied down or anchored for fixtures and devices mounted in suspended ceiling systems so as not to cause tile to sag and so that fixture or device cannot be lifted, rotated, or displaced.

3.4 INSTALLATION OF FABRICATED METAL SUPPORTS

A. Comply with installation requirements in Division 05 Section "Metal Fabrications" for site-fabricated metal supports.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

C. Field Welding: Comply with AWS D1.1/D1.1M.

3.5 PAINTING

A. Touchup: Comply with requirements in Specification Section 099123 for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 26 05 29

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SECTION 26 05 33
RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

B. Related Sections include the following:

1. Specification Section 078400 for fire stopping requirements.

1.3 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. FMC: Flexible metal conduit.

C. IMC: Intermediate metal conduit.

D. LFMC: Liquidtight flexible metal conduit.

E. LFNC: Liquidtight flexible nonmetallic conduit.

F. MC Cable: Metallic Conduit Cable

G. NBR: Acrylonitrile-butadiene rubber.

H. PVC: Rigid Polyvinyl Chloride Conduit

I. RMC: Rigid metal conduit.

J. RNC: Rigid nonmetallic conduit.

1.4 ACTION SUBMITTALS

A. Product Data: For surface raceways, floor boxes, hinged-cover enclosures, and cabinets.

1.5 QUALITY ASSURANCE

A. Listing and Labeling: Conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, Article 100, by a qualified testing agency, and marked for intended location and application.

PART 2 - PRODUCTS

2.1 METAL CONDUITS, TUBING, AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. AFC Cable Systems, Inc.
2. Allied Tube & Conduit; a Tyco International Ltd. Co.
3. O-Z/Gedney; a brand of EGS Electrical Group.
4. Robroy Industries.
5. Southwire Company.
6. Thomas & Betts Corporation.

B. EMT: Comply with ANSI C80.3 and UL 797.

C. FMC: Comply with UL 1; zinc-coated steel or aluminum.

D. RMC: Comply with ANSI C80.1 and UL 6.

E. IMC: Comply with ANSI C80.6 and UL 1242.

F. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.

G. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.

H. Conduit Fittings for Indoor Wet Locations or Exterior: Steel insulated throat, compression, UL listed rain-tight.

I. Fittings for EMT: Steel insulated throat, set-screw or compression type (Die-cast fittings will not be accepted).

J. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where these fittings installed, and including flexible external bonding jumper.

K. Joint Compound for IMC, RMC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

L. MC Cable and Fittings: Factory assembled of one or more insulated circuit conductors enclosed in an armor of interlocking metal tape or a corrivated metallic (steel) sheath; fittings and conduit bodies: ANSI/NEMA FB 1, compression type, there shall be a metallic cover/insert on the end of the conduit inside the connector housing to seal the cut conduit end.

2.2 NONMETALLIC CONDUITS, TUBING, AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. AFC Cable Systems, Inc.
2. Condux International, Inc.
3. Electri-Flex Company.
4. Kraloy.
5. Carlon Electrical Products.
6. RACO; a Hubbell company.
7. Thomas & Betts Corporation.

B. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.

C. LFNC: Comply with UL 1660.

D. Fittings for RNC: Comply with NEMA TC 3; match to conduit type and material.

E. Fittings for LFNC: Comply with UL 514B.

2.3 METAL WIREWAYS AND AUXILIARY GUTTERS

A. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Cooper B-Line, Inc.
2. Hoffman; a Pentair company.
3. Mono-Systems, Inc.
4. Square D; a brand of Schneider Electric.

B. Description: Sheet metal sized and shaped as indicated, NEMA 250, Type 1 for indoor, dry locations, Type 3R for outdoor and indoor wet locations, and Type 4X for corrosive areas, unless otherwise indicated.

C. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

D. Wireway Covers: Hinged type for Type 1 wireways, Flanged-and-gasketed type for Type 3R and 4X wireways.

E. Finish: Manufacturer's standard enamel finish.

2.4 BOXES, ENCLOSURES, AND CABINETS

A. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Cooper Technologies Company; Cooper Crouse-Hinds.
2. Hoffman; a Pentair company.
3. Hubbell Incorporated; Killark Division.
4. O-Z/Gedney; a brand of EGS Electrical Group.

5. Quazite/a Hubbell Company
6. RACO; a Hubbell Company.
7. Robroy Industries.
8. Thomas & Betts Corporation.
9. Wiremold / Legrand.

B. General Requirements: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations. Weatherproof outlets shall utilize a use stainless steel or cadmium plated malleable iron box suitable for flush mounting.

C. Interior Sheet Metal Boxes: code gauge galvanized steel, screw covers, flanged and spot welded joints and corners.

D. Junction boxes 6" x 6" or larger size shall be without stamped knock-outs.

E. Wireways shall not be used in lieu of junction boxes.

F. Interior Sheet Metal Boxes Larger Than 12 Inches (300 mm) in any dimension shall have a hinged cover or a chain installed between box and cover.

G. Sheet Metal Outlet and Device Boxes: Galvanized Steel. Comply with NEMA OS 1 and UL 514A.

H. Refer to T-series drawings for telecommunication outlet box sizes.

I. Concrete Ceiling Boxes: 4-inch octagon, minimum depth of 3 inches.

J. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb. Outlet boxes designed for attachment of luminaires weighing more than 50 lb shall be listed and marked for the maximum allowable weight.

K. Cast-Metal Outlet and Device Boxes: Surface mount, NEMA FB 1, ferrous alloy, Type FD, with gasketed cover with stainless steel screws. Provide threaded hubs.

L. Device Box Dimensions: Minimum 4 inches square by 2-1/8 inches deep.

M. Sheet Metal Pull and Junction Boxes: NEMA OS 1.

N. Exterior Boxes, Wet Location and Utility Tunnel Installations: Type 4 and Type 6, flat flanged, surface mounted junction box, UL listed as raintight. Galvanized cast iron and cover with ground flange, neoprene gasket, and stainless-steel cover screws.

O. Polymer-concrete handholes: Boxes and handholes for use in underground systems shall be designed and identified as defined in NFPA 70, for intended location and application.

1. Boxes installed in wet areas shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

P. Polymer-Concrete Handholes and Boxes with Polymer-Concrete Cover: Molded of sand and aggregate, bound together with polymer resin, and reinforced with steel, fiberglass, or a combination of the two.

1. Standard: Comply with SCTE 77.

2. Configuration: Designed for flush burial with open bottom unless otherwise indicated.

3. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.

4. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.

5. Cover Legend: Molded lettering "ELECTRIC".

6. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.

Q. Handholes: Sizes as indicated on the Drawings: Have inserts for cable racks and pulling-in irons installed before concrete is poured.

1. Handhole and Pull-Box Prototype Test: Test prototypes of handholes and boxes for compliance with SCTE 77. Strength tests shall be for specified tier ratings of products supplied.

2. Tests of materials shall be performed by an independent testing agency.

3. Strength tests of complete boxes and covers shall be by either an independent testing agency or manufacturer. A qualified registered professional engineer shall certify tests by manufacturer.

4. Testing machine pressure gages shall have current calibration certification complying with ISO 9000 and ISO 10012 and traceable to NIST standards.

R. Coordinate finish flanges and cover with architect:

1. Provide power conduits to side of box with fewer number gangs and communications and/or AV conduits to side of box with greater number of gangs.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below, unless otherwise indicated:

1. Exposed Conduit: RMC or IMC.
2. Concealed Conduit, Aboveground: RMC, IMC, EMT.
3. Underground Conduit: RNC, Type EPC-40-PVC
4. Outside Building Foundation: RNC, Type EPC-40-PVC.
5. Under Slab on Grade: Use RNC, Type EPC-40-PVC.
6. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.

B. Indoors: Apply raceway products as specified below, unless otherwise indicated:

1. Exposed, Not Subject to Physical Damage: EMT.
2. Exposed and Subject to Physical Damage: Use RMC below 10'-0" and EMT above 10'-0", except that EMT may be used below 10'-0" in designated equipment rooms and closets, utility chases and similar locations.
3. Includes raceways in the following locations:

    a. Receiving D102.
    b. Garage B106.
    c. Shop B112
    d. Metals E111.
    e. Metals E117.
    f. Auto Shop F109.
    g. Auto Shop F107.
    h. Bldg Trades F106.

4. Exposed Wet Locations: Use RMC or IMC between finish grade and 96 inches above finish grade. Use EMT above 96 inches with rain-tight compression fittings.
5. Concealed above Ceilings, elevated underfloor, and in Interior Walls and Partitions: EMT.
6. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
7. Concealed in Concrete Walls: Type EPC-40-PVC.
8. Connections to Lighting Fixtures in Accessible Ceilings: FMC – max 72 inches in length, MC-LED – 72 inches max in length
9. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 3R in damp or wet locations.
10. MC Cable:

    a. All conductors shall be cabled together with separator tape containing the identification print legend to form the cable core.
    b. Use of MC Cable will be permitted on this project for installation of branch circuits for lighting and power, control circuits and signal circuits in sizes #18 AWG thru #6 AWG for copper conductors. All home runs MUST be installed in EMT, IMC or RMC.
    c. Where MC Cable is implemented for lighting circuit utilizing 0-10-volt control wiring, MC-LED cable must be used and clearly labeled in each every junction and pull box for power and control wiring occupying same enclosures.
    d. Installation of MC Cable shall be in accordance with NEC Article 330.
    e. Uses permitted will be limited to interior branch wiring only. Exterior use, direct burial and applications in wet locations will not be acceptable. Additional "not permitted" uses as identified in NEC Article 330.12.
    f. There shall be no sharp edges in the fitting or on the armor that could damage conductor's insulation.
    g. Insulated bushings shall be provided at each termination.
    h. Provide supports every 6' on center.

i. The bending requirements for interlocked armor MC cables shall not exceed “seven times the external diameter of the metallic sheath” per NEC Article 330.24.
j. Shared neutrals will not be allowed.
k. Equipment grounding conductor shall be provided with each run. The equipment grounding conductor shall be insulated and may be sectioned, when sectioned –all sections shall be identical.

C. Minimum Raceway Size:

1. Minimum conduit size shall be ½ inch except for conduit homeruns to panelboards, minimum size shall be ¾ inch.
2. Minimum FMC size shall be ½ inch except flexible connections to lighting fixtures may be 3/8 inch, not to exceed 6 feet in length

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.

3.2 INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.

B. Keep raceways at least 12 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

C. Conduit routing shown on drawings indicate approximate locations unless dimensioned. Route as required to complete wiring system.

D. Complete raceway installation before starting conductor installation.

E. Comply with requirements in Division 26 Section "Hangers and Supports for Electrical Systems" for hangers and supports.

F. Arrange stub-ups so curved portions of bends are not visible above the finished slab.

G. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches of changes in direction.

H. Install 4 to 6-foot flexible steel conduit drops from an independent junction box mounted above ceiling and accessible from below ceiling to recessed ceiling mounted equipment. Allow for positioning of equipment to tile increments.

I. Flexible conduit shall not be run from light fixture to light fixture.

J. Conceal conduit within finished walls, above ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.

K. Support conduit within 12 inches of enclosures to which attached.

L. Raceways below slabs:

1. Change from PVC to rigid steel conduit before rising above the floor.

M. Stub-ups to Above Recessed Ceilings:

1. Use EMT, IMC, or RMC for raceways.
2. Use conduit bushings or insulated fitting at conduit ends not terminated in hubs or to an enclosure.

N. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

O. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch trade size and insulated throat metal bushings on 1-1/2-inch trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.

P. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.

Q. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.

R. Cut conduit perpendicular to the length. For conduits 2-inch trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.

S. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.

T. Install raceway sealing fittings at suitable, approved, and accessible locations and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points:

U. Where otherwise required by NFPA 70.

V. Expansion-Joint Fittings:

1. Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F and that has straight-run length that exceeds 25 feet. Install in each run of aboveground RNC conduit that is located

where environmental temperature change may exceed 100 deg F and that has straight-run length that exceeds 100 feet.

2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:

    a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.
    b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change. (Roof of Kennedy Elementary School).
    c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F temperature change.

3. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
4. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.

W. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches of flexible conduit for recessed and semi-recessed luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

1. Use LFMC in damp or wet locations subject to severe physical damage.
2. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.

X. Conduit Routing:

1. Arrange conduit to maintain headroom and present neat appearance.
2. Route exposed conduit parallel with and perpendicular to walls and other building architectural and structural elements.
3. Route conduits above accessible ceilings to clear access openings.
4. Maintain adequate clearance between conduit and piping of other trades.
5. Maintain 12 inches clearance between conduit and surfaces with temperatures exceeding 104 deg F.

Y. Cut conduit square using saw or pipe-cutter; de-burr cut ends.

Z. Use conduit bodies to make sharp changes in direction, as around beams.

AA. Provide suitable fittings to accommodate expansion and deflection where conduit crosses control expansion joints.

BB. Use suitable caps to protect installed conduit against entrance of dirt and moisture.

CC. Termination of Conduit Stubs:

1. Underground and Flush with Finish Floor: Use coupling and threaded plug.
2. Above Floor: Use conduit bushing.
3. Signal Systems: Use conduit bushing.

DD. Make conduit penetrations of exterior concrete or masonry walls below grade, and of floor slabs on fill below grade, watertight.

EE. Set metal floor boxes level and flush with finished floor surface.

FF. Audio-Visual Conduit Installation: AV systems cabling must be enclosed within continuously grounded ferrous metallic conduit or raceway. PVC conduit is not acceptable. Conduits, boxes and raceway shall be furnished and installed by electrical contractor. Conduits containing different wiring classes must maintain minimum separations to minimize interferences from electrical noise. Conduits sizes and quantities are shown on AV Bid documents. Separate conduit runs specified in AV Bid documents may not be combined for any purpose unless specifically noted otherwise.

3.3 OUTLET BOX INSTALLATION

A. Location of outlets and equipment as shown on drawings is approximate, and exact location shall be verified and shall be determined by:

1. Construction or code requirements.
2. Conflict with equipment of other trades.
3. Equipment manufacturer's drawings.
4. As dimensioned on interior or architectural elevations/plans as long as in compliance with all applicable codes.

B. All outlet boxes shall be mounted flush with wall surface unless noted otherwise.

C. Electrical box locations shown on Contract Drawings are approximate unless dimensioned. Verify location of floor boxes and outlets prior to rough in.

1. No outlet, junction, or pull boxes shall be located where it will be obstructed by other equipment, piping, lockers, benches, counters, etc.
2. Conduit and boxes shall not be fastened to the metal roof deck. If conduit and boxes are required to be located and installed on roof decks, the conduit and boxes are required to be spaced minimum 1-5/8” off the lowest part of the metal roof decking material, per NEC 300.4 (E).
3. It shall be the Contractor's responsibility to study drawings pertaining to other trades, to discuss location of outlets with workmen installing other piping and equipment and to fit all electrical outlets to job conditions.
4. In case of any question or argument over the location of an outlet, the Contractor shall refer the matter to the Architect/Engineer and install outlet as instructed by the Architect/Engineer.
5. The proper location of each outlet is considered a part of this contract and no additional compensation will be paid to the Contractor for moving outlets which were improperly located.

D. Weatherproof outlet boxes specifically noted for surface mounting shall utilize a cast metal box complete with threaded conduit ends for surface outlets.

E. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.

F. Use plaster rings for all concealed work except for masonry boxes; depth of rings as required to reach finished surface.

G. Use masonry boxes with square corners in tile, marble, brick or concrete block.

H. Do not fasten boxes to ceiling support wires and support boxes independently of conduit.

I. Orient boxes to accommodate wiring devices oriented as specified in Division 26 Section "Wiring Devices".

J. Inaccessible Ceiling Areas: Install outlet and junction boxes no more than 6 inches from ceiling access panel or from removable recessed luminaire.

K. Conflict with furniture, millwork, casework, markerboards, smartboards, tack boards, etc.

1. Coordinate mounting heights and exact location of outlets mounted above counters, benches and backsplashes, etc.
2. Contractor shall review architectural elevations and millwork drawings before roughing-in boxes and conduit.
3. Any conflicts shall be noted and addressed by an RFI requesting direction as to resolution.
4. Adjusting box locations due to such conflicts shall be at no additional compensation.

L. Minor modification in the location of outlets and equipment is considered incidental up to a distance of 10 feet with no additional compensation, providing necessary instructions are given prior to roughing in of outlet.

M. Electrical outlet boxes may be installed in vertical fire resistive assemblies classified as fire/smoke and smoke partitions without affecting the fire classification, provided such openings do not exceed 16 square inches and they are located per applicable U.L. assembly. All clearances between such outlet boxes and the gypsum board must be completely filled with joint compound or other approved materials. The wall must be built around outlets of a larger size so as to not interfere with the integrity of the wall rating. The aggregate surface area of the boxes shall not exceed 100 square inches per 100 square feet. Boxes located on opposite sides of walls or partitions shall be separated by a horizontal distance of 24 inches or by providing listed putty pads around both boxes. The metallic outlet or switch boxes shall be securely fastened to the studs and the opening in the wallboard facing shall be cut so that the clearance between the box and the wallboard does not exceed 1/8 inch.

N. Do not install boxes back to back or through wall. Offset outlet boxes on opposite sides of wall a minimum of 12 inches or on opposite sides of stud in partition walls. Where back to back boxes cannot be avoided, provide gypsum board between boxes.

O. Where more than two switches or devices are located at one point, use ganged boxes and covers, unless devices do not allow for ganging or manufacturer recommends otherwise. Provide permanently installed barriers between adjacent switches as required to meet regulatory requirements.

P. Align adjacent wall mounted outlet boxes for switches, thermostats and similar devices.

3.4 FLOOR BOX INSTALLATION

A. Set boxes level and flush with finish flooring material.

B. Floor boxes for communications shall each be served by conduit(s) dedicated to that box. Conduit runs between floor boxes for communications are not allowed. Conduit shall be part of path that allows for cable to be terminated at wiring hub (e.g. Telecom Room) on same floor on which floor box appears unless noted otherwise.

3.5 CONCRETE-POLYMER HANDHOLE INSTALLATION

A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.

B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch (12.5-mm) sieve to No. 4 (4.75-mm) sieve and compacted to same density as adjacent undisturbed earth.

C. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch (25 mm) above finished grade.

D. Install handholes with bottom below frost line, below grade.

E. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arm lengths to be long enough to provide spare space for future cables but short enough to preserve adequate working clearances in enclosure. Field-cut openings for conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

3.6 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Division 26 Section "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.7 FIRESTOPPING

A. Fire stopping by others. Coordinate all fire stopping requirements with fire stopping contractor. Refer to Specification Section 078400 for additional fire stopping requirements.

3.8 PROTECTION

A. Protect coatings, finishes, and cabinets from damage and deterioration.

B. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.

END OF SECTION 26 05 33

SECTION 26 05 44
SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Sleeves for raceway and cable penetration of non-fire-rated construction walls and floors.
2. Sleeve-seal systems.
3. Sleeve-seal fittings.
4. Grout.
5. Silicone sealants.

PART 2 - PRODUCTS

2.1 SLEEVES

A. Wall Sleeves:

1. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, plain ends.
2. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral water-stop unless otherwise indicated.

B. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies: Galvanized-steel sheet; 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.

C. Sleeves for Rectangular Openings:

1. Material: Galvanized sheet steel.
2. Minimum Metal Thickness:

    a. For sleeve cross-section rectangle perimeter less than 50 inches and with no side larger than 16 inches, thickness shall be 0.052 inch.
    b. For sleeve cross-section rectangle perimeter 50 inches or more and one or more sides larger than 16 inches, thickness shall be 0.138 inch.

2.2 SLEEVE-SEAL SYSTEMS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.

B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Advance Products & Systems, Inc.
2. CALPICO, Inc.
3. Metraflex Company (The).
4. Pipeline Seal and Insulator, Inc.
5. Proco Products, Inc.

C. Sealing Elements: EPDM rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.

D. Pressure Plates: Carbon steel.

E. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, of length required to secure pressure plates to sealing elements.

2.3 SLEEVE-SEAL FITTINGS

A. Description: Manufactured plastic, sleeve-type, water-stop assembly made for embedding in concrete slab or wall. Unit shall have plastic or rubber water-stop collar with center opening to match piping OD.

B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Pre-sealed Systems.

2.4 GROUT

A. Description: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.

B. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

A. Comply with NECA 1.

B. Comply with NEMA VE 2 for cable tray and cable penetrations.

C. Sleeves for Conduits Penetrating Above-Grade Non-Fire-Rated Concrete and Masonry-Unit Floors and Walls:

1. Interior Penetrations of Non-Fire-Rated Walls and Floors:

   a. Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Division 07 Section "Joint Sealants."
   b. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall, so no voids remain. Tool exposed surfaces smooth; protect material while curing.

2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
3. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway or cable unless sleeve seal is to be installed.
4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.
5. Install sleeves for floor penetrations. Extend sleeves installed in floors 2 inches above finished floor level. Install sleeves during erection of floors.

D. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies:

1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
2. Seal space outside of sleeves with approved joint compound for gypsum board assemblies.

E. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

F. Aboveground, Exterior-Wall Penetrations: Seal penetrations using cast-iron pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

G. Underground, Exterior-Wall and Floor Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch annular clear space between raceway or cable and sleeve for installing sleeve-seal system.

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at raceway entries into building.

B. Install type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.3 SLEEVE-SEAL-FITTING INSTALLATION

A. Install sleeve-seal fittings in new walls and slabs as they are constructed.

B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position water-stop flange to be centered in concrete slab or wall.

C. Secure nailing flanges to concrete forms.

D. Using grout, seal the space around outside of sleeve-seal fittings.

END OF SECTION 26 05 44

SECTION 26 05 53
IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Color and legend requirements for raceways, conductors, and warning labels and signs.
2. Labels.
3. Tapes and stencils.
4. Tags.
5. Cable ties.
6. Paint for identification.
7. Fasteners for labels and signs.

1.3 ACTION SUBMITTALS

A. Delegated-Design Submittal: For arc-flash hazard study.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Comply with ASME A13.1 and IEEE C2.

B. Comply with NFPA 70.

C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.

D. Comply with ANSI Z535.4 for safety signs and labels.

E. Comply with NFPA 70E and Section 260573.19 "Arc-Flash Hazard Analysis" requirements for arc-flash warning labels.

F. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

2.2 LABELS

A. Vinyl Wraparound Labels: Preprinted, flexible labels laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing label ends.

B. Snap-around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeves, with diameters sized to suit diameters and that stay in place by gripping action.

C. Self-Adhesive Wraparound Labels: Preprinted, 3-mil-thick, vinyl, flexible label with acrylic pressure-sensitive adhesive.

1. Self-Lamination: Clear; UV-, weather- and chemical-resistant; self-laminating, protective shield over the legend. Labels sized such that the clear shield overlaps the entire printed legend.
2. Marker for Labels: Machine-printed, permanent, waterproof, black ink recommended by printer manufacturer.

D. Self-Adhesive Labels: Vinyl, thermal, transfer-printed, 3-mil-thick, multicolor, weather- and UV-resistant, pressure-sensitive adhesive labels, configured for intended use and location.

1. Minimum Nominal Size:

a. 1-1/2 by 6 inches for raceway and conductors.
b. 3-1/2 by 5 inches for equipment.
c. As required by authorities having jurisdiction.

2.3 TAPES AND STENCILS

A. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

B. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; not less than 3 mils thick by 1 to 2 inches wide; compounded for outdoor use.

C. Floor Marking Tape: 2-inch-wide, 5-mil pressure-sensitive vinyl tape, with yellow and black stripes and clear vinyl overlay.

D. Underground-Line Warning Tape:

1. Tape:

a. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications utility lines.
b. Printing on tape shall be permanent and shall not be damaged by burial operations.
c. Tape material and ink shall be chemically inert and not subject to degradation when exposed to acids, alkalis, and other destructive substances commonly found in soils.

2. Color and Printing:

a. Comply with ANSI Z535.1, ANSI Z535.2, ANSI Z535.3, ANSI Z535.4, and ANSI Z535.5.
b. Inscriptions for Red-Colored Tapes: "ELECTRIC LINE, HIGH VOLTAGE".

c. Inscriptions for Orange-Colored Tapes: "TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE, OPTICAL FIBER CABLE".

E. Stenciled Legend: In nonfading, waterproof, white ink or paint. Minimum letter height shall be coordinated with Owner.

2.4 TAGS

A. Nonmetallic Preprinted Tags: Polyethylene tags, 0.015 inch thick, color-coded for phase and voltage level, with factory printed permanent designations; punched for use with self-locking cable tie fastener.

2.5 CABLE TIES

A. General-Purpose Cable Ties: Fungus inert, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.

1. Minimum Width: 3/16 inch.
2. Tensile Strength at 73 Deg F according to ASTM D 638: 12,000 psi.
3. Temperature Range: Minus 40 to plus 185 deg F.
4. Color: Black, except where used for color-coding.

B. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.

1. Minimum Width: 3/16 inch.
2. Tensile Strength at 73 Deg F according to ASTM D 638: 12,000 psi.
3. Temperature Range: Minus 40 to plus 185 deg F.
4. Color: Black.

C. Plenum-Rated Cable Ties: Self-extinguishing, UV stabilized, one piece, and self-locking.

1. Minimum Width: 3/16 inch.
2. Tensile Strength at 73 Deg F according to ASTM D 638: 7000 psi.
3. UL 94 Flame Rating: 94V-0.
4. Temperature Range: Minus 50 to plus 284 deg F.
5. Color: Black.

2.6 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Retain paint system applicable for surface material and location (exterior or interior).

B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 PREPARATION

A. Self-Adhesive Identification Products: Before applying electrical identification products, clean substrates of substances that could impair bond, using materials and methods recommended by manufacturer of identification product.

3.2 INSTALLATION

A. Verify and coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and operation and maintenance manual. Use consistent designations throughout Project.

B. Install identifying devices before installing acoustical ceilings and similar concealment.

C. All boxes with power wiring shall be further identified with circuit numbers and source panel designation as follows:

1. All outlet and device boxes shall use machine-generated adhesive labels, or neatly hand-written permanent marker.
2. All exposed junction and pull boxes larger than 8” square shall utilize engraved nameplates with ½” minimum letter height. All exposed junction and pull boxes 8” square or smaller shall utilize machine-generated adhesive labels.
3. All junction and pull boxes located above an accessible ceiling shall utilize neatly hand-written permanent marker.

D. All fire alarm boxes (covers and outer sides) shall be painted red and labeled “Fire Alarm” or “FA”. Utilize red conduit for all fire alarm systems or paint all couplings red. When red conduit is used for the alarm system installation, there is no need to paint the box sides, - paint the covers only. Non-factory device boxes shall also be painted red

E. Verify identity of each item before installing identification products.

F. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and operation and maintenance manual.

G. Apply identification devices to surfaces that require finish after completing finish work.

H. Install signs with approved legend to facilitate proper identification, operation, and maintenance of electrical systems and connected items.

I. System Identification for Raceways and Cables under 600 V: Identification shall completely encircle cable or conduit. Place identification of two-color markings in contact, side by side.

1. Secure tight to surface of conductor, cable, or raceway.

J. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.

K. Elevated Components: Increase sizes of labels, signs, and letters to those appropriate for viewing from the floor.

L. Vinyl Wraparound Labels:

1. Secure tight to surface of raceway or cable at a location with high visibility and accessibility.
2. Attach labels that are not self-adhesive type with clear vinyl tape, with adhesive appropriate to the location and substrate.

M. Snap-around Labels: Secure tight to surface at a location with high visibility and accessibility.

N. Self-Adhesive Wraparound Labels: Secure tight to surface at a location with high visibility and accessibility.

O. Self-Adhesive Labels:

1. On each item, install unique designation label that is consistent with wiring diagrams, schedules, and operation and maintenance manual.
2. Unless otherwise indicated, provide a single line of text with 1/2-inch-high letters on 1-1/2-inch-high label; where two lines of text are required, use labels 2 inches high.

P. Marker Tapes: Secure tight to surface at a location with high visibility and accessibility.

Q. Self-Adhesive Vinyl Tape: Secure tight to surface at a location with high visibility and accessibility.

1. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding.

R. Tape and Stencil: Comply with requirements in painting Sections for surface preparation and paint application.

S. Floor Marking Tape: Apply stripes to finished surfaces following manufacturer's written instructions.

T. Underground Line Warning Tape:

1. Refer to Specification Section 26 05 43.

U. Cable Ties: General purpose, for attaching tags, except as listed below:

1. Outdoors: UV-stabilized nylon.
2. In Spaces Handling Environmental Air: Plenum rated.

3.3 IDENTIFICATION SCHEDULE

A. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, pull points, and locations of high visibility. Identify by system and circuit designation.

B. Power-Circuit Conductor Identification, 600 V or Less: For conductors in pull and junction boxes, and handholes, use self-adhesive vinyl tape to identify the phase.

C. Control-Circuit Conductor Identification: For conductors and cables in pull and junction boxes, manholes, and handholes, use self-adhesive labels with the conductor or cable designation, origin, and destination.

D. Control-Circuit Conductor Termination Identification: For identification at terminations, provide self-adhesive labels with the conductor designation.

E. Locations of Underground Lines: Underground-line warning tape for power, lighting, communication, and control wiring and optical-fiber cable.

F. Workspace Indication: Apply floor marking tape to finished surfaces. Show working clearances in the direction of access to live parts. Workspace shall comply with NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.

G. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive labels.

1. Apply to exterior of door, cover, or other access.

H. Arc Flash Warning Labeling: Self-adhesive labels.

I. Equipment Identification Labels:

1. Indoor Equipment: Laminated acrylic or melamine plastic sign.
2. Outdoor Equipment: Stenciled legend 4 inches high.
3. Equipment to Be Labeled:

    a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be in the form of a self-adhesive, engraved, laminated acrylic or melamine label.
    b. Enclosures and electrical cabinets.
    c. Access doors and panels for concealed electrical items.
    d. Switchboards.
    e. Enclosed switches.
    f. Enclosed circuit breakers.
    g. Enclosed controllers.
    h. Variable-speed controllers.
    i. Push-button stations.
    j. Battery-inverter units.
    k. Lighting control system and associated devices.

END OF SECTION 26 05 53

SECTION 26 05 74
OVERCURRENT PROTECTIVE DEVICE ARC-FLASH STUDY (HIGH/MIDDLE SCHOOL)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes a computer-based, arc-flash study to determine the arc-flash hazard distance and the incident energy to which personnel could be exposed during work on or near electrical equipment.

1.3 DEFINITIONS

A. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

B. Existing to be Relocated: Existing items of construction that are being removed and that are indicated to be removed and relocated or reinstalled.

C. One-Line Diagram: A diagram which shows, by means of single lines and graphic symbols, the course of an electric circuit or system of circuits and the component devices or parts used therein.

D. Protective Device: A device that senses when an abnormal current flow exists and then removes the affected portion from the system.

E. SCCR: Short-circuit current rating.

F. Service: The conductors and equipment for delivering electric energy from the serving utility to the wiring system of the premises served.

1.4 ACTION SUBMITTALS

A. Product Data: For computer software program to be used for studies.

B. Study Submittals: Submit the following submittals after the approval of system protective devices submittals. Submittals shall be in digital form.

1. Arc-flash study input data, including completed computer program input data sheets.
2. Arc-flash study report; signed, dated, and sealed by a qualified professional engineer.
3. Submit study report for action prior to receiving final approval of the distribution equipment submittals. If formal completion of studies will cause delay in equipment manufacturing, obtain approval from Architect for preliminary

submittal of sufficient study data to ensure that the selection of devices and associated characteristics is satisfactory.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data:

1. Maintenance procedures according to requirements in NFPA 70E shall be provided in the equipment manuals.
2. Operation and Maintenance Procedures: In addition to items specified in Section 017823 "Operation and Maintenance Data," provide maintenance procedures for use by Owner's personnel that comply with requirements in NFPA 70E.

1.6 QUALITY ASSURANCE

A. Studies shall use computer programs that are distributed nationally and are in wide use. Software algorithms shall comply with requirements of standards and guides specified in this Section. Manual calculations are unacceptable.

B. Arc-Flash Study Software Developer Qualifications: An entity that owns and markets computer software used for studies, having performed successful studies of similar magnitude on electrical distribution systems using similar devices.

1. The computer program shall be developed under the charge of a licensed professional engineer who holds IEEE Computer Society's Certified Software Development Professional certification.

C. Arc-Flash Study Specialist Qualifications: Professional engineer in charge of performing the study, analyzing the arc flash, and documenting recommendations, licensed in the state where Project is located. All elements of the study shall be performed under the direct supervision and control of this professional engineer.

PART 2 - PRODUCTS

2.1 COMPUTER SOFTWARE DEVELOPERS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Easy Power.
2. SKM Systems Analysis, Inc.

B. Comply with IEEE 1584 and NFPA 70E.

C. Analytical features of device coordination study computer software program shall have the capability to calculate "mandatory," "very desirable," and "desirable" features as listed in IEEE 399.

2.2 ARC-FLASH STUDY REPORT CONTENT

A. Executive summary.

B. Study descriptions, purpose, basis and scope.

C. One-line diagram, showing the following:

1. Protective device designations and ampere ratings.
2. Cable size and lengths.
3. Transformer kilovolt ampere (kVA) and voltage ratings.
4. Motor and generator designations and kVA ratings.
5. Switchgear, switchboard, motor-control center and panelboard designations.

D. Study Input Data: As described in "Power System Data" Article.

E. Short-Circuit Study Output: As specified in "Short Circuit Study Output" Paragraph in "Short-Circuit Study Report Contents" Article in Section 260572 "Overcurrent Protective Device Short-Circuit Study."

F. Arc-Flash Study Output:

1. Interrupting Duty Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:

a. Voltage.
b. Calculated symmetrical fault-current magnitude and angle.
c. Fault-point X/R ratio.
d. No AC Decrement (NACD) ratio.
e. Equivalent impedance.
f. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a symmetrical basis.
g. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a total basis.

G. Incident Energy and Flash Protection Boundary Calculations:

1. Arcing fault magnitude.
2. Protective device clearing time.
3. Duration of arc.
4. Arc-flash boundary.
5. Working distance.
6. Incident energy.
7. Hazard risk category.
8. Recommendations for arc-flash energy reduction.

H. Fault study input data, case descriptions, and fault-current calculations including a definition of terms and guide for interpretation of the computer printout.

2.3 ARC-FLASH WARNING LABELS

A. Comply with requirements in Section 260553 "Identification for Electrical Systems" for self-adhesive equipment labels. Produce a 3.5-by-5-inch self-adhesive equipment label for each work location included in the analysis.

B. The label shall have an orange header with the wording, "WARNING, ARC-FLASH HAZARD," and shall include the following information taken directly from the arc-flash hazard analysis:

1. Location designation.
2. Nominal voltage.
3. Flash protection boundary.
4. Hazard risk category.
5. Incident energy.
6. Working distance.
7. Engineering report number, revision number, and issue date.

C. Labels shall be machine printed, with no field-applied markings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine Project overcurrent protective device submittals. Proceed with arc-flash study only after relevant equipment submittals have been assembled. Overcurrent protective devices that have not been submitted and approved prior to arc-flash study may not be used in study.

3.2 ARC-FLASH HAZARD ANALYSIS

A. Comply with NFPA 70E and its Annex D for hazard analysis study.

B. Preparatory Studies:

1. Short-Circuit Study Output: As specified in "Short-Circuit Study Output" Paragraph in "Short-Circuit Study Report Contents" Article in Section 260572 "Overcurrent Protective Device Short-Circuit Study."

C. Calculate maximum and minimum contributions of fault-current size.

1. The minimum calculation shall assume that the utility contribution is at a minimum and shall assume no motor load.
2. The maximum calculation shall assume a maximum contribution from the utility and shall assume motors to be operating under full-load conditions.

D. Calculate the arc-flash protection boundary and incident energy at locations in the electrical distribution system where personnel could perform work on energized parts.

E. Include low-voltage equipment locations, except equipment rated 240-V ac or less fed from transformers less than 15 kVA.

F. Safe working distances shall be specified for calculated fault locations based on the calculated arc-flash boundary, considering incident energy of 1.2 cal/sq.cm.

G. Incident energy calculations shall consider the accumulation of energy over time when performing arc-flash calculations on buses with multiple sources. Iterative calculations shall take into account the changing current contributions, as the sources are interrupted or decremented with time. Fault contribution from motors and generators shall be decremented as follows:

1. Fault contribution from induction motors should not be considered beyond three to five cycles.
2. Fault contribution from synchronous motors and generators should be decayed to match the actual decrement of each as closely as possible (e.g., contributions from permanent magnet generators will typically decay from 10 per unit to three per unit after 10 cycles).

H. Arc-flash computation shall include both line and load side of a circuit breaker as follows:

1. When the circuit breaker is in a separate enclosure.
2. When the line terminals of the circuit breaker are separate from the work location.

I. Base arc-flash calculations on actual overcurrent protective device clearing time. Cap maximum clearing time at two seconds based on IEEE 1584, Section B.1.2.

3.3 POWER SYSTEM DATA

A. Obtain all data necessary for the conduct of the arc-flash hazard analysis.

1. Verify completeness of data supplied on the one-line diagram on Drawings and under "Preparatory Studies" Paragraph in "Arc-Flash Hazard Analysis" Article. Call discrepancies to the attention of Architect.
2. For new equipment, use characteristics submitted under the provisions of action submittals and information submittals for this Project.

B. Electrical Survey Data: Gather and tabulate the following input data to support study. Comply with recommendations in IEEE 1584 and NFPA 70E as to the amount of detail that is required to be acquired in the field. Field data gathering shall be under the direct supervision and control of the engineer in charge of performing the study and shall be by the engineer or its representative who holds NETA ETT Level III certification or NICET Electrical Power Testing Level III certification.

1. Product Data for overcurrent protective devices specified in other Sections and involved in overcurrent protective device coordination studies. Use equipment designation tags that are consistent with electrical distribution system diagrams, overcurrent protective device submittals, input and output data, and recommended device settings.
2. Obtain electrical power utility impedance at the service.
3. Power sources and ties.
4. Short-circuit current at each system bus, three phase and line-to-ground.
5. Full-load current of all loads.

6. Voltage level at each bus.
7. For transformers, include kVA, primary and secondary voltages, connection type, impedance, X/R ratio, taps measured in per cent, and phase shift.
8. For circuit breakers and fuses, provide manufacturer and model designation. List type of breaker, type of trip and available range of settings, SCCR, current rating, and breaker settings.
9. Motor horsepower and NEMA MG 1 code letter designation.
10. Low-voltage cable sizes, lengths, number, conductor material and conduit material (magnetic or nonmagnetic).

3.4 LABELING

A. Apply one arc-flash label for all 480-V ac and applicable 240-V ac and 208-V ac panelboards and disconnect switches.

3.5 APPLICATION OF WARNING LABELS

A. Install the arc-fault warning labels under the direct supervision and control of the Arc-Flash Study Specialist.

3.6 DEMONSTRATION

A. Engage the Arc-Flash Study Specialist to train Owner's maintenance personnel in the potential arc-flash hazards associated with working on energized equipment and the significance of the arc-flash warning labels.

END OF SECTION 26 05 74

SECTION 26 09 23
LIGHTING CONTROL DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Indoor occupancy sensors.

B. Related Requirements:

1. Division 26 Section "Wiring Devices" for wall-box dimmers and manual light switches.

1.3 SYSTEM DESCRIPTION

A. Occupancy Sensors

1. Locations and quantities of the occupancy sensors shown on drawings are diagrammatic and intended to show control intent logistics. It shall be the contractor's responsibility to provide a complete coverage with occupancy sensor system to meet energy code requirements based on the performance requirements of this specification, a specific manufacturer supplying the equipment and energy code requirements.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Show installation details for occupancy sensors.

1. Floor plans indicating exact quantity and locations of devices for 100% sensor coverage based on manufacturer's requirements.
2. Interconnection diagrams showing field-installed wiring.
3. Include diagrams for power, signal, and control wiring.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For each type of lighting control device to include in emergency, operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1 INDOOR OCCUPANCY SENSORS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Acuity Brands/Sensor Switch as indicated on drawings or comparable product by one of the following:

1. Leviton Mfg. Company Inc.
2. Legrand/Watt Stopper
3. Eaton Industries/GreenGate
4. Hubbell Wiring Devices

B. General Requirements for Sensors: Wall- or ceiling-mounted, solid-state indoor occupancy sensors with a separate power pack.

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Operation: Unless otherwise indicated, turn lights on when coverage area is occupied, and turn them off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
3. Sensor Output: Contacts rated to operate the connected relay, complying with UL 773A. Sensor is powered from the power pack.
4. Power Pack: Dry contacts rated for 20-A ballast load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Sensor has 24-V dc, 150-mA, Class 2 power source, as defined by NFPA 70.
5. Mounting:

    a. Sensor: Suitable for mounting in any position on a standard outlet box or provide with Corner Wall/Ceiling bracket where indicated on the drawings.
    b. Relay: Externally mounted through a 1/2-inch (13-mm) knockout in a standard electrical enclosure.
    c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.

6. Indicator: Digital display, to show when motion is detected during testing and normal operation of sensor.
7. Bypass Switch: Override the "on" function in case of sensor failure.
8. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc; dim lights and/or turn lights off when selected lighting level is present.

C. PIR Type: Ceiling mounted; detect occupants in coverage area by their heat and movement.

1. Detector Sensitivity: Detect occurrences of 6-inch- (150-mm-) minimum movement of any portion of a human body that presents a target of not less than 36 sq. in. (232 sq. cm).

D. Ultrasonic Type: Ceiling mounted; detect occupants in coverage area through pattern changes of reflected ultrasonic energy. Frequency 42kHZ or higher

1. Detector Sensitivity: Detect a person of average size and weight moving not less than 12 inches (305 mm) in either a horizontal or a vertical manner at an approximate speed of 12 inches/s (305 mm/s).

E. Dual-Technology Type: Ceiling mounted; detect occupants in coverage area using PIR and ultrasonic(microphonic) detection methods. The particular technology or combination of technologies that control on-off functions is selectable in the field by operating controls on unit.

1. Sensitivity Adjustment: Separate for each sensing technology.
2. Detector Sensitivity: Detect occurrences of 6-inch- (150-mm-) minimum movement of any portion of a human body that presents a target of not less than 36 sq. in. (232 sq. cm), and detect a person of average size and weight moving not less than 12 inches (305 mm) in either a horizontal or a vertical manner at an approximate speed of 12 inches/s (305 mm/s).

2.2 DAYLIGHT HARVESTING SENSORS

A. Combines the On/Off Photocell sensor with the Automatic Dimming Control sensor to provide the industry's most intelligent control of lighting for daylight harvesting applications. Can be used alone or as part of an occupancy sensor system. Shall be powered with 24 VAC/VDC and operate with a PP-20 or MP-20 Power Pack; enabling complete 20 Amp circuits to be controlled.

B. Full On/Off Control of Lighting

1. Automatically Dims/Brightens 0-10 VDC drivers as daylight changes
2. Works as Stand-Alone Unit or with Occupancy Sensor System
3. Capable of finding optimum set-point
4. Digital Set-Point Control
5. Programmable via simple push-button commands
6. Outputs to Power Pack or Lighting Control System via SPDT Relay
7. Dimming sinks up to 20 mA
8. 100 Hour Lamp Burn-in Timer Mode

2.3 SWITCHBOX-MOUNTED OCCUPANCY SENSORS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Acuity Brands/Sensor Switch as specified on drawings or comparable product by one of the following:

1. Leviton Mfg. Company Inc.
2. Legrand/Watt Stopper
3. Eaton Industries
4. Hubbell Wiring Devices

B. General Requirements for Sensors: Automatic-wall-switch occupancy sensor, suitable for mounting in a single gang switchbox.

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2. Operating Ambient Conditions: Dry interior conditions, 32 to 120 deg F.
3. Switch Rating: Not less than 800-VA at 120 V, 1200-VA at 277 V.

C. Wall-Switch Sensor:

1. Standard Range: 180-degree field of view, field adjustable from 180 to 40 degrees; with a minimum coverage area of 900 sq. ft..
2. Sensing Technology: Passive Infrared.
3. Switch Type: SP and dual circuit, field selectable automatic "on," or manual "on" automatic "off."
4. Voltage: Dual voltage, 120 and 277 V.
5. Ambient-Light Override: Concealed, field-adjustable, light-level sensor from 10 to 150 fc. The switch prevents the lights from turning on when the light level is higher than the set point of the sensor.
6. Concealed, field-adjustable, "off" time-delay selector at up to 30 minutes.

2.4 CONDUCTORS AND CABLES

A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG. Comply with requirements in Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

B. Classes 2 and 3 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 18 AWG. Comply with requirements in Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

C. Class 1 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 14 AWG. Comply with requirements in Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

PART 3 - EXECUTION

3.1 SENSOR INSTALLATION

A. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, smoke detectors, fire-suppression systems, and partition assemblies.

B. Install and aim sensors in locations to achieve not less than 90 percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.

3.2 WIRING INSTALLATION

A. Wiring Method: Comply with Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

B. Wiring within Enclosures: Comply with NECA 1. Separate power-limited and nonpower-limited conductors according to conductor manufacturer's written instructions.

C. Size conductors according to lighting control device manufacturer's written instructions unless otherwise indicated.

D. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

3.3 IDENTIFICATION

A. Identify components and power and control wiring according to Division 26 Section "Identification for Electrical Systems."

1. Identify controlled circuits in lighting contactors.
2. Identify circuits or luminaires controlled by photoelectric and occupancy sensors at each sensor.

B. Label time switches and contactors with a unique designation.

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

B. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. Operational Test: After installing time switches and sensors, and after electrical circuitry has been energized, start units to confirm proper unit operation.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Lighting control devices will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports.

3.5 ADJUSTING

A. Occupancy Adjustments: When requested within 3 months from date of Substantial Completion, provide on-site assistance in adjusting sensors to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

1. For occupancy and motion sensors, verify operation at outer limits of detector range. Set time delay to suit Owner's operations.
2. For daylighting controls, adjust set points and dead-band controls to suit Owner's operations.
3. Align high-bay occupancy sensors using manufacturer's laser aiming tool.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain lighting control devices.

END OF SECTION 26 09 23

SECTION 26 22 00
LOW-VOLTAGE TRANSFORMERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following types of dry-type transformers rated 600 V and less, with capacities up to 1000 kVA:

1. Distribution transformers.

1.3 ACTION SUBMITTALS

A. Product Data: Include rated nameplate data, capacities, weights, dimensions, minimum clearances, installed devices and features, vibration isolation devices, and performance for each type and size of transformer indicated.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Wiring Diagrams: Power, signal, and control wiring.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For transformers to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain each transformer type through one source from a single manufacturer.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with IEEE C57.12.91, "Test Code for Dry-Type Distribution and Power Transformers."

D. Test and inspect transformers according to IEEE C57.12.91.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Temporary Heating: Apply temporary heat according to manufacturer's written instructions within the enclosure of each ventilated-type unit, throughout periods during which equipment is not energized and when transformer is not in a space that is continuously under normal control of temperature and humidity.

1.7 COORDINATION

A. Coordinate size and location of concrete bases with actual transformer provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

B. Coordinate installation of wall-mounting and structure-hanging supports with actual transformer provided.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton Electrical Inc.; Cutler-Hammer Products.
2. General Electric Company.
3. Siemens Energy & Automation, Inc.
4. Square D; Schneider Electric.

2.2 GENERAL TRANSFORMER REQUIREMENTS

A. Description: Factory-assembled and -tested, air-cooled units for 60-Hz service.

B. Cores: Grain-oriented, non-aging silicon steel.

C. Coils: Continuous windings without splices except for taps.

1. Internal Coil Connections: Brazed or pressure type.
2. Coil Material: Aluminum or copper.

D. Nominal System Voltages:

1. Primary voltage 480V 3 phase, delta connected, unless noted otherwise.
2. Secondary voltage 208/120 volts, 3 phase, wye connected, unless noted otherwise.

2.3 DISTRIBUTION TRANSFORMERS

A. Comply with NEMA ST 20, and list and label as complying with UL 1561.

B. Cores: One leg per phase.

C. Enclosure: Ventilated, NEMA 250, Type 2 for indoor transformers.

1. Core and coil shall be encapsulated within resin compound, sealing out moisture and air.

D. Transformer Enclosure Finish: Comply with NEMA 250.

1. Finish Color: Gray.

E. Transformer Taps:

1. Taps for Transformers Smaller Than 3 kVA: None.
2. Taps for Transformers 7.5 to 24 kVA: Two 5 percent taps below rated voltage.
3. Taps for Transformers 25 kVA and Larger: Two 2.5 percent taps above and four 2.5 percent taps below normal full capacity.

F. Insulation Class: 220 deg C, UL-component-recognized insulation system with a maximum of 150 deg C rise above 40 deg C ambient temperature.

G. Energy Efficiency for Transformers Rated 15 kVA and Larger:

1. Complying with NEMA TP 1, Class 1 efficiency levels.
2. Tested according to NEMA TP 2.
3. Label in accordance with NEMA TP 3 requirements.

H. Wall Brackets: Manufacturer's standard brackets. Provide for wall mounted transformers indicated on drawings.

I. Low Sound-Level Requirements: Shall not exceed NEMA ST20 standard sound levels when factory tested according to IEEE C57.12.91.

1. 15 to 29kVA: 40 dba.
2. 30 to 50 kVA: 45 dBA.
3. 51 to 150 kVA: 50 dBA.
4. 151 to 300 kVA: 55 dBA.

2.4 VIBRATION ISOLATION DEVICES

A. Manufacturer: Basis-of-Design Product: Subject to compliance with requirements, provide Mason Industries products specified herein or a comparable product by one of the following:

1. Mason Industries
2. Korfund Company
3. Amber-Booth Company
4. Consolidated Kinetics Corporation
5. M.W. Sausse.

B. All isolation devices shall be designed for the equipment with which they will be used. Materials used shall retain their isolation characteristics for the life of the equipment served. All elastomeric materials shall be industrial grade neoprene. Isolation devices subject to weather shall have hot dipped galvanized finish.

C. Type 2 Mounts: Type W or K neoprene pads. Both surfaces shall be rib molded for skid resistance. On equipment such as small vent sets and close coupled pumps, steel rails shall be used above the mountings to compensate for the overhang.

D. Type 5 Hangers: Mason type 30N, vibration hangers with a steel spring and 0.3" deflection neoprene element in series. The neoprene element shall be molded with a rod isolation bushing that passes through the hanger box. Spring diameters and hanger box lower hole sizes shall be large enough to permit the hanger rod to swing through a 30 degrees arc before contacting the hole and short circuiting the spring. Springs shall have a minimum additional travel to solid equal to 50% of the rated deflection.

2.5 IDENTIFICATION DEVICES

A. Nameplates: Engraved, laminated-plastic or metal nameplate for each transformer, mounted with corrosion-resistant screws. Nameplates and label products are specified in Division 26 Section "Identification for Electrical Systems."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions for compliance with enclosure- and ambient-temperature requirements for each transformer.

B. Verify that field measurements are as needed to maintain working clearances required by NFPA 70 and manufacturer's written instructions.

C. Examine walls, floors, roofs, and concrete bases for suitable mounting conditions where transformers will be installed.

D. Verify that ground connections are in place and requirements in Division 26 Section "Grounding and Bonding for Electrical Systems" have been met. Maximum ground resistance shall be 5 ohms at location of transformer.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 VIBRATION ISOLATION APPLICATION

A. Use type 2 mounts for transformers installed on concrete slabs and where supports and attachments do not have to meet seismic forces defined in ASCE 7-05.

B. Use type 5 hangers for suspended transformers where supports and attachments do not have to meet seismic forces defined in ASCE 7-05.

3.3 INSTALLATION

A. Equipment Mounting: Install transformers on concrete bases complying with Division 26 Section "Common Work Results for Electrical."

B. Install wall-mounting transformers level and plumb with wall brackets fabricated by transformer manufacturer.

C. Set transformers plumb and level.

D. Install vibration isolation devices according to Manufacturer's written instructions.

E. Suspended transformers shall be coordinated with structure with hangers sized to handle transformer physical weight.

F. Maintain a minimum distance of 6 inches from transformer enclosure to adjacent surfaces and equipment.

3.4 CONNECTIONS

A. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

B. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.5 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Perform visual and mechanical inspection and electrical tests. Test procedures and values shall be in accordance with NETA-2007 requirements. Certify compliance with test parameters.
2. Compare equipment nameplate data with drawings and specifications.
3. Inspect physical and mechanical condition, anchorage, alignment, and grounding
4. Verify that resilient mounts are free and that any shipping brackets have been removed.
5. Verify the unit is clean.
6. Inspect bolted electrical connections for high resistance

    a. Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA-2007, Table 100.12.
    b. Perform resistance measurements through bolted connections with a low-resistance ohmmeter.

7. Perform insulation-resistance tests winding-to-winding and each winding-to-ground. Apply voltage in accordance with manufacturer's published data or in the absence of manufacturer's published data, use NETA-2007, Table 100.5.
8. Verify correct secondary voltage phase-to-phase and phase-to-neutral after energization and prior to loading.

B. Remove and replace units that do not pass tests or inspections and retest as specified above.

C. Test Labeling: On completion of satisfactory testing of each unit, attach a dated and signed "Satisfactory Test" label to tested component.

D. Any transformers deemed to be noisy by Engineer shall have actual dB level of transformer verified by manufacturer. Any transformer exceeding NEMA standard sound levels shall be replaced.

3.6 ADJUSTING

A. Adjust transformer taps to provide optimum voltage conditions at secondary terminals. Optimum is defined as not exceeding nameplate voltage plus 10 percent and not being lower than nameplate voltage minus 3 percent at maximum load conditions. Submit voltage readings and tap settings as test results.

B. Output Settings Report: Prepare a written report recording output voltages and tap settings.

3.7 CLEANING

A. Vacuum dirt and debris; do not use compressed air to assist in cleaning.

END OF SECTION 26 22 00

SECTION 26 24 16
PANELBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Distribution panelboards.
2. Lighting and appliance branch-circuit panelboards.
3. Disconnecting and Overcurrent Protective Devices

1.3 ACTION SUBMITTALS

A. Product Data: For each type of panelboard, switching and overcurrent protective devices, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: For each panelboard and related equipment.

1. Include dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and electrical ratings.
2. Detail enclosure types and details for types other than NEMA 250, Type 1.
3. Detail bus configuration, current, and voltage ratings.
4. Short-circuit current rating of panelboards and overcurrent protective devices.
5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
6. Include wiring diagrams for power, signal, and control wiring.
7. Field quality control test results
8. Operating and Maintenance data.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:

1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
2. Time-current curves, including selectable ranges for each type of overcurrent protective device that allows adjustments.
3. Copies of all panelboard typewritten directories.

B. Record Drawings: Create and submit record drawings including the final version of each panel schedule after load balancing. Create drawings matching the record set and incorporate final panel schedules on drawing and add panel schedule sheets to drawing index.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain panelboards, overcurrent protective devices, components, and accessories from single source from single manufacturer.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Comply with National Electrical Manufacturer's Association (NEMA) Standards Publication Number PB1.1 and PB 1.2.

D. Comply with NEMA PB 1.

E. Comply with NFPA 70.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Remove loose packing and flammable materials from inside panelboards.

B. Do not store panelboards exposed to weather.

C. Handle and prepare panelboards for installation according to NEMA PB 1.

D. Protect panelboards against damage from work of other trades.

1.7 COORDINATION

A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

1.8 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

B. Keys: Two spares for each type of panelboard cabinet lock.

C. Circuit Breakers Including GFCI and Ground Fault Equipment Protection (GFEP) Types: spares for each panelboard as shown on one the Panel Schedules.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PANELBOARDS

A. Except as otherwise indicated, provide panelboards, enclosures and ancillary components, of types, sizes, and ratings indicated, which comply with manufacturer's standard materials; design and construction in accordance with published product information; equip with proper number of unit panelboard devices as required for complete installation. Where types, sizes or ratings are not indicated, comply with NEC, UL and established industry standards for those applications indicated. Provide circuit directory in clear plastic cover. Provide panelboards with lugs suitable for termination of feeder sizes indicated on drawings.

B. Each panelboard, as complete unit, shall have a short circuit current rating equal to or great than the integrated equipment rating shown on the panelboard schedule or on the plans. This rating shall be established by testing with the overcurrent devices mounted in the panelboard. Panelboards shall be marked with their maximum short circuit current rating at the supply voltage. All panelboards shall be fully rated, series rated panels are not approved.

C. Enclosures: Flush and surface mounted cabinets. Refer to panel schedule and floor plans for types of panel cabinets required.

1. Rated for environmental conditions at installed location.
2. Indoor Dry and Clean Locations: NEMA 250, TYPE 1.
3. Other Wet or Damp Indoor Locations: NEMA 250, TYPE 3R or 4X.
4. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box. Provide full height hinged trim integrated into front cover to allow access to wire gutters without the removal of cover. Provide hinged door for access to overcurrent devices.
5. Back Boxes: Galvanized steel.
6. Directory Card: Inside panelboard door, mounted in transparent card holder.
7. Incoming Mains Location: Top or bottom. Mains location is at the contactor's option as project conditions dictate, unless specifically indicated otherwise on the drawings.
8. Phase, Neutral, and Ground Buses:

    a. Material: Hard-drawn copper, 98 percent conductivity.
    b. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.

D. Conductor Connectors: Suitable for use with conductor material and sizes.

1. Material: Hard-drawn copper, 98 percent conductivity.
2. Main and Neutral Lugs: Mechanical type.
3. Ground Lugs and Bus-Configured Terminators: Mechanical type. Lugs shall be of sizes as required to accept feeders as indicated on the drawings.
4. Feed-Through Lugs: Mechanical type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
5. Sub-feed (Double) Lugs: Mechanical type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.
6. Gutter-Tap Lugs: Compression type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.

E. Future Devices: Mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.

F. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals. Series rated panels are not approved.

2.2 DISTRIBUTION PANELBOARDS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Square D I-Line type distribution panelboards or comparable product by one of the following. The listing of a manufacturer as “acceptable” does not imply automatic approval. It is the sole responsibility of the Contractor to ensure that any submittals made are for products that meet or exceed the specifications included here.

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric

B. Panelboards: NEMA PB 1, power and feeder distribution type.

C. Doors: Secured with vault-type latch with tumbler lock; keyed alike.

1. For doors more than 36 inches high, provide two latches, keyed alike.

D. Mains: Circuit breaker or main lugs only as indicated on the Panel Schedules.

E. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes 125 A and Smaller: bolt-on circuit breakers.

F. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes Larger than 125 A: Bolt-on circuit breakers or plug-in circuit breakers, where individual positive-locking device requires mechanical release for removal.

G. Buses:

1. Copper phase and neutral buses; 200 percent capacity neutral bus and lugs. Provide on panels where specifically noted on the panel schedules or one-line diagram.
2. Copper equipment and isolated ground buses. Provide on panels where specifically noted on the panel schedules or one-line diagram.

2.3 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Square D NQOD series panelboards or comparable product by one of the following. The listing of a manufacturer as “acceptable” does not imply automatic approval. It is the sole responsibility of the Contractor to ensure that any submittals made are for products that meet or exceed the specifications included here.

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.

2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

B. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.

C. Mains: Circuit breaker or main lugs only as indicated on the on the Panel Schedules.

D. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.

E. Buses:

1. Copper phase and neutral buses; 200 percent capacity neutral bus and lugs. Provide on panels where specifically noted on the panel schedules or one line diagram.
2. Copper equipment and isolated ground buses. Provide on panels where specifically noted on the panel schedules or one-line diagram.

F. Contactors in Main Bus: NEMA ICS 2, Class A, mechanically held, general-purpose controller, with same short-circuit interrupting rating as panelboard.

G. Internal Control-Power Source: Control-power transformer, with fused primary and secondary terminals, connected to main bus ahead of contactor connection.

H. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.

2.4 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

B. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with interrupting capacity to meet available fault currents.

C. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.

D. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.

E. Solid State, electronic trip circuit breakers with rms sensing; field-replaceable rating plug or field-replicable electronic trip; and the following field-adjustable settings:

1. Instantaneous trip.
2. Long- and short-time pickup levels.

3. Long- and short-time time adjustments.
4. Ground-fault pickup level, time delay, and I^2t response.

F. GFCI Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).

G. Molded-Case Circuit-Breaker (MCCB) Features and Accessories:

1. Standard frame sizes, trip ratings, and number of poles.
2. Lugs: Mechanical type, suitable for number, size, trip ratings, and conductor materials.
3. Provide the following where noted on the drawings or schedules:

   a. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 55 percent of rated voltage.
   b. Handle Clamp: Loose attachment, for holding circuit breaker handle in the on position.
   c. Lockable: Fixed attachment for padlocking circuit breaker handle in the on or off position.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Receive, inspect, handle, and store panelboards according to NEMA PB 1.1.

B. Examine panelboards before installation. Reject panelboards that are damaged or rusted or have been subjected to water saturation.

C. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install panelboards and accessories according to manufacturer's written instructions, according to NEMA PB 1.1, and in accordance with recognized industry standards.

B. Mount panelboards recessed within a wall or surface mounted as indicated on drawings and schedules.

C. Support panel cabinets independently to structure with no weight bearing on conduits.

D. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from panelboards.

E. Mount so that top breaker is not higher than 6'-0" AFF, unless otherwise indicated.

F. Mount panelboard cabinet plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush and tight with wall finish and mating with back box.

G. Adjacent panel cabinets shall be of same physical size and mounted in horizontal alignment.

H. Provide lugs in panelboards of adequate size to accept feeders as indicated on drawings.

I. Install overcurrent protective devices and controllers not already factory installed.

1. Set field-adjustable, circuit-breaker trip ranges.
2. Install filler plates in unused spaces.
3. Provide handle clamp accessory for any circuit breaker serving fire alarm control panels or fire alarm power supplies.
4. Provide lockable handle padlock circuit breaker attachment where noted on panel schedules or plans as lockable option.

J. Provide one ¾" empty conduit for each three panel spaces between panelboard and accessible ceiling space or space designated to be ceiling space in the future, for future use. On recessed mounted panel boards, stub four 2-inch empty conduits**.**

K. Arrange conductors in gutters into groups and bundle and wrap with wire ties after completing load balancing.

3.3 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with Division 26 Section "Identification for Electrical Systems."

B. Create a directory to indicate installed circuit loads after balancing panelboard loads; incorporate Owner's final room designations. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable. Verify actual room names and numbers to be used, and include room name, room number and name of load being served for every circuit.

C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

D. Device Nameplates: Label each branch circuit device in distribution panelboards with a nameplate complying with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

3.4 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data.

2. Megger check and test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit. Do not megger check solid state components.
3. Test continuity of each circuit.
4. Energize each circuit and check for complete function.
5. Set adjustable trip circuit breakers in accordance with coordination study.

B. Panelboards will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

D. Touch up paint scratched or marred surfaces to match original finish.

3.5 ADJUSTING AND CLEANING

A. Adjust moving parts and operable component to function smoothly and lubricate as recommended by manufacturer.

B. Load Balancing: After Substantial Completion, but not more than 60 days after Final Acceptance, measure load balancing and make circuit changes.

1. Measure as directed during period of normal system loading.
2. Perform load-balancing circuit changes outside normal occupancy/working schedule of the facility and at time directed. Avoid disrupting critical 24-hour services such as fax machines and on-line data processing, computing, transmitting, and receiving equipment.
3. After circuit changes, recheck loads during normal load period. Record all load readings before and after changes and submit test records.
4. Tolerance: Difference exceeding 10 percent between phase loads, within a panelboard, is not acceptable. Rebalance and recheck as necessary to meet this minimum requirement.

C. Tighten lugs and bus connections.

D. Clean interior of panelboards from all debris and dust collected during construction.

END OF SECTION 26 24 16

SECTION 26 27 26
WIRING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Receptacles, receptacles with integral GFCI.
2. Twist-locking receptacles.
3. Snap switches and wall-box dimmers.
4. Device face plates.

1.3 DEFINITIONS

A. GFCI: Ground-fault circuit interrupter.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Receptacles for Owner-Furnished Equipment: Match plug configurations.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.

1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of wiring device and associated wall plate through one source from a single manufacturer. Insofar as they are available, obtain all wiring devices and associated wall plates from a single manufacturer and one source unless noted otherwise.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:

1. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).
2. Leviton Mfg. Company Inc. (Leviton).
3. Pass & Seymour/Legrand; Wiring Devices & Accessories (Pass & Seymour).

2.2 DEVICE COLORS

A. Color: Wiring device catalog numbers in Section Text do not designate device color.

1. Wiring Devices Connected to Normal Power System: **IVORY** unless otherwise selected by Architect or unless otherwise indicated or required by NFPA 70 or device listing.
2. Wiring device coverplates shall be matching device color unless specifically stated otherwise.
3. All wiring devices installed in the METAL SHOP shall be BLACK with stainless steel covers

2.3 STRAIGHT BLADE RECEPTACLES

A. General:

1. Convenience Receptacles, 125 V, 20 A, 5-20R configuration: Comply with NEMA WD 1, NEMA WD 6, UL 498, and FS W-C-596.

B. Heavy-Duty, Simplex:

1. Products: Subject to compliance with requirements, provide one of the following:

a. Pass & Seymour – 5361
b. Hubbell –HBL5361
c. Leviton - 5361

C. Heavy-Duty Duplex:

1. Products: Subject to compliance with requirements, provide one of the following:

a. Pass & Seymour – 5362
b. Hubbell – HBL5362
c. Leviton - 5362

D. GFCI Receptacles:

1. General Description: Feed-through type. Comply with UL 943, Class A, and include indicator light that is lighted when device is tripped.
2. Duplex GFCI Convenience Receptacles, 125 V, 20 A:

a. Receptacle shall be capable of being installed in a 2-1/2 inch deep outlet box without adapter.
b. Shall be grounding type with solid-state ground fault sensing and signaling; with 5 milliamperes ground fault trip level.
c. Test and reset buttons shall match color of face.
d. If critical components within receptacle are damaged and the ground fault protection is lost, power to receptacle shall be automatically disconnected within the device.

3. Products: Subject to compliance with requirements, provide one of the following:

a. Indoor – Dry Locations:

1) Pass & Seymour – 2095
2) Hubbell – GF20-LA
3) Leviton – 7899

b. Outdoor and Damp/Wet Locations:

1) Pass & Seymour – 2095TRWR
2) Hubbell – GFR5362-SG
3) Leviton – W7899

E. Combination Duplex and USB Charging Receptacles
1. Description: Single-piece, rivetless, nickel-plated, all-brass grounding system. Nickel-plated, brass mounting strap. Integral shutters that operate only when a plug is inserted in the line voltage receptacle.
2. Line Voltage Receptacles: Two pole, three wire, and self-grounding; NEMA WD 6, Configuration 5-20R.
3. USB Receptacles: Dual USB Type A, 5 V dc, and 2.1 A per receptacle (minimum).
4. Standards: Comply with UL 498, UL 1310, USB 3.0 devices, and FS W-C-596.
5. Marking: Listed and labeled as complying with NFPA 70, "Tamper-Resistant Receptacles" Article.

F. Special Purpose Receptacle:

1. Manufacturer: Same as general purpose receptacle.
2. Configuration as shown on Drawings.

2.4 SWITCHES

A. General: All manual toggle switches and wall box dimmers shall be **IVORY** unless seleted otherwise by the Architect.

B. Switches shall be rated for 20 amperes, and rated 120/277 volts AC. Switch shall be manufacturer’s specification grade toggle switch. Switches shall have quiet action mechanism with silver alloy contacts for longevity. Comply with NEMA WD 1, UL 20, and FS W-S-896.

1. Terminal screws shall allow back and side wiring and accept #14, 12, and 10 AWG stranded or solid wire.

C. Single Pole:

1. Products: Subject to compliance with requirements, provide one of the following:

a. Pass & Seymour – PS20AC1
b. Hubbell – HBL1221
c. Leviton – 1221-2

D. Three Way:

1. Products: Subject to compliance with requirements, provide one of the following:

a. Pass & Seymour – PS20AC3
b. Hubbell – HBL1223
c. Leviton – 1223-2

E. Four Way:

1. Products: Subject to compliance with requirements, provide one of the following:

a. Pass & Seymour – PS20AC4
b. Hubbell – HBL1224
c. Leviton – 1224-2

F. Key Switch Locking - Same series devices as above with –L option.

2.5 DIMMERS - WALL BOX

A. LED:

1. Dimmer Switches: Modular, full-wave, solid-state units with integral, quiet on-off switches, with audible frequency and EMI/RFI suppression filters.
2. Control: Continuously adjustable slider; with single-pole or three-way switching. Comply with UL 1472.
3. LED Lamp Dimmer Switches: Modular; compatible with LED lamps; trim potentiometer to adjust low-end dimming; capable of consistent dimming with low end not greater than 20 percent of full brightness.

2.6 WIRING DEVICE ACCESSORIES

A. Wall Plates:

1. Provide wall plates for single and combination wiring devices, of types, sizes, and with ganging and cutouts as indicated. Select plates which mate and match wiring devices to which attached. Construct with metal screws for securing plates to devices; screw heads colored to match finish of plates; wall plates colored to match wiring devices. Provide plates possessing the following additional construction features:

a. Material and Finish:

1) General use classrooms, conference rooms and offices – thermoplastic covers - color matching device colors.
2) All other interior spaces - Stainless Steel (0.04 inch thick type 302 satin finished)

2. Device plates for surface mounted Type FS or FD boxes: Type FSK galvanized steel covers.
3. Device plates for surface mounted, 4 in. square boxes: 1/2 in. raised galvanized steel covers.

B. Weatherproof Covers:

1. Weatherproof covers for all 125-250 volt, 15 and 20 ampere receptacles installed outdoors or in a wet location shall be weatherproof, NEMA 3R, with hinged outlet enclosure rated for rain proof protection while outlet is in use. The unit shall be furnished with a neoprene gasket between the mounting surface and the enclosure, and between the mounting plate and the hinged cover to assure proper seal.

a. Surface Mounted Type: shall be equal to, Die Cast with GFCI mounting plate, horizontal mount (duplex), WP1010HMC, vertical mount (quad), Catalog # WP1030MC.
b. Recessed/Flush Mounted Type: Shall be Arlington Industries Catalog# DBVM1W with metal backbox.

2. Weatherproof covers for all free standing outdoor receptacles shall be installed in a 19.5”, low-profile enclosure with built in while in use cover. Shall be bronze in color equal to Arlington Industries GPD19BR.
3. Weatherproof covers for all other receptacles shall be cast aluminum with a gasketed cover. Shall be equal to Hubbell CWP26H (standard flush box) or Hubbell WPFS26 (surface FS box).
4. Weatherproof covers for switches shall be lever switch type, rugged metallic construction with gasketed cover . Shall be equal to Hubbell-Raco 5121 (single switch), Hubbell-Raco 5124 (two ganged switches), Hubbell-Raco 5126 (three ganged switches).

2.7 INSTALLATION

A. Coordination with Other Trades:

1. Take steps to insure that devices and their boxes are protected. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of the boxes.
2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
4. Install wiring devices after all wall preparation, including painting, is complete.

B. Conductors:

1. Do not strip insulation from conductors until just before they are spliced or terminated on devices.
2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.

C. Device Installation:

1. Clean debris from every outlet box; including excess drywall mud.
2. Replace all devices that have been in temporary use during construction or that show signs that they were installed before building finishing operations were complete.
3. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
4. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment. Clean exposed surfaces to remove spatters and restore finish.
5. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.
6. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, 2/3 to 3/4 of the way around terminal screw.
7. Use a torque screwdriver when a torque is recommended or required by the manufacturer.
8. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
9. Tighten unused terminal screws on the device.
10. When mounting into metal boxes, remove the fiber or plastic washers used to hold device mounting screws in yokes, allowing metal-to-metal contact. Provide extension rings to bring device flush with finished surface (do not use switch box extension rings/goof rings). Install devices plumb, level and rigidly in place.

D. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles down, and on horizontally mounted receptacles to the right.

E. Device Plates:

1. Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.
2. Flush mounted, while in use, weatherproof covers shall be used in all public, front of house areas, and on building facades. Surface mounted type, while in use, weatherproof covers shall be used on all surface mounted receptacles.

F. Dimmers:

1. Install dimmers within terms of their listing.
2. Verify that dimmers used for fan speed control are listed for that application.
3. Install unshared neutral conductors on line and load side of dimmers according to manufacturers' device listing conditions in the written instructions.
4. Verify dimmers achieve full rating of specified/designed load indicated after derating for ganging as instructed by manufacturer.

G. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on bottom. Group adjacent switches under single, multigang wall plates where devices permit.

H. All exterior receptacles shall be GFCI type mounted in weatherproof boxes.

I. Ground receptacles with the insulated green ground wire from device ground screw to a bolted outlet box connection.

J. This Contractor shall check the switch location against the Architectural plans and shop drawings to be certain that switches are on the strike side of the door, regardless of swing shown on drawings. Edge of plate shall be not more than 12" from door frame.

K. Ground-fault circuit interrupter type receptacles may provide GFCI protection for downstream receptacles on same circuit only where located in same room as other receptacles.

2.8 IDENTIFICATION

A. Comply with Division 26 Section "Identification for Electrical Systems."

1. Receptacles: Identify panelboard and circuit number from which served on device.

2.9 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

1. Test Instruments: Use instruments that comply with UL 1436.
2. Test receptacles for correct polarity, proper ground connection, and wiring faults.

B. Wiring device will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

END OF SECTION 26 27 26

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SECTION 26 28 13
FUSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Cartridge fuses rated 600-V ac and less for use in control circuits, enclosed switches and enclosed controllers.
2. Plug fuses rated 125-V ac and less for use in plug-fuse-type enclosed switches.
3. Spare-fuse cabinets.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material, dimensions, descriptions of individual components, and finishes for spare-fuse cabinets. Include the following for each fuse type indicated:

1. Dimensions and manufacturer's technical data on features, performance, electrical characteristics, and ratings.
2. Fuse sizes for elevator feeders and elevator disconnect switches.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain fuses, for use within a specific product or circuit, from single source from single manufacturer.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Comply with NEMA FU 1 for cartridge fuses.

D. Comply with NFPA 70.

E. Comply with UL 248-11 for plug fuses.

1.6 PROJECT CONDITIONS

A. Where ambient temperature to which fuses are directly exposed is less than 40 deg F or more than 100 deg F, apply manufacturer's ambient temperature adjustment factors to fuse ratings.

1.7 COORDINATION

A. Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size and with system short-circuit current levels.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cooper Bussmann, Inc.
2. Edison Fuse, Inc.
3. Ferraz Shawmut, Inc.
4. Littelfuse, Inc.

2.2 CARTRIDGE FUSES

A. Characteristics: NEMA FU 1, nonrenewable cartridge fuses with voltage ratings consistent with circuit voltages.

2.3 SPARE-FUSE CABINET

A. Characteristics: Wall-mounted steel unit with full-length, recessed piano-hinged door and key-coded cam lock and pull.

1. Size: Adequate for storage of spare fuses specified with 15 percent spare capacity minimum.
2. Finish: Gray, baked enamel.
3. Identification: "SPARE FUSES" in 1-1/2-inch-high letters on exterior of door.
4. Fuse Pullers: For each size of fuse, where applicable and available, from fuse manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine fuses before installation. Reject fuses that are moisture damaged or physically damaged.

B. Examine holders to receive fuses for compliance with installation tolerances and other conditions affecting performance, such as rejection features.

C. Examine utilization equipment nameplates and installation instructions. Install fuses of sizes and with characteristics appropriate for each piece of equipment.

D. Evaluate ambient temperatures to determine if fuse rating adjustment factors must be applied to fuse ratings.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 FUSE APPLICATIONS

A. Cartridge Fuses:

1. Motor Branch Circuits: Class RK5, time delay.
2. Control Circuits: Class CC, fast acting.

3.3 INSTALLATION

A. Install fuses in fusible devices. Arrange fuses so rating information is easily readable without removing fuse.

B. Install spare-fuse cabinet(s) in each electrical room serving fused equipment.

3.4 IDENTIFICATION

A. Install labels complying with requirements for identification specified in Division 26 Section "Identification for Electrical Systems" and indicating fuse replacement information on inside door of each fused switch and adjacent to each fuse block, socket, and holder.

END OF SECTION 26 28 13

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SECTION 26 28 16
ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Fusible switches.
2. Non-fusible switches.
3. Molded-case circuit breakers (MCCB's).
4. Molded-case switches.
5. Enclosures.

1.3 DEFINITIONS

A. NC: Normally closed.

B. NO: Normally open.

C. SPDT: Single pole, double throw.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.

1. Enclosure types and details for types other than NEMA 250, Type 1.
2. Current and voltage ratings.
3. Short-circuit current ratings (interrupting and withstand, as appropriate).
4. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.

B. Shop Drawings: For enclosed switches and circuit breakers. Include plans, elevations, sections, details, and attachments to other work.

1. Wiring Diagrams: For power, signal, and control wiring.

C. Field quality-control reports.

1. Test procedures used.
2. Test results that comply with requirements.

3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:

1. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
2. Fuse Pullers: Two for each size and type.

1.7 QUALITY ASSURANCE

A. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single source from single manufacturer.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Comply with NFPA 70.

1.8 COORDINATION

A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

PART 2 - PRODUCTS

2.1 FUSIBLE SWITCHES

A. Basis-of-Design Product: Subject to compliance with requirements, provide Square D switches or comparable product by one of the following. The listing of a manufacturer as “acceptable” does not imply automatic approval. It is the sole responsibility of the contractor to ensure that any submittals made are for products that meet or exceed the specifications included here.

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.

2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.

B. Type HD, Heavy Duty, Single Throw, 240 and 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate specified fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

C. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
4. Auxiliary Contact Kit: Two NO/NC (Form "C") auxiliary contact(s), arranged to activate before switch blades open.
5. Hook-stick Handle: Allows use of a hook-stick to operate the handle.
6. Lugs: Mechanical type, suitable for number, size, and conductor material.

2.2 NON-FUSIBLE SWITCHES

A. Basis-of-Design Product: Subject to compliance with requirements, provide Square D HD series switches or comparable product by one of the following. The listing of a manufacturer as “acceptable” does not imply automatic approval. It is the sole responsibility of the contractor to ensure that any submittals made are for products that meet or exceed the specifications included here.

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.

B. Type HD, Heavy Duty, Single Throw, 240 and 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

C. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Auxiliary Contact Kit: Two NO/NC (Form "C") auxiliary contact(s), arranged to activate before switch blades open.
4. Hook-stick Handle: Allows use of a hook-stick to operate the handle.
5. Lugs: Mechanical type, suitable for number, size, and conductor material.

2.3 MOLDED-CASE CIRCUIT BREAKERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Square D I-Line Style bolt-on molded case circuit breakers or comparable product by one of the following. The listing of a manufacturer as “acceptable” does not imply automatic approval. It is the sole responsibility of the contractor to ensure that any submittals made are for products that meet or exceed the specifications included here.

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.

B. General Requirements: Comply with UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents indicated on the drawings.

C. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits in each pole. Adjustable magnetic trip setting for circuit-breaker frame sizes 150 A and larger, adjustable from the front.

D. Construct with over center, trip-free toggle type operating mechanisms with quick make, quick break action and positive handle trip indication. Construct breakers for mounting and operating in any physical position. Provide breakers lugs AL/CU rated. Lugs shall be adequate to accept wire size indicated on the drawings.

E. Adjustable, Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.

F. Electronic Trip Circuit Breakers: Field-replaceable rating plug, rms sensing, with the following field-adjustable settings:

1. Instantaneous trip.
2. Long- and short-time pickup levels.
3. Long- and short-time time adjustments.
4. Ground-fault pickup level, time delay, and I^2t response.

G. Ground-Fault, Circuit-Interrupter (GFCI) Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA or more trip and hold below 4mA of ground fault current). One way circuit length shall not exceed 250 feet. If length exceeds 250 feet, notify engineer in writing prior to installing circuit.

H. Interrupting ratings shall be as indicated on drawings. Circuit breakers shall be fully rated for available fault current. Series rating is not acceptable.

I. Features and Accessories:

1. Standard frame sizes, trip ratings, and number of poles.
2. Lugs: Mechanical type, suitable for number, size, trip ratings, and conductor material.
3. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge lighting circuits.
4. Provide the following where noted on the drawings or schedules:

a. Ground-Fault Protection: Comply with UL 1053; integrally mounted, self-powered for solid state type trip units and remote-mounted and powered for magnetic type trip units with mechanical ground-fault indicator; relay with adjustable pickup and time-delay settings, push-to-test feature, internal memory, and shunt trip unit; and three-phase, zero-sequence current transformer/sensor.
b. Shunt Trip: Trip coil energized from separate circuit, with coil-clearing contact.

2.4 ENCLOSURES

A. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.

1. Indoor Dry and Clean Locations: NEMA 250, TYPE 1
2. Outdoor Locations: NEMA 250, TYPE 3R.
3. Other Wet or Damp Indoor Locations: NEMA 250, TYPE 4X
4. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Non-corrosive Liquids: NEMA 250, TYPE12.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.

B. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

C. Install fuses in fusible devices.

D. Circuit breakers and molded case switches shall be factory installed in enclosures.

E. Comply with NECA 1.

F. Disconnect switches, located at motors controlled by an adjustable frequency drive shall be provided with a late make, early break auxiliary contact rated for ten amps continuous duty. This auxiliary contact shall be wired into the VFD emergency shutdown (coast to stop) circuit to ensure shutdown of the VFD in the event of the disconnect being opened.

3.3 IDENTIFICATION

A. Comply with requirements in Division 26 Section "Identification for Electrical Systems."

1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Acceptance Testing Preparation:

1. Test insulation resistance for each enclosed switch and circuit breaker, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

C. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
3. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

D. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports, including a certified report that identifies enclosed switches and circuit breakers and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

F. Test and/or permanently record the following:

1. Fuses:

a. Equipment nameplate requirement.
b. Actual fuse rating.

2. Circuit Breakers:

a. Nameplate data.
b. Actual trip setting.

3.5 ADJUSTING

A. Adjust moving parts and operable components to function smoothly and lubricate as recommended by manufacturer.

END OF SECTION 26 28 16

SECTION 26 29 13
ENCLOSED CONTROLLERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes the following enclosed controllers rated 600 V and less:

1. Manual motor controllers

B. All VFDs, relays, pushbuttons, pilot lights, and other devices required for the control of motors or electrical equipment shall be furnished by Divisions 22 and 23, except as specifically noted elsewhere in these specifications.

C. VFD's furnished by Division 22 or 23 Contractor shall be installed and wired by Division 26 Contractor, coordinated with Division 22 & 23 Contractor, all control wiring shall be provided by the Contractor supplying the motor and controller.

D. Motor starter and or combination motor controller/disconnect switches shall be provided by the Division 26 contractor

1.3 DEFINITIONS

A. CPT: Control power transformer.

B. MCP: Motor circuit protector.

C. N.C.: Normally closed.

D. N.O.: Normally open.

E. OCPD: Overcurrent protective device.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of enclosed controller. Include manufacturer's technical data on features, performance, electrical characteristics, ratings, and enclosure types and finishes.

B. Shop Drawings: For each enclosed controller. Include dimensioned plans, elevations, sections, details, and required clearances and service spaces around controller enclosures.

1. Show tabulations of the following:

a. Each installed unit's type and details.
b. Factory-installed devices.
c. Nameplate legends.
d. Short-circuit current rating of integrated unit.
e. Listed and labeled for integrated short-circuit current (withstand) rating of OCPDs in combination controllers by an NRTL acceptable to authorities having jurisdiction.
f. Features, characteristics, ratings, and factory settings of individual OCPDs in combination controllers.

2. Wiring Diagrams: For power, signal, and control wiring.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For enclosed controllers to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:

1. Routine maintenance requirements for enclosed controllers and installed components.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: Member company of NETA or an NRTL.

1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Comply with NFPA 70.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store enclosed controllers indoors in clean, dry space with uniform temperature to prevent condensation. Protect enclosed controllers from exposure to dirt, fumes, water, corrosive substances, and physical damage.

B. Do not store in areas subject to weather.

C. Protect motor starters against damage from work of other trades.

1.8 COORDINATION

A. Coordinate layout and installation of enclosed controllers with other construction including conduit, piping, equipment, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Coordinate features of enclosed controllers and accessory devices with pilot devices and control circuits to which they connect.

C. Coordinate features, accessories, and functions of each enclosed controller with ratings and characteristics of supply circuit, motor, required control sequence, and duty cycle of motor and load.

D. Coordinate with installation of roof curbs, equipment supports, and roof penetrations.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following. The listing of a manufacturer as "acceptable" does not imply automatic approval. It is the sole responsibility of the Contractor to ensure that any submittals made are for products that meet or exceed the specifications included here.

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

2.2 MANUAL MOTOR CONTROLLERS

A. Motor-starting Switches (MX): "Quick-make, quick-break" toggle action; marked to show whether unit is off or on.

1. Comply with NEMA ICS 2, general purpose, Class A.
2. Configuration: Non-reversing.
3. Surface Mounting

B. Fractional Horsepower Manual Controllers (MS): "Quick-make, quick-break" toggle action; marked to show whether unit is off, on or tripped.

1. Configuration: Non-reversing.
2. Overload Relays: Inverse-time-current characteristics; NEMA ICS 2, Class 10 tripping characteristics; heaters matched to nameplate full-load current of actual protected motor, external reset push button; bimetallic type.
3. Pilot Light: Red.

2.3 ENCLOSURES

A. Enclosed Controllers: NEMA ICS 6, to comply with environmental conditions at installed location.

1. Indoor Dry and Clean Locations: Type 1.
2. Other Wet or Damp Indoor Locations: Type 4.
3. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Non-corrosive Liquids: Type 12.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and surfaces to receive enclosed controllers, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

B. Examine enclosed controllers before installation. Reject enclosed controllers that are wet, moisture damaged, or mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Wall-Mounted Controllers: Install enclosed controllers on walls with tops at uniform height unless otherwise indicated, and by bolting units to wall or mounting on lightweight structural-steel channels bolted to wall. For controllers not at walls, provide freestanding racks complying with Division 26 Section "Hangers and Supports for Electrical Systems."

B. Comply with NECA 1.

3.3 IDENTIFICATION

A. Identify enclosed controllers, components, and control wiring. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
2. Label each enclosure with engraved nameplate.
3. Label each enclosure-mounted control and pilot device.

3.4 CONTROL WIRING INSTALLATION

A. Install wiring between enclosed controllers and remote devices and facility's central control system. Comply with requirements in Division 26 Section "Low-Voltage Electrical Power Conductors Cables."

B. Bundle, train, and support wiring in enclosures.

C. Connect selector switches and other automatic-control selection devices where applicable.

1. Connect selector switches to bypass only those manual- and automatic-control devices that have no safety functions when switch is in manual-control position.
2. Connect selector switches with enclosed-controller circuit in both manual and automatic positions for safety-type control devices such as low- and high-pressure cutouts, high-temperature cutouts, and motor overload protectors.

3.5 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Acceptance Testing Preparation:

1. Test insulation resistance for each component, enclosed controller, component, connecting supply, feeder, and control circuit in accordance with the latest version of the NETA Acceptance Testing Specification Chapter 7.
2. Test continuity of each circuit.

C. Tests and Inspections:

1. Inspect controllers, wiring, components, connections, and equipment installation. Test and adjust controllers, components, and equipment.
2. Test insulation resistance for each enclosed controller element, component, connecting motor supply, feeder, and control circuits.
3. Test continuity of each circuit.
4. Verify that voltages at controller locations are within 10 percent of motor nameplate rated voltages. If outside this range for any motor, notify Architect and Owner before starting the motor(s).
5. Test each motor for proper phase rotation.
6. Perform each electrical test and visual and mechanical inspection stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
7. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
8. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.
9. Mark up a set of manufacturer's drawings with all field modifications incorporated during construction and return to manufacturer for inclusion in Record Drawings.

D. Enclosed controllers will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports including a certified report that identifies enclosed controllers and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.6 ADJUSTING

A. Set field-adjustable switches, auxiliary relays, time-delay relays, timers, and overload-relay pickup and trip ranges.

3.7 PROTECTION

A. Replace controllers whose interiors have been exposed to water or other liquids prior to Substantial Completion.

END OF SECTION 26 29 13

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SECTION 263202 - 2-WAY COMMUNICATION CALL SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SCOPE

A. Provide a 2-Way Communication Call System as shown on the plans and as herein specified. System shall be in compliance with the American Disabilities Act (ADA) and International Building Code (IBC).

B. The system shall be comprised of an Internal Call System and an External Call System. The internal call system shall be utilized to inform fire fighters of an occupied call station location, the external call system shall be utilized for external building call for assistance (per IBC). The Internal Call System shall allow occupants to be able to communicate outside the building.

1.3 ACTION SUBMITTALS

A. Submittals shall include, at a minimum, the following information:

B. Cover Sheet including the submittal date, specification section, contractor name, fire alarm vendor name, and the project name.

C. Equipment list, including quantity, manufacturer, manufacturer part number, and equipment description.

D. Spare parts shall be listed separately and labeled as spares. A separate equipment list shall be provided for each specification section.

E. Manufacturer's Data Sheets for each piece of equipment provided. Data sheets shall be bound in the order they occur in the equipment list. If an item occurs more than once in the equipment list, only one data sheet is needed.

F. Data sheets shall be clearly marked, noting which item or items on that sheet are being provided.

G. Sequence of Operation shall be provided giving a description of the functions of the system. The sequence of operation shall be in a narrative form. Sequence of Operation shall include preprogrammed phone numbers for the External System.

H. Riser diagrams shall be provided to illustrate communication circuits. Each riser diagram shall be job specific and show the point of origin for each circuit, areas served by each circuit, circuit type and wire type.

PART 2 - PRODUCTS

2.1 INTERNAL CALL SYSTEM

A. Acceptable Manufacturers
   1. Cornell 4800 series, rescue assistance annunciator panel (master) and associated call stations. Size as needed for the proper number of call stations
   2. RATH Emergency Communication System.

2.2 EXTERNAL CALL SYSTEM

A. The emergency communication phones shall be programmed to first dial a local building number (verify with owner). If there is no answer at that number, the phone shall automatically dial 911.

B. Upon answered call, the Call Progress Lamp shall be illuminated.

C. The phone shall be provided with automatic voice location identifier in-case the person calling is incapable of speaking.

PART 3 - EXECUTION

3.1 INTERNAL CALL SYSTEM

A. The central station operator on receiving a call station signal activates a zone button that illuminates both a flashing LED and a green “voice” LED. By depressing and releasing the “talk” button, voice communication is established for as long as required. Upon completion, the appropriate zone button is depressed again however, the flashing red light continues. If more than one zone is signaling, the control station accepts the calls in the same manner.

B. When the emergency is resolved, the central station operator pushes a reset button that restores the entire system to standby status. In the event of a wiring fault, each annunciator zone button is equipped with a yellow LED that will illuminate and an alarm that will sound identifying the area requiring service.

C. Communication wiring shall be routed in minimum ½” conduit.

D. Power wiring from the power supply to the annunciator shall be 18 gauge minimum routed in ½” conduit. Three conductors (2 for 24VDC and 1 ground) are required between the power supply and the annunciator panel. Locate the power supply above the accessible ceiling at the annunciator location. Wire power supply to a 120-volt circuit.

3.2 EXTERNAL CALL SYSTEM

A. Coordinate with the owner’s PBX provider and provide the proper number of phone circuits for the system.

B. The contractor shall install the phone power supply where it is not visible from a public location.

C. Basic programming functions are given above, coordinate with the owner to provide additional phone numbers.

END OF SECTION 26 32 02

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SECTION 26 33 23.11
CENTRAL BATTERY EQUIPMENT FOR EMERGENCY LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes the following central battery and power conversion equipment rated 600 V and less for emergency lighting:

1. Uninterruptible (UPS-type) central battery equipment.

1.3 DEFINITIONS

A. DDC: Direct digital control.

B. IBC: International Building Code.

C. Interruptible: As used in the Section Text, an off-line, passive-standby or line-interactive, inverter-only unit, with an intentional interruption of power to the load until an internal transfer switch picks up and transfers the load to the unit's inverter and internal battery source on loss of the "normal" source, and then retransfers to the "normal" source when it is restored. Transfer time can be "slow" (up to approximately 1 second) or "fast" (2-4 ms or 40-50 ms, depending on manufacturer).

D. LED: Light-emitting diode.

E. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control, signaling power-limited circuits.

F. NiCd: Nickel cadmium.

G. OCPD: Overcurrent protective device.

H. PWM: Pulse-width modulated.

I. TDD: Total demand (harmonic current) distortion (also listed as "THD" in catalog data by manufacturers).

J. Uninterruptible: As used in the Section Text, an on-line, double-conversion (rectifier/inverter) unit, with no interruption of power to the load on interruption and restoration of the "normal" source.

K. UPS: Uninterruptible power supply.

L. VRLA: Valve-regulated lead acid.

1.4 ACTION SUBMITTALS

A. Product Data: For each type and rating of central battery equipment unit.

1. Include features, performance, electrical ratings, operating characteristics, shipping and operating weights, shipping splits, and furnished options, specialties, and accessories.

B. Shop Drawings: For each type and rating of central battery equipment unit.

1. Include plans, elevations, sections, and mounting details.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, ventilation requirements, method of field assembly, components, and location and size of each field connection.
3. Include system one-line diagram, internal and interconnecting wiring; and diagrams for power, signal, and control wiring.
4. Include elevation, details, and legends of control and indication displays.
5. Include -circuit current (withstand) rating of unit.

C. Warranty Information

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For central battery equipment to include in emergency, operation, and maintenance manuals.

1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

a. Manufacturer's written instructions for testing central battery equipment.
b. Manufacturer's written instructions for testing, adjusting, and reprogramming microprocessor control modules.
c. Manufacturer's written instructions for selecting and setting field-adjustable controls and status and alarm points.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents. Deliver extra materials to Owner.

1. Fuses: One for every 10 of each type and rating, but no fewer than 2 of each type.
2. Cabinet Ventilation Filters: One complete set.
3. Circuit Board: One spare circuit board for each critical circuit.

1.7 QUALITY ASSURANCE

A. Testing Agency Qualifications: Member company of NETA or an NRTL.

1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver equipment in fully enclosed vehicles.

B. Store equipment in spaces having environments controlled within manufacturers' written instructions for ambient temperature and humidity conditions for non-operating equipment.

1.9 FIELD CONDITIONS

A. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:

1. Ambient Temperature: Less than 0 deg F or exceeding 104 deg F, with an average value exceeding 95 deg F over a 24-hour period.
2. Ambient Storage Temperature: Not less than minus 4 deg F and not exceeding 140 deg F.
3. Humidity: More than 95 percent (condensing).
4. Altitude: Exceeding 3300 feet.

1.10 COORDINATION

A. Coordinate sizes and locations of concrete bases. Cast anchor-bolt inserts into bases.

1.11 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace central battery equipment that fails in materials or workmanship within specified warranty period. Special warranty, applying to batteries only, applies to materials only, on a prorated basis, for period specified.

1. Warranty Period: Include the following warranty periods, from date of Substantial Completion:

a. Central Battery Equipment (excluding Batteries): Two (2) years.
b. Standard VRLA Batteries:

1) Full Warranty: One (1) year.
2) Pro Rata: Nine (9) years.

PART 2 - PRODUCTS

2.1 UNINTERRUPTIBLE (UPS-TYPE) CENTRAL BATTERY EQUIPMENT

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. EATON/Cooper Industries, Inc.
2. Philips: Bodine
3. Dual-Lite.
4. Lithonia Lighting; Acuity Brands Lighting, Inc.
5. Isolite, Inc

B. General Requirements for Central Battery Equipment:

1. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. NRTL Compliance: Fabricate and label central battery equipment to comply with UL 924.
3. Comply with the IBC, NFPA 70, and NFPA 101.
4. Comply with NEMA PE 1.

C. Performance Requirements for UPS-Type Central Battery Equipment:

1. Type: On-line, double conversion.
2. Continuously provide uninterrupted ac power to connected emergency electrical lighting system.
3. Automatic Operation:

    a. Normal Conditions: Supply the load with ac power flowing from normal ac power input terminals, through rectifier and inverter, with battery connected in parallel with rectifier output.
    b. Abnormal Supply Conditions: If normal ac supply deviates from specified and adjustable voltage, voltage waveform, or frequency limits, battery supplies constant, regulated, inverter ac power output to the load without switching or disturbance.
    c. If normal power fails, battery continues to supply regulated ac power through the inverter to the load without switching or disturbance.
    d. When power is restored at normal supply terminals of system, controls automatically synchronize inverter with the external source before transferring the load. Rectifier then supplies power to the load through the inverter and simultaneously recharges battery.
    e. If battery becomes discharged and normal supply is available, rectifier charges battery. When battery is fully charged, rectifier automatically shifts to float-charge mode.
    f. If any element in the rectifier/inverter string fails and power is available at normal supply terminals of system, static transfer switch transfers the load to normal ac supply circuit without disturbance or interruption of supply.
    g. If a fault occurs in system supplied by the inverter output, and current flows in excess of the overload rating of the inverter, static transfer switch operates to bypass fault current to normal ac supply circuit for fault clearing.
    h. When fault has cleared, static transfer switch returns the load to inverter output.

i. If battery is disconnected, inverter continues to supply power to the load with no degradation of its regulation of voltage and frequency of output bus.

4. Manual Operation:

a. Turning inverter off causes static transfer switch to transfer the load directly to normal ac supply circuit without disturbance or interruption.
b. Turning inverter on causes static transfer switch to transfer the load to inverter.

D. Unit Operating Requirements:

1. Input AC Voltage Tolerance: Plus 10 and minus 15 percent of central battery equipment input voltage rating.
2. Input Frequency Tolerance: Plus or minus 3 percent of central battery equipment frequency rating.
3. Synchronizing Slew Rate: 1 Hz per second, maximum.
4. Minimum Off-Line Efficiency: 95 percent at 60 Hz, full load.
5. Minimum Displacement Primary-Side Power Factor: 98 percent under any load or operating condition.
6. Ambient Temperature Rating (Other Than Batteries): Not less than 68 deg F and not exceeding 86 deg F.
7. Ambient Storage Temperature Rating (Other Than Batteries): Not less than minus 4 deg F and not exceeding 158 deg F
8. Ambient Temperature Rating (Batteries): Not less than 32 deg F and not exceeding 104 deg F.
9. Ambient Storage Temperature Rating (Batteries): Not less than 0 deg F and not exceeding 104 deg F
10. Humidity Rating: Less than 95 percent (noncondensing).
11. Altitude Rating: Not exceeding 3300 feet.
12. Off-Line Overload Capability: 1.5 times the base load current for 60 seconds; minimum of 1.8 times the base load current for three seconds.

E. Inverter and Controls Logic: Microprocessor based, isolated from all power circuits; provides complete self-diagnostics, periodic automatic testing and reporting; with alarms.

F. Controls and Indication:

1. Status Indication: Door-mounted, labeled LED indicators displaying the following conditions:

a. Normal power available.
b. Status of system.
c. Battery charging status.
d. On battery power.
e. System fault.
f. External fault.

G. Self-Protection and Reliability Features:

1. Input transient protection by means of surge suppressors to provide protection against damage from supply voltage surges as defined in IEEE C62.45, Category B and C.
2. Integral, programmable, self-diagnostic and self-test circuitry; with alarms and logging.
3. Battery deep-discharge and self-discharge protection; with alarms.
4. Battery self-test circuitry; with alarms and logging.

H. Integral Input Disconnecting Means and OCPD: Thermal-magnetic circuit breaker, complying with UL 489.

1. Integrated Equipment Minimum Short-Circuit Current (Withstand) Rating: 65 kA.

I. Rectifier:

1. Description: Solid state, with the following operational features:

a. Automatically convert incoming ac voltage to regulated dc bus voltage, with less than 2 percent rms ripple voltage with inverter fully loaded and batteries disconnected.
b. Rectified Efficiency: Not less than 97 percent.

J. Inverter:

1. Description: Solid-state, high-frequency, PWM type, with the following operational features:

a. Automatically regulate output voltage to within plus or minus 3 percent, for all load ranges and for maximum 25 percent step-load changes; regulation may increase to 8 percent for 100 percent step-load changes, with recovery within 3 cycles.
b. Automatically regulate output frequency to within plus or minus 0.05 Hz, from no load to full load, at unity power factor, over the operating range of battery voltage.
c. Inverter Overload Capability: 115 percent for 10 minutes; 150 percent surge for 10 seconds.
d. Brownout Protection: Produces rated power without draining batteries when input voltage is down to 75 percent of normal.
e. Load Power Factor: 0.5 lead to 0.5 lag.

K. Battery Charger:

1. Description: Solid state, variable rate, temperature compensated; automatically maintains batteries in fully charged condition when normal power is available.
2. Maximum Battery Recharge Time from Fully Discharged State: 24 hours.
3. Low-voltage disconnect circuit reduces battery discharge during extended power outages, monitors battery voltage, and disconnects inverter when battery voltage drops to no less than 85.7 percent of nominal voltage.

L. Batteries:

1. Description: Standard VRLA batteries.

   a. Capable of sustaining full-capacity output of inverter unit for minimum of 90 minutes.

2. Battery Disconnect and OCPD: Manufacturer's standard.

M. Integral Output Disconnecting Means and OCPD:

1. As scheduled on Drawings; manufacturer's standard ratings based on unit output ratings.

2.2 ENCLOSURES

A. Central Battery Equipment Enclosures: NEMA 250, to comply with environmental conditions at installed location.

1. Dry and Clean Indoor Locations: Type 1 steel cabinets with access to components through hinged doors with flush tumbler lock and latch.
2. Finish: Manufacturer's standard baked-enamel finish over corrosion-resistant prime treatment.

2.3 SOURCE QUALITY CONTROL

A. Testing: Test and inspect central battery equipment according to UL 924.

B. Factory Tests: Test and inspect assembled central battery equipment, by a qualified testing agency, according to UL 924. Affix standards organization's label. Include the following:

1. Functional test and demonstration of all functions, controls, indicators, sensors, and protective devices.
2. Full-load test.
3. Transient-load response test.
4. Overload test.
5. Power failure test.

C. Central battery equipment will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Receive, inspect, handle, and store central battery equipment according to NECA 411.

B. Examine areas, surfaces, and substrates to receive central battery equipment, with Installer present, for compliance with requirements for installation tolerances, structural

support, ventilation, temperature, humidity, and other conditions affecting performance of the Work.

1. Verify that manufacturer's written instructions for environmental conditions have been permanently established in spaces where equipment will be installed, before installation begins.

C. Examine equipment before installation. Reject equipment that is wet, moisture damaged, or mold damaged.

D. Examine roughing-in for electrical connections to verify actual locations of connections before installation.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Coordinate layout and installation of central battery equipment with other construction including conduit, piping, equipment, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Install central battery equipment and accessories according to NECA 411.

C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

D. Comply with NECA 1.

E. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.

F. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.

3.3 CONNECTIONS

A. Connections: Interconnect system components. Make connections to supply and load circuits according to manufacturer's wiring diagrams unless otherwise indicated.

B. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

1. Separately Derived Systems: Make grounding connections to grounding electrodes and bonding connections to metallic piping systems as indicated; comply with NFPA 70.

C. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.4 CONTROL WIRING INSTALLATION

A. Install wiring between central battery equipment and remote devices. Comply with requirements in Section 260523 "Control-Voltage Electrical Power Cables."

B. Bundle, train, and support wiring in enclosures.

3.5 IDENTIFICATION

A. Identify central battery equipment, components, and control wiring. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
2. Label central battery equipment with engraved nameplates.
3. Label each enclosure-mounted control and pilot device.

3.6 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Acceptance Testing Preparation:

1. Inspect and Test Each Component:

    a. Inspect wiring, components, connections, and equipment installations. Test and adjust components and equipment.
    b. Test insulation resistance for all external branch circuit, feeder, control, and alarm wiring connected to central battery equipment element and component.
    c. Test continuity of each circuit.

C. Tests and Inspections:

1. Inspect central battery equipment, wiring, components, connections, and equipment installation. Test and adjust components and equipment.
2. Test insulation resistance for all external branch circuit, feeder, control, and alarm wiring connected to central battery equipment element and component.
3. Test continuity of each circuit.
4. Verify that input voltages and frequencies at central battery equipment locations are within voltage and frequency limits specified in Part 2. If outside this range, notify Architect before closing input OCPDs.
5. Perform each visual and mechanical inspection and electrical test stated in manufacturer's written instructions and in NETA Acceptance Testing Specification, including specifically those for batteries, battery chargers, and UPS, regardless of the type of central battery equipment provided. Certify compliance with test parameters.
6. Perform a load-duration test at rated voltage and rated output current to verify the correct functional operation of the unit under full-load stable operating conditions for the minimum time limits required by UL 924. Monitor and record ambient temperature and temperatures within the unit.

7. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

D. Central battery equipment will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports, including a certified report that identifies central battery equipment and describes all test results. Include notation of deficiencies detected, remedial action taken, and observations made after remedial action.

3.7 ADJUSTING

A. Set the automatic system test parameters.

3.8 PROTECTION

A. Replace central battery equipment whose interiors have been exposed to water or other liquids prior to Substantial Completion.

END OF SECTION 26 33 23.11

SECTION 26 43 13
SURGE PROTECTION FOR LOW-VOLTAGE ELECTRICAL POWER CIRCUITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes field-mounted SPDs for low-voltage (120 to 600 V) power distribution and control equipment.

1.3 DEFINITIONS

A. I nominal: Nominal discharge current.

B. MCOV: Maximum continuous operating voltage.

C. Mode(s), also Modes of Protection: The pair of electrical connections where the VPR applies.

D. MOV: Metal-oxide varistor; an electronic component with a significant non-ohmic current-voltage characteristic.

E. OCPD: Overcurrent protective device.

F. SCCR: Short-circuit current rating.

G. SPD: Surge protective device.

H. VPR: Voltage protection rating.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
2. Copy of UL Category Code VZCA certification, as a minimum, listing the tested values for VPRs, I nominal ratings, MCOVs, type designations, OCPD requirements, model numbers, system voltages, and modes of protection.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For SPDs to include in maintenance manuals.

1.6 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to replace or replace SPDs that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five (5) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GENERAL SPD REQUIREMENTS

A. SPD with Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

C. Comply with UL 1449.

D. MCOV of the SPD shall be the nominal system voltage.

2.2 SERVICE ENTRANCE SUPPRESSOR

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton.
2. General Electric Company.
3. Liebert; a brand of Emerson Electric Co.
4. SIEMENS Industry, Inc.; Energy Management Division.
5. Square D; by Schneider Electric.

B. SPDs: Comply with UL 1449, Type 2.

C. SPDs: Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 1449, Type 2

1. SPDs with the following features and accessories:

D. Comply with UL 1283.

E. Peak Surge Current Rating: The minimum single-pulse surge current withstand rating per phase shall not be less than 200 kA. The peak surge current rating shall be the arithmetic sum of the ratings of the individual MOVs in a given mode.

F. Protection modes and UL 1449 VPR for grounded wye circuits with 480Y/277 V and 208Y/120 V, three-phase, four-wire circuits shall not exceed the following:

1. Line to Neutral: 1200 V for 480Y/277 V; 700 V for 208Y/120 V.
2. Line to Ground: 1200 V for 480Y/277 V; 1200 V for 208Y/120 V.
3. Line to Line: 2000 V for 480Y/277 V; 1000 V for 208Y/120 V.

G. Protection modes and UL 1449 VPR for 240/120 V, single-phase, three-wire circuits shall not exceed the following:

1. Line to Neutral: 700 V.
2. Line to Ground: 700 V.
3. Line to Line: 1000 V.

H. SCCR: Equal or exceed 100 kA.

2.3 PANEL SUPPRESSORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton.
2. General Electric Company.
3. Leviton Manufacturing Co., Inc.
4. SIEMENS Industry, Inc.; Energy Management Division.
5. Square D; by Schneider Electric.

B. SPDs: Comply with UL 1449, Type 2.

1. Include LED indicator lights for power and protection status.
2. Internal thermal protection that disconnects the SPD before damaging internal suppressor components.
3. Include Form-C contacts rated at 5 A and 250-V ac, one normally open and one normally closed, for remote monitoring of protection status.

C. Peak Surge Current Rating: The minimum single-pulse surge current withstand rating per phase shall not be less than 100 kA. The peak surge current rating shall be the arithmetic sum of the ratings of the individual MOVs in a given mode.

D. Comply with UL 1283.

E. Protection modes and UL 1449 VPR for grounded wye circuits with 480Y/277 V, three-phase, four-wire circuits shall not exceed the following:

1. Line to Neutral: 1200 V for 480Y/277 V.
2. Line to Ground: 1200 V for 480Y/277 V.
3. Neutral to Ground: 1200 V for 480Y/277 V.
4. Line to Line: 2000 V for 480Y/277 V

F. Protection modes and UL 1449 VPR for 240/120-V, single-phase, three-wire circuits shall not exceed the following:

1. Line to Neutral: 700 V.
2. Line to Ground: 700 V.
3. Neutral to Ground: 700 V.
4. Line to Line: 1200 V.

G. SCCR: Equal or exceed 100 kA.

2.4 ENCLOSURES

A. Indoor Enclosures: NEMA 250, Type 1.

B. Outdoor Enclosures: NEMA 250, Type 3R.

2.5 CONDUCTORS AND CABLES

A. Power Wiring: Same size as SPD leads, complying with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1.

B. Install an OCPD or disconnect as required to comply with the UL listing of the SPD.

C. Install SPDs with conductors between suppressor and points of attachment as short and straight as possible and adjust circuit-breaker positions to achieve shortest and straightest leads. Do not splice and extend SPD leads unless specifically permitted by manufacturer. Do not exceed manufacturer's recommended lead length. Do not bond neutral and ground.

D. Use crimped connectors and splices only. Wire nuts are unacceptable.

E. Wiring:

1. Power Wiring: Comply with wiring methods in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
2. Controls: Comply with wiring methods in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.2 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Compare equipment nameplate data for compliance with Drawings and Specifications.
2. Inspect anchorage, alignment, grounding, and clearances.
3. Verify that electrical wiring installation complies with manufacturer's written installation requirements.

B. An SPD will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.3 STARTUP SERVICE

A. Complete startup checks according to manufacturer's written instructions.

B. Do not perform insulation-resistance tests of the distribution wiring equipment with SPDs installed. Disconnect SPDs before conducting insulation-resistance tests, and reconnect them immediately after the testing is over.

C. Energize SPDs after power system has been energized, stabilized, and tested.

3.4 DEMONSTRATION

A. Train Owner's maintenance personnel to operate and maintain SPDs.

END OF SECTION 26 43 13

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SECTION 26 51 00
INTERIOR LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Interior lighting fixtures.
2. Exit signs.
3. Lighting fixture supports.

B. Related Sections:

1. Section 260923 "Lighting Control Devices" for automatic control of lighting, including time switches, photoelectric relays and occupancy sensors.
2. Section 262726 "Wiring Devices" for manual wall-box dimmers for LED sources.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of lighting fixture, arranged in order of fixture designation. Include data on features, accessories, finishes, and the following:

1. Physical description of lighting fixture including dimensions.
2. Emergency lighting units including battery and charger.
3. Energy-efficiency data.
4. Lumens, CCT, CRI and Lumens per Watt.
5. Photometric data and adjustment factors based on laboratory tests, complying with IESNA Lighting Measurements Testing & Calculation Guides, of each lighting fixture type. The adjustment factors shall be for lumen output identical to those indicated for the lighting fixture as applied in this Project.

    a. Testing Agency Certified Data: For indicated fixtures, photometric data shall be certified by a qualified independent testing agency. Photometric data for remaining fixtures shall be certified by manufacturer.
    b. Manufacturer Certified Data: Photometric data shall be certified by a manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.

B. Shop Drawings: For nonstandard or custom lighting fixtures. Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Wiring Diagrams: For power, signal, and control wiring.

C. Installation instructions.

1.4 INFORMATIONAL SUBMITTALS

A. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For lighting equipment and fixtures to include in emergency, operation, and maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Plastic Diffusers and Lenses: One for every 100 of each type and rating installed. Furnish at least one of each type.

1.7 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910, complying with the IESNA Lighting Measurements Testing & Calculation Guides.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.8 COORDINATION

A. Coordinate layout and installation of lighting fixtures and suspension system with other construction that penetrates ceilings or is supported by them, including HVAC equipment, fire-suppression system, and partition assemblies.

1.9 WARRANTY

A. Special Warranty for LED luminaires: Manufacturer's standard form, made out to Owner and signed by fixture manufacturer agreeing to replace fixture/module that fail in materials or workmanship. Warranty shall include “finish” warranty against failure or substationally deterioration such as blistering, cracking, peeling, chalking or fading. Warranty shall include replacement for defective or non-starting power supply units and LED source assemblies, which include, but are not limited to, LED packages, LED arrays, LED modules, LED dies, encapsulates and phosphors. Warranty shall include

replacement for any LED source assembly, package, array or module, which does not include the power supply, against 10% or more of the individual LEDs in that assembly, package, array, or module failing to illuminate.

1. Warranty Period for interior LED light fixtures: Five (5) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, product(s) indicated on Drawings.

2.2 GENERAL REQUIREMENTS FOR LIGHTING FIXTURES AND COMPONENTS

A. Provide luminaires of the size, type and rating indicated in “Lighting Fixture Schedule”, complete with, but not necessarily limited to reflectors, drivers, starters, wiring and any other accessories required for a complete working installation.

B. Luminaire catalog numbers do not necessarily include all accessories and are intended to serve as a guide in defining types and manufacturers of luminaire only.

C. The contractor shall ensure that the luminaire is UL listed for the ambient conditions where fixtures installed. Extra compensation will not be permitted for failure to coordinate luminaires with their ambient conditions.

1. Luminaires located in unconditioned damp spaces and under covered canopies protected from direct weather exposure shall be UL listed as “Suitable for Damp Locations” unless noted otherwise.
2. Luminaires located exterior to the building and/or in unconditioned wet spaces and in direct contact with the weather or in washdown areas shall be UL listed as “Suitable for Wet Locations” unless noted otherwise.

D. Luminaires installed with direct contact with insulation shall have an “IC” rating for direct contact with insulation. Verify if luminaires will be in contact with insulation prior to installation. Notify COR of any conflicts.

E. Gasketing material shall be vinyl or other non-aging type material as approved by COR.

F. Provide proper trim for each luminaire as required for various types of ceiling being installed throughout the project; plaster rings, luminaire ends or caps, suspension units, mounting brackets and/or other accessory parts necessary for a complete luminaire.

G. Recessed Fixtures: Comply with NEMA LE 4 for ceiling compatibility for recessed fixtures.

H. Metal Parts: Free of burrs and sharp corners and edges.

I. Sheet Metal Components: Steel unless otherwise indicated. Form and support to prevent warping and sagging.

J. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit access without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during re-lamping and when secured in operating position.

K. Diffusers:

1. Acrylic Lighting Diffusers: 100 percent virgin acrylic plastic. High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.

    a. Lens Thickness: At least 0.125 inch minimum unless otherwise indicated.
    b. UV stabilized.

2.3 LED LUMINAIRES

A. LED luminaires shall provide a continuous and controllable light source. LED luminaire lumen output will be in accordance with the specifications and shall not depreciate more than 20% after 10,000 hours of use. Rated lumen output for LED luminaires to operate in ambient temperature of minus 4 deg F to 122 deg F). Luminaires to have minimum life of 50,000 hours.

B. All LEDs used in the LED luminaires will be of high brightness and proven quality. All LEDs shall be driven digitally with pulse width modulation control to prolong life and maintain consistency of lumen output.

C. All connections to luminaires will be reverse polarity protected and provide high voltage protection in the event connections are reversed or shorted during the installation process.

D. Fuse Protections: All power supply outputs will be either fuse protected or PTC-protected as per Class 2 UL listing. All luminaires will have built-in fuse protection. All power supplies will provide for knockouts for conduit connections or clamp-style connection for the low-voltage wiring.

2.4 LED DRIVERS (POWER SUPPLIES)

A. All LED drivers to be compatible with LEDs. All LED luminaires and drivers (power supplies) shall be furnished by single manufacture to insure compatibility.

B. Electric Characteristics (at 77°F ambient temperature)

1. Input Voltage Range: 108V to 277V.
2. Efficiency Minimum: 80%.
3. Output Current Regulation Range (+/-) 5%A.
4. Total Harmonic Distortion (THD): 20% maximum.
5. Power Factor: 0.9 minimum.
6. Crest Factor (LED Current): 1.5 maximum.

7. FCC Class B for Conducted EMI.
8. FCC Class A for Radiated EMI.
9. Drivers life: 50,000 hours minimum.

2.5 EXIT SIGNS

A. General Requirements for Exit Signs: Comply with UL 924; for sign colors, visibility, luminance, and lettering size, comply with authorities having jurisdiction.

B. Internally Lighted Signs:

1. AC Operation: LEDs, 50,000 hours minimum rated life.

2.6 LIGHTING FIXTURE SUPPORT COMPONENTS

A. Comply with Section 260529 "Hangers and Supports for Electrical Systems" for channel- and angle-iron supports, and nonmetallic channel and angle supports.

B. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fittings and ceiling canopy. Finish same as fixture.

C. Twin-Stem Hangers: Two, 1/2-inch steel tubes with single canopy designed to mount a single fixture. Finish same as fixture.

D. Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated steel, 12 gage.

E. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.

F. Hook Hangers: Integrated assembly matched to fixture and line voltage and equipped with threaded attachment, cord, and locking-type plug.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Lighting fixtures:

1. Set level, plumb, and square with ceilings and walls unless otherwise indicated.
2. The contractor shall install fixture supports as required to support all lighting fixtures adequately, providing extra steel work for the support of the fixtures if required. Any components necessary for mounting fixtures shall be provided by the contractor.

B. Temporary Lighting: If it is necessary, and approved by Owner, to use permanent luminaires for temporary lighting, install and energize the minimum number of luminaires necessary. When construction is sufficiently complete, remove the temporary luminaires, disassemble, clean thoroughly, install new lamps, and reinstall.

C. Lay-in Ceiling Lighting Fixtures Supports: Use grid as a support element.

1. Install ceiling support system rods or wires, independent of the ceiling suspension devices, for each fixture. Locate not more than 6 inches from lighting fixture corners.
2. Support Clips: Fasten to lighting fixtures and to ceiling grid members at or near each fixture corner with clips that are UL listed for the application.
3. Fixtures of Sizes Less Than Ceiling Grid: Install as indicated on reflected ceiling plans or center in acoustical panel, and support fixtures independently with at least two 3/4-inch metal channels spanning and secured to ceiling tees.

D. Suspended Lighting Fixture Support:

1. Pendants and Rods: Where longer than 48 inches, brace to limit swinging.
2. Stem-Mounted, Single-Unit Fixtures: Suspend with twin-stem hangers.
3. Continuous Rows: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of fixture chassis, including one at each end.
4. Do not use grid as support for pendant luminaires. Connect support wires or rods to building structure.

E. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

F. Bond fixtures and metal accessories to branch circuit equipment grounding conductor.

G. Exit lights shall be mounted above their respective doors and to clear the door frame, where mounting heights would exceed 10 feet Contractor shall coordinate a new location with Contracting Officer's Representative such that sign is mounted at 10' A.F.F. or less.

H. All fixtures shall be checked and cleaned.

3.2 IDENTIFICATION

A. Install labels with panel and circuit numbers on concealed junction and outlet boxes. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.3 FIELD QUALITY CONTROL

A. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

END OF SECTION 26 51 00

SECTION 26 51 15
SIGNAL VOLTAGE LIGHTING CONTROL SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes manually operated lighting controls with relays, relay panels, room and zone controllers, control modules and digital switches, dimmers and preset stations.

B. Section includes manually operated, PC-based, digital lighting controls with external signal source relays and control modules. System components may include but not limited to the following:

1. Digital Lighting Management (DLM) local network: Free topology, plug-in wiring system (Cat 5e) for power and data to room devices.
2. Digital Room Controllers: Self-configuring, digitally addressable one, two or three relay plenum-rated controllers for on/off control. Selected models include 0-10 volt or line voltage forward phase control dimming outputs and integral current monitoring capabilities.
3. Digital Occupancy Sensors: Self-configuring, digitally addressable, calibrated occupancy sensors with LCD display and two-way active infrared (IR) communications.
4. Digital Switches: Self-configuring, digitally addressable pushbutton on/off, dimming, and scene switches with two-way active infrared (IR) communications.
5. Digital Daylighting Sensors – Single-zone closed loop, multi-zone open loop and single-zone dual-loop daylighting sensors with two-way active infrared (IR) communications for daylight harvesting using switching, bi-level, tri-level or dimming control.
6. Configuration Tools: Handheld remote for room configuration and relay panel programming provides two-way infrared (IR) communications to digital devices and allows complete configuration and reconfiguration of the device / room from up to 30 feet away.
7. Programming and Configuration Software: Optional PC-native application capable of accessing DLM control parameters within a room, for the local network, via a USB adapter, or globally, for many segment networks simultaneously, via BACnet/IP communication.

C. Related Sections:

1. Section 26 05 19 “Low-Voltage Power Conductors and Cables.”
2. Section 26 05 26 “Grounding and Bonding for Electrical Systems.”
3. Section 26 05 33 “Raceway and Boxes for Electrical Systems.”
4. Section 26 05 53 “Identification for Electrical Systems.”
5. Section 26 09 23 "Lighting Control Devices."

6. Section 26 27 26 “Wiring Devices.”

1.3 SYSTEM DESCRIPTION

A. Performance Statement:

1. This specification section and the accompanying lighting design documents describe the minimum material quality, required features, and operational requirements of the signal voltage lighting control system.
2. The documents do not convey every wire that must be installed and every equipment connection that must be made.
3. This specification and Contract Documents identity the intent of the system performance, which requires the Contractor and system manufacturer/vendor to be solely responsible for determining all equipment and associated accessories, wiring, and programming to be provided as necessary for a complete and operational system.
4. Provide an integrated signal voltage lighting control system consisting of, power supplies, controllers, sensors, relays, switches, devices, wiring, etc. necessary to perform the Sequence of Operation as defined on the plans and specifications. Contractor is responsible for confirming that all components and luminaires interoperate as a single system.

B. Sequence of Operation:

1. Refer to the lighting plans and low voltage panel and switch station schedule for additional information
2. Each space will be provided with its own controls capable of manual on/off operation as well as raise/lower dimming operations.
3. Low voltage stations shall be capable of controlling 0-10-volt dimmable drivers.
4. Programing of the individual pre-sets shall be coordinated with the Owner.
5. Room Entry stations shall be programmed for the general scene - all lights on at full brightness).
6. Master Controls station in the Labs will be installed at the teachers podiums and shall be capable of recalling each zone and dimming functions of each zone.
7. Where indicated on the plans, the Touch Screen LCD panels shall be password protected.

C. Drawings:

1. Schematic wiring diagrams on the drawings do not intent to show all required parts and wiring, EC shall account for all additional equipment to make a complete and functioning system.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for control modules, power distribution components, manual switches and plates, and conductors and cables.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Outline Drawings: Indicate dimensions, weights, arrangement of components, and clearance and access requirements.
2. Block Diagram: Show interconnections between components specified in this Section and devices furnished with power distribution system components. Indicate data communication paths and identify networks, data buses, data gateways, concentrators, and other devices to be used. Describe characteristics of network and other data communication lines.
3. Wiring Diagrams: For power, signal, and control wiring. Coordinate nomenclature and presentation with a block diagram.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Submit evidence that lighting controls are compatible with connected monitoring and control devices and systems specified in other Sections.

1. Show interconnecting signal and control wiring and interfacing devices that prove compatibility of inputs and outputs.
2. For networked controls, list network protocols and provide statements from manufacturers that input and output devices meet interoperability requirements of the network protocol.

B. Field quality-control reports.

C. Software licenses and upgrades required by and installed for operation and programming of digital and analog devices.

D. Warranty: Sample of special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For lighting controls to include in emergency, operation, and maintenance manuals.

B. Software and Firmware Operational Documentation:

1. Software operating and upgrade manuals.
2. Program Software Backup: On a magnetic media or compact disc, complete with data files.
3. Device address list.
4. Printout of software application and graphic screens.

1.7 QUALITY ASSURANCE

A. Manufacturers shall be regularly engaged in the manufacture of lighting control equipment and ancillary equipment, of types and capacities required, whose products have been in satisfactory use in similar service for not less than five (5) years.

B. Source Limitations: Obtain lighting control module and power distribution components through one source from a single manufacturer.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Panels and accessory devices are to be UL listed under UL 916 Energy Management Equipment. Panels and accessories used for control of life safety and critical branch circuits shall be listed under UL 924 Emergency Lighting and Power Equipment.

E. Comply with 47 CFR, Subparts A and B, for Class A digital devices.

F. Comply with NFPA 70.

1.8 COORDINATION

A. Coordinate lighting control components to form an integrated interconnection of compatible components.

1. Match components and interconnections for optimum performance of lighting control functions.

B. Coordinate lighting control components specified in this Section with components specified in Section 262416 "Panelboards."

1.9 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of lighting controls that fail in materials or workmanship or from transient voltage surges within specified warranty period.

1. Failures include, but are not limited to, the following:

   a. Failure of software input/output to execute switching or dimming commands.
   b. Failure of modular relays to operate under manual or software commands.
   c. Damage of electronic components due to transient voltage surges.

2. Warranty Period: Two (2) years from date of Substantial Completion.
3. Extended Warranty Period Failure Due to Transient Voltage Surges: Eight (8) years.
4. Extended Warranty Period for Electrically Held Relays: Ten (10) years from date of Substantial Completion.

1.10 EXTRA STOCK

A. Provide extra stock under provisions of Section 260000.

B. Power Supplies, and Relays: Five percent of quantity installed. Minimum of two (2) of each configuration and type.

C. Control Stations: One (1) of each configuration and type, except for LCD touch screens requiring factory setup prior to installation

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Acuity Brands Lighting, Inc.
2. ETC Connect, Inc
3. Douglas, Inc
4. Watt Stopper/Legrand
5. Leviton, Inc

2.2 SYSTEM REQUIREMENTS

A. Relay Panel:

1. Shall be Factory Assembled and UL Listed and CSA Approved, and house all components as required.
2. Cover shall accommodate surface mounting or flush mounted as indicated on the drawings
3. Panel shall have dead front barrier separation for line voltage compartment.
4. Panels shall include appropriate barrier strips for mounting relays and for separating low voltage wiring from line voltage wiring.
5. Panels shall be available for up to 48 relays in combination of the single and or double pole to be installed in one enclosure with a single control electronics.
6. Allow empty enclosures to be shipped prior to interiors for electrical rough in.
7. This contractor shall connect low voltage wires and signal voltage control wires to applicable terminal blocks in cabinets.
8. It shall be constructed of 16-gauge steel. All panel components shall be properly treated, primed and finished in fine-textured, scratch resistant paint.
9. Equally sized top, bottom, and side removable knockout panels shall facilitate conduit entry, with an internal pass-through plenum for side-by-side or top-to-bottom mounting. The front panel shall be easily removable as well for full front access to input, output and data connections.
10. The panel control electronics shall operate on single phase, two wire + ground, 120, 230V, or 277V AC 60Hz, at an amperage sufficient to power the panel (8 amps max). Standard fault current protection shall be 5,000 AIC.
11. The panel shall be capable of switching all relays on or off at once, or in a user-selectable delay period of 0.1 to 60 seconds, in 0.1 second increments, per relay.
12. All line terminals shall accept 10-14 AWG wire. The control wiring shall land on a removable header for easy contractor installation (On-board DMX, stations and Emergency Input terminations).

13. A voltage barrier shall be available to separate relays carrying normal and emergency power in the same panel. The barrier shall be capable of installation, without tools, between any two relays, and shall allow up to eight barriers per panel (4 per side).
14. The panel shall operate safely in an environment having an ambient temperature between 32ºF (0ºC) and 104ºF (40□C), and humidity between 5-95% (non-condensing).

B. Expandability: System shall be capable of increasing the number of control functions in the future by 25 percent of current capacity; to include equipment ratings, housing capacities, spare relays, terminals, number of conductors in control cables, and control software.

C. Performance Requirements: Manual switch operation sends a signal to network-system control module that processes the signal according to its programming and routes an open or close command to one or more relays in the power-supply circuits to groups of lighting fixtures or other loads.

D. A Low Voltage 0-10V Dimming Option shall link each of the 24 0-10V outputs with a relay circuit in the panel. Each output shall support up to 400mA of current sink for support of at least 50 LED drivers of fluorescent ballasts

E. A Contact Input Option shall allow 24 dry contact inputs to be linked for direct or group relay control, to activate a preset, or to activate a sequence. Controller software shall allow for normally open maintained, normally closed maintained, or momentary toggle.

F. The control of lighting and associated systems via real time and Astronomical clock controls.

1. The relay panel shall allow the activation of presets, sequence, and zone programming of up to 50-times clock events via a built in real and astronomical timeclock.
2. System time events shall be programmable via the control panel.

G. The Lighting Control System shall consist of low voltage relay panels with up to 48 programmable switch inputs and up to 48 control relays outputs per panel.

H. Low voltage control panels shall be microprocessor based with touch screen display or handheld pluggable display interface.

I. Programmable options shall include time-of-day control, 32 holiday dates, warning signal for impending swipe-off time, preset controls, astronomical clock, daylight sensor, photocell control, digital switches inputs and network override interface from Building Automation System via Modbus, N2 or BACnet interface depend on the BAS selected.

J. The lighting controls system may also be fully programmed from the remote PC with programmable software.

2.3 CONTROL MODULE

A. Control Module Description:

1. Comply with UL 916 (CSA C22.2, No. 205); microprocessor-based, solid-state, 365-day timing and control unit.
2. Output circuits shall be switched on or off by internally programmed time signals or by program-controlled analog or digital signals from external sources.
3. Output circuits shall be pilot-duty relays compatible with power switching devices. An integral keypad shall provide local programming and control capability.
4. A key-locked cover and a programmed security access code shall protect keypad use.
5. An integral alphanumeric LCD or LED shall display menu-assisted programming and control.
6. Multichannel output with number of channels shown on drawings.
7. Multiple inputs for occupancy sensors and multichannel outputs.

B. Built in Control shall include:

1. Ability to record up to 16 presets in each space from the control panel, connected control stations, or timed events
2. Presets shall be programmable by recording current levels, by entering levels on the control panel directly, manually selecting relay state on each relay or a combination of these methods.
3. Up to 8 spaces in a single rack for total of up to 16 spaces shall be supported per system or system subnet
4. Indication of an active preset shall be visible on the control panel display.
5. The panel shall have a UL924-listed contact input for use in Emergency Lighting systems. The panel shall respond to the contact input by setting included relays to “on”, while setting non-emergency relays “off”. Each relay can be selected for activation upon contact input.

C. Relays:

1. Relays shall be split coil, mechanically latching design, 24 volts AC or DC, electrically operated with load contacts rated at 20 amps, 120/277 volts, UL and CSA listed.
2. Single or Double pole 20 A relay shall provide:

    a. ON/OFF control of lighting.
    b. 0-10 volt dimming control
    c. Full life and voltage rating up to 277 VAC
    d. 1,500 Amp in-rush capability.
    e. 5,000 Amp “no damage” short circuit rating
    f. 300,000 mechanical cycles (600,000 operations)
    g. 30,000 cycles inductive, Tungsten or motor
    h. 20,000 cycles electronic (LED)
    i.

2.4 POWER DISTRIBUTION COMPONENTS

A. Modular Relay Panel: Comply with UL 508 (CAN/CSA C22.2, No. 14), UL 916 (CSA C22.2, No. 205), and UL 924; factory assembled with modular single-pole relays, power supplies, and accessory components required for specified performance.

1. Cabinet: Steel with hinged, locking door.

    a. Barriers separate low-voltage and line-voltage components.
    b. Directory: Mounted on back of door. Identifies each relay as to load groups controlled and each programmed pilot device if any.
    c. Control Power Supply: Transformer and full-wave rectifier with filtered dc output.
    d. Barriers to separate normal lighting circuit from emergency lighting circuits where indicated on the drawings

2. Single-Pole Relays: Mechanically held unless otherwise indicated; split-coil, momentary-pulsed type.

    a. Low-Voltage Leads: Plug connector to the connector strip in cabinet and pilot light power where indicated.
    b. Rated Capacity (Mounted in Relay Panel): 20 A, 125-V ac for tungsten filaments; 20 A, 277-V ac for ballasts.
    c. Endurance: 50,000 cycles at rated capacity.
    d. Mounting: Provision for easy removal and installation in relay cabinet.

B. Electrically Operated, Molded-Case Circuit-Breaker Panelboard: Comply with NEMA PB 1

C. Line-Voltage Surge Suppression: Factory installed as an integral part of 120- and 277-V ac, solid-state control panels or field-mounting surge suppressors that comply with Section 264313 "Transient-Voltage Suppression for Low-Voltage Electrical Power Circuits" for Category A locations.

2.5 MANUAL ANALOG SWITCHES AND PLATES

A. Push-Button Switches: Modular, momentary-contact, low-voltage type.

1. Match color specified in Section 262726 "Wiring Devices."
2. Integral green LED pilot light to indicate when circuit is on.
3. Internal red LED locator light to illuminate when circuit is off.

B. Manual, Maintained Contact, Full- or Low-Voltage Switch: Comply with Section 262726 "Wiring Devices."

C. Wall-Box Dimmers: Comply with Section 262726 "Wiring Devices."

D. Wall Plates: Single and multi-gang plates as specified in Section 262726 "Wiring Devices."

E. Legend: Engraved or permanently silk-screened on wall plate where indicated. Use designations indicated on Drawings.

F. Lockout Stations - shall be a remote station on the digital lighting control system network that uses a key switch to lock out button and fader control of presets and zones stored in a power control product.

1. Each lockout station shall functionally lockout the entire space that it is assigned to.
2. The station shall operate on class 2 voltage provided by the control system via system network.
3. Station wiring must be topology free. It may be point-to-point, bus, loop, home run or any combination of these.

2.6 FIELD-MOUNTED DIGITAL CONTROLS AND PLATES

A. Connection Type: RS-485 protocol, category 6 UTP cable, using RJ45 connectors. Power shall be from the control unit.

B. Control station electronics shall mount directly behind the faceplate. The entire assembly shall mount into a single gang back box. Back boxes for the flush mounted stations shall be industry standard back boxes. The manufacturer shall supply back boxes for surface mounted stations.

C. Station faceplates shall be constructed of ABS plastic and shall use no visible means of attachment. All Button stations shall be available with white, signal white, ivory, gray or black faceplates and buttons.

D. Button station wiring shall utilize low-voltage Class 2 unshielded twisted pair, type Belden 8471 or equivalent, and one #14 ESD drain wire (when not installed in grounded metal conduit).

1. Station wiring must be topology free. It may be point-to-point, bus, loop, home run or any combination of these.
2. Wiring termination connectors shall be provided with all stations.
3. The station shall consist of a dual function (program/play) push-button with an integral LED for each corresponding preset.

E. Pushbutton Switches: Modular, solid-state, programmable, digital, momentary contact, designed to connect to a microprocessor-based control unit as a manual control source.

1. Mounting: Standard single-gang recessed switchbox, using device plates specified in Section 262726 "Wiring Devices."
2. Multi-Gang Mounting: One to six pushbuttons per gang.
3. Switches shall be provided with lighted LED indicators to identify when relays/switches are in “ON” or “OFF” position
4. Each station shall support preset recall in a single room

F. Button and Fader Stations shall operate using one, two, four, six or eight buttons. A four button with fader station shall also be available. The station shall consist of a dual function (control/ record) push-button with an integral bi-color backlight for each corresponding button and fader. Station wiring must be topology free. It may be point-to-point, bus, loop, home run or any combination of these.

2.7 DIGITAL ROOM CONTROLLERS

A. Room Controllers shall be constructed by 16AWG steel and finished in a black fine-texture powder paint.

B. The Room Controller shall be 9” x 12” x 3.5” for 4 zone models or 14” x 12” x 3.5” for 8 zone models

C. Room Controllers shall support wall and ceiling mounting, including installation in Plenum air return spaces.

D. A removable with dead front cover shall be mechanically fastened using by four screws.

E. Integral Time Clock shall be available

F. Room Controllers shall support onboard configuration without the use of software.

G. The Room controller shall support an input for use in UL 924 Emergency Systems.

1. A dry contact input shall provide triggering of an emergency condition.
2. A three-position switch shall set the input as Normally Open (NO) Normally Closed (NC), or Off.
3. Load shedding shall be supported via a two-position switch per zone, that includes or excludes each zone from the UL924 input.

H. The Room Controller shall support a Demand Response input to automatically reduce overall power consumption.

1. A dry contact input shall be supported to trigger the demand response condition.
2. A single rotary dial shall be available for each to set the maximum trim level when the input is active.

I. The Room Controller shall support a dry contact input to trigger an AV preset input.

1. A two-position switch shall provide selection of momentary or maintained.

J. Room controllers shall provide station bus power for six control station.

1. A two-position switch shall allow the internal station bus power supply to be disabled when multiple controllers or external power supplies are used.

K. All configuration buttons shall be fully accessible when the Controller is mounted and the front panel is removed.

L. Power Input shall support 120-277 Volts AC 47-63Hz for control electronics and each independent zone.

M. A voltage barrier shall be available to separate normal and emergency circuits or lighting and plug loads when combined in a single controller. The barrier shall be constructed of 94-V-0 plastic.

N. All Room Controllers shall provide a 20 Ampere, fully rated, normally open relay for each output.

O. 0-10V dimming output shall support 0-10V sink control rated for 100mA per output.

P. Room controllers shall support 0-10 volt dimming control via terminals 16-26AWG terminals for 0-10V+ and 0-10V common wiring connections.

2.8 CONDUCTORS AND CABLES

A. Power Wiring to Supply Side of Class 2 Power Source: Not smaller than No. 12 AWG, complying with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

B. Classes 2 and 3 Control Cables: Stranded copper, complying with UL 83, multi-conductor cable with copper conductors not smaller than No. 22 AWG, complying with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

C. Class 1 Control Cables: Stranded copper, complying with UL 83, multi-conductor cable with copper conductors not smaller than No. 16 AWG, complying with Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables."

2.9 DIGITAL TIME CLOCK

A. Digital Time Clock (DTC) shall control and program the entire lighting control system and supply all time functions and accept interface inputs.

B. DTC shall be capable of up to 32 schedules. Each schedule shall consist of one set of On and Off times per day for each day of the week and for each of two holiday lists. The schedules shall apply to any individual relay or group of relays.

C. The DTC shall be run from non-volatile memory so that all system programming and real time clock functions are maintained for a minimum of 15 years with loss of power.

PART 3 - EXECUTION

3.1 WIRING INSTALLATION

A. Comply with NECA 1.

B. Wiring Method: Install wiring in raceways. Comply with Division 26. Minimum conduit size shall be 3/4 inch (19 mm).

C. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points. Separate power-limited and non-power-limited conductors according to conductor manufacturer's written instructions.

D. Install field-mounting transient voltage suppressors for lighting control devices in Category A locations that do not have integral line-voltage surge protection.

E. Size conductors according to lighting control device manufacturer's written instructions unless otherwise indicated. Install in accordance with manufacturer's instructions.

F. The Electrical Contractor shall be accountable for installing the Class 2 low voltage control wire for the lighting control system in accordance with the factory recommendations and shop drawings.

G. All Class 2 low voltage control wire shall be installed in conduit and labeled on both ends to match the designations on the submittal drawings.

H. Tag all wires and provide typewritten directories on inside cover identifying relays and associated circuit and room or area designation.

I. Demonstrate proper operation of system. The manufacturer's representative shall be responsible for coordinating the system installation with the Electrical Contractor; they shall also be liable for any return visits by the factory engineer as a result of incomplete or incorrect wiring.

J. The manufacturer shall meet with the owner's representative prior to system commissioning to provide basic system programming, which will be installed at commissioning.

K. Upon completion of the formal checkout, the factory engineer shall demonstrate operation and maintenance of the system to the owner's representatives. Training shall not exceed eight hours on the job site.

L. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in terminal cabinets, equipment enclosures, and in junction, pull, and outlet boxes.

M. Identify components and power and control wiring according to Section 260553 "Identification for Electrical Systems."

3.2 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

C. Tests and Inspections:

1. Test for circuit continuity.
2. Verify that the control module features are operational.
3. Check operation of local override controls.

D. Lighting controls will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports.

3.3 SOFTWARE INSTALLATION

A. Install and program software with initial settings of adjustable values. Make backup copies of software and user-supplied values. Provide current licenses for software.

3.4 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain lighting controls.

B. Include a minimum of four (4) hours of training and demonstration with the Owner authorized personnel for each School.

3.6 WARRANTY

A. Electrical Contractor shall provide two (2) years warranty from the date of building substantial completion or manufacturer's standard warranty, whichever is longer on all equipment and installation provided.

B. Warranty shall cover a 100% of the cost of repair or replace any parts required over the first two (2) years which are directly attributable to the manufacturer/EC.

END OF SECTION 26 51 15

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SECTION 26 56 00
EXTERIOR LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Exterior luminaires.

1.3 ACTION SUBMITTALS

A. Product Data: For each luminaire, pole, and support component, arranged in order of lighting unit designation. Include data on features, accessories, finishes, and the following:

1. Physical description of luminaire, including materials, dimensions, effective projected area, and verification of indicated parameters.
2. Details of attaching luminaires and accessories.
3. Details of installation and construction.
4. Luminaire materials.
5. Photometric data based on laboratory tests of each luminaire type, complete with indicated lumens and accessories.

    a. Testing Agency Certified Data: For indicated luminaires, photometric data shall be certified by a qualified independent testing agency. Photometric data for remaining luminaires shall be certified by manufacturer.

6. Photoelectric relays.
7. Means of attaching luminaires to supports, and indication that attachment is suitable for components involved.

1.4 INFORMATIONAL SUBMITTALS

A. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For luminaires to include in emergency, operation, and maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Glass and Plastic Lenses, Covers, and Other Optical Parts: One for every 100 of each type and rating installed. Furnish at least one (1) of each type.
2. Guards: One for every 20 of each type and rating installed. Furnish at least one (1) of each type.

1.7 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Comply with IEEE C2, "National Electrical Safety Code."

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace products that fail in materials or workmanship; that corrode; or that fade, stain, perforate, erode, or chalk due to effects of weather or solar radiation within specified warranty period. Manufacturer may exclude lightning damage, hail damage, vandalism, abuse, or unauthorized repairs or alterations from special warranty coverage.

B. Special Warranty for LED luminaires: Manufacturer's standard form, made out to Owner and signed by fixture manufacturer agreeing to replace fixture/module that fail in materials or workmanship. Warranty shall include replacement for defective or non-starting power supply units and LED source assemblies, which include, but are not limited to, LED packages, LED arrays, LED modules, LED dies, encapsulates and phosphors. Warranty shall include replacement for any LED source assembly, package, array or module, which does not include the power supply, against 10% or more of the individual LEDs in that assembly, package, array, or module failing to illuminate.

1. Warranty Period for LED Luminaires: Five (5) years from date of Substantial Completion
2. Warranty Period for Metal Corrosion: Five (5) years from date of Substantial Completion.
3. Warranty Period for Color Retention: Five (5) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, product(s) indicated on Drawings.

2.2 LED LUMINAIRES

A. LED luminaires shall provide a continuous and controllable light source. LED luminaire lumen output will be in accordance with the specifications and shall not depreciate more than 20% after 10,000 hours of use. Rated lumen output for LED luminaires to operate in ambient temperature of minus 4°F to 122°F). Luminaires to have minimum life of 50,000 hours.

B. All LEDs used in the LED luminaires will be of high brightness and proven quality. All LEDs shall be driven digitally with pulse width modulation control to prolong life and maintain consistency of lumen output.

C. All connections to luminaires will be reverse polarity protected and provide high voltage protection in the event connections are reversed or shorted during the installation process.

D. Fuse Protections: All power supply outputs will be either fuse protected or PTC-protected as per Class 2 UL listing. All luminaires will have built-in fuse protection. All power supplies will provide for knockouts for conduit connections or clamp-style connection for the low-voltage wiring.

2.3 GENERAL REQUIREMENTS FOR LUMINAIRES

A. Luminaires shall comply with UL 1598 and be listed and labeled for installation in wet locations by an NRTL acceptable to authorities having jurisdiction.

B. Lateral Light Distribution Patterns: Comply with IESNA RP-8 for parameters of lateral light distribution patterns indicated for luminaires.

C. Metal Parts: Free of burrs and sharp corners and edges.

D. Sheet Metal Components: Corrosion-resistant aluminum unless otherwise indicated. Form and support to prevent warping and sagging.

E. Housings: Rigidly formed, weather- and light-tight enclosures that will not warp, sag, or deform in use. Provide filter/breather for enclosed luminaires.

F. Doors, Frames, and Other Internal Access: Smooth operating, and free of light leakage under operating conditions. Doors shall be removable for cleaning or replacing lenses.

G. Exposed Hardware Material: Stainless steel.

H. Plastic Parts: High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.

I. Light Shields: Metal baffles, factory installed and field adjustable, arranged to block light distribution to indicated portion of normally illuminated area or field.

J. Reflecting surfaces shall have minimum reflectance as follows unless otherwise indicated:

1. White Surfaces: 85 percent.
2. Specular Surfaces: 83 percent.
3. Diffusing Specular Surfaces: 75 percent.

K. Lenses and Refractors Gaskets: Use heat- and aging-resistant resilient gaskets to seal and cushion lenses and refractors in luminaire doors.

L. Luminaire Finish: Manufacturer's standard paint applied to factory-assembled and -tested luminaire before shipping. Where indicated, match finish process and color of pole or support materials.

2.4 LUMINAIRE-MOUNTED PHOTOELECTRIC RELAYS

A. Comply with UL 773 or UL 773A.

B. Contact Relays: Factory mounted, single throw, designed to fail in the on position, and factory set to turn light unit on at 1.5 to 3 fc (16 to 32 lx) and off at 4.5 to 10 fc (48 to 108 lx) with 15-second minimum time delay. Relay shall have directional lens in front of photocell to prevent artificial light sources from causing false turnoff.

1. Relay with locking-type receptacle shall comply with ANSI C136.10.
2. Adjustable window slide for adjusting on-off set points.

PART 3 - EXECUTION

3.1 LUMINAIRE INSTALLATION

A. Fasten luminaire to indicated structural supports.

B. Adjust luminaires that require field adjustment or aiming. Include adjustment of photoelectric device to prevent false operation of relay by artificial light sources, favoring a north orientation.

3.2 CORROSION PREVENTION

A. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum by insulating fittings or treatment.

B. Steel Conduits: Comply with Section 260533 "Raceways and Boxes for Electrical Systems." In concrete foundations, wrap conduit with 0.010-inch- thick, pipe-wrapping plastic tape applied with a 50 percent overlap.

3.3 FIELD QUALITY CONTROL

A. Inspect each installed fixture for damage. Replace damaged fixtures and components.

B. Illumination Observations: Verify normal operation of lighting units after installing luminaires and energizing circuits with normal power source.

1. Verify operation of photoelectric controls.

C. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

END OF SECTION 26 56 00

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SECTION 27 05 26
GROUNDING AND BONDING FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Grounding conductors.
2. Grounding connectors.
3. Grounding busbars.
4. Grounding rods.
5. Grounding labeling.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

A. As-Built Data: Plans showing as-built locations of grounding and bonding infrastructure, including the following:

1. Ground rods.
2. Ground and roof rings.
3. BCT, TMGB, TGBs, and routing of their bonding conductors.

B. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.

1. Installation Supervision: Installation shall be under the direct supervision of ITS Level 2 Installer, who shall be present at all times when Work of this Section is performed at Project site.
2. Field Inspector: Currently registered by BICSI as a designer RCDD to perform the on-site inspection.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with UL 467 for grounding and bonding materials and equipment.

C. Comply with TIA-607-B.

2.2 CONDUCTORS

A. Comply with UL 486A-486B.

B. Insulated Conductors: Stranded copper wire, green or green with yellow stripe insulation, insulated for 600 V, and complying with UL 83.

1. Ground wire for custom-length equipment ground jumpers shall be No. 6 AWG, 19-strand, UL-listed, Type THHN wire.
2. Lead Content: Less than 300 parts per million.
3. Cable Tray Equipment Grounding Wire: No. 6 AWG.

C. Bare Copper Conductors:

1. Solid Conductors: ASTM B 3.
2. Stranded Conductors: ASTM B 8.
3. Tinned Conductors: ASTM B 33.
4. Bonding Cable: 28 kcmils (14.2 sq. mm), 14 strands of No. 17 AWG conductor, and 1/4 inch (6.3 mm) in diameter.
5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
6. Bonding Jumper: Tinned-copper tape, braided conductors terminated with two-hole copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.

2.3 CONNECTORS

A. Irreversible connectors listed for the purpose. Listed by an NRTL as complying with NFPA 70 for specific types, sizes, and combinations of conductors and other items connected. Comply with UL 486A-486B.

B. Compression Wire Connectors: Crimp-and-compress connectors that bond to the conductor when the connector is compressed around the conductor. Comply with UL 467.

1. Electroplated tinned copper, C and H shaped.

C. Busbar Connectors: Cast silicon bronze, solderless compression or exothermic-type, mechanical connector; with a long barrel and two holes spaced on 5/8- or 1-inch (15.8- or 25.4-mm) centers for a two-bolt connection to the busbar.

D. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

2.4 GROUNDING BUSBARS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Panduit Corp.

B. TMGB: Predrilled, wall-mounted, rectangular bars of hard-drawn solid copper, 1/4 by 4 inches (6.3 by 100 mm) in cross section, length as indicated on Drawings. The busbar shall be NRTL listed for use as TMGB and shall comply with TIA-607-B.

1. Predrilling shall be with holes for use with lugs specified in this Section.
2. Mounting Hardware: Stand-off brackets that provide a 4-inch (100-mm) clearance to access the rear of the busbar. Brackets and bolts shall be stainless steel.
3. Stand-off insulators for mounting shall be Lexan or PVC. Comply with UL 891 for use in 600-V switchboards, impulse tested at 5000 V.

C. TGB: Predrilled rectangular bars of hard-drawn solid copper, 1/4 by 2 inches (6.3 by 50 mm) in cross section, length as indicated on Drawings. The busbar shall be for wall mounting, shall be NRTL listed as complying with UL 467, and shall comply with TIA-607-B.

1. Predrilling shall be with holes for use with lugs specified in this Section.
2. Mounting Hardware: Stand-off brackets that provide at least a 2-inch (50-mm) clearance to access the rear of the busbar. Brackets and bolts shall be stainless steel.
3. Stand-off insulators for mounting shall be Lexan or PVC. Comply with UL 891 for use in 600-V switchboards, impulse tested at 5000 V.

D. Rack and Cabinet Grounding Busbars: Rectangular bars of hard-drawn solid copper, accepting conductors ranging from No. 14 to No. 2/0 AWG, NRTL listed as complying with UL 467, and complying with TIA-607-B. Predrilling shall be with holes for use with lugs specified in this Section.

1. Cabinet-Mounted Busbar: Terminal block, with stainless-steel or copper-plated hardware for attachment to the cabinet.
2. Rack-Mounted Horizontal Busbar: Designed for mounting in 19- or 23-inch (483- or 584-mm) equipment racks. Include a copper splice bar for transitioning to an adjoining rack, and stainless-steel or copper-plated hardware for attachment to the rack.
3. Rack-Mounted Vertical Busbar: 72 or 36 inches (1827 or 914 mm) long, with stainless-steel or copper-plated hardware for attachment to the rack.

2.5 GROUND RODS

A. Ground Rods: Stainless- steel; 3/4 inch by 10 feet (19 mm by 3 m) in diameter.

2.6 IDENTIFICATION

A. Comply with requirements for identification products in Section 270553 "Identification for Communications Systems."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the ac grounding electrode system and equipment grounding for compliance with requirements for maximum ground-resistance level and other conditions affecting performance of grounding and bonding of the electrical system.

B. Inspect the test results of the ac grounding system measured at the point of BCT connection.

C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

D. Proceed with connection of the BCT only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Bonding shall include the ac utility power service entrance, the communications cable entrance, and the grounding electrode system. The bonding of these elements shall form a loop so that each element is connected to at least two others.

B. Comply with NECA 1.

C. Comply with TIA-607-B.

3.3 APPLICATION

A. Conductors: Install solid conductor for No. 8 AWG and smaller and stranded conductors for No. 6 AWG and larger unless otherwise indicated.

1. The bonding conductors between the TGB and structural steel of steel-frame buildings shall not be smaller than No. 6 AWG.
2. The bonding conductors between the TMGB and structural steel of steel-frame buildings shall not be smaller than No. 6 AWG.

B. Underground Grounding Conductors: Install bare tinned-copper conductor, No. 2 AWG minimum.

C. Conductor Terminations and Connections:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
3. Connections to Ground Rods at Test Wells: Bolted connectors.
4. Connections to Structural Steel: Welded connectors.

D. Conductor Support:

1. Secure grounding and bonding conductors at intervals of not less than 36 inches (900 mm).

E. Grounding and Bonding Conductors:

1. Install in the straightest and shortest route between the origination and termination point, and no longer than required. The bend radius shall not be smaller than eight times the diameter of the conductor. No one bend may exceed 90 degrees.
2. Install without splices.
3. Support at not more than 36-inch (900-mm) intervals.
4. Install grounding and bonding conductors in 3/4-inch (21-mm) PVC conduit until conduit enters a telecommunications room. The grounding and bonding conductor pathway through a plenum shall be in EMT. Conductors shall not be installed in EMT unless otherwise indicated.

    a. If a grounding and bonding conductor is installed in ferrous metallic conduit, bond the conductor to the conduit using a grounding bushing that complies with requirements in Section 270528 "Pathways for Communications Systems," and bond both ends of the conduit to a TGB.

3.4 GROUNDING ELECTRODE SYSTEM

A. The BCT between the TMGB and the ac service equipment ground shall not be smaller than No. 1/0 AWG.

3.5 GROUNDING BUSBARS

A. Indicate locations of grounding busbars on Drawings. Install busbars horizontally, on insulated spacers 2 inches (50 mm) minimum from wall, 12 inches (300 mm) above finished floor unless otherwise indicated.

B. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, and down; connect to horizontal bus.

3.6 CONNECTIONS

A. Bond metallic equipment in a telecommunications equipment room to the grounding busbar in that room, using equipment grounding conductors not smaller than No. 6 AWG.

B. Stacking of conductors under a single bolt is not permitted when connecting to busbars.

C. Assemble the wire connector to the conductor, complying with manufacturer's written instructions and as follows:

1. Use crimping tool and the die specific to the connector.
2. Pretwist the conductor.
3. Apply an antioxidant compound to all bolted and compression connections.

D. Primary Protector: Bond to the TMGB with insulated bonding conductor.

E. Interconnections: Interconnect all TGBs with the TMGB with the telecommunications backbone conductor. If more than one TMGB is installed, interconnect TMGBs using the

grounding equalizer conductor. The telecommunications backbone conductor and grounding equalizer conductor size shall not be less than 2 kcmils/linear foot (1 sq. mm/linear meter) of conductor length, up to a maximum size of No. 3/0 AWG unless otherwise indicated.

F. Telecommunications Enclosures and Equipment Racks: Bond metallic components of enclosures to the telecommunications bonding and grounding system. Install top-mounted rack grounding busbar unless the enclosure and rack are manufactured with the busbar. Bond the equipment grounding busbar to the TGB No. 2 AWG bonding conductors.

G. Structural Steel: Where the structural steel of a steel frame building is readily accessible within the room or space, bond each TGB and TMGB to the vertical steel of the building frame.

H. Electrical Power Panelboards: Where an electrical panelboard for telecommunications equipment is located in the same room or space, bond each TGB to the ground bar of the panelboard.

I. Shielded Cable: Bond the shield of shielded cable to the TGB in communications rooms and spaces. Comply with TIA-568-C.1 and TIA-568-C.2 when grounding shielded balanced twisted-pair cables.

J. Rack- and Cabinet-Mounted Equipment: Bond powered equipment chassis to the cabinet or rack grounding bar. Power connection shall comply with NFPA 70; the equipment grounding conductor in the power cord of cord- and plug-connected equipment shall be considered as a supplement to bonding requirements in this Section.

K. Access Floors: Bond all metal parts of access floors to the TGB.

3.7 IDENTIFICATION

A. Labels shall be preprinted or computer-printed type.

1. Label TMGB(s) with "fs-TMGB," where "fs" is the telecommunications space identifier for the space containing the TMGB.
2. Label TGB(s) with "fs-TGB," where "fs" is the telecommunications space identifier for the space containing the TGB.
3. Label the BCT and each telecommunications backbone conductor at its attachment point: "WARNING! TELECOMMUNICATIONS BONDING CONDUCTOR. DO NOT REMOVE OR DISCONNECT!"

3.8 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.

2. Test the bonding connections of the system using an ac earth ground-resistance tester, taking two-point bonding measurements in each telecommunications equipment room containing a TMGB and a TGB and using the process recommended by BICSI TDMM. Conduct tests with the facility in operation.

    a. Measure the resistance between the busbar and the nearest available grounding electrode. The maximum acceptable value of this bonding resistance is 100 milliohms.

3. Test for ground loop currents using a digital clamp-on ammeter, with a full-scale of not more than 10 A, displaying current in increments of 0.01 A at an accuracy of plus/minus 2.0 percent.

    a. With the grounding infrastructure completed and the communications system electronics operating, measure the current in every conductor connected to the TMGB and in each TGB. Maximum acceptable ac current level is 1 A.

C. Excessive Ground Resistance: If resistance to ground at the BCT exceeds 5 ohms, notify Architect promptly and include recommendations to reduce ground resistance.

D. Grounding system will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

END OF SECTION 27 05 26

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SECTION 27 05 28
PATHWAYS FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Metal conduits and fittings.
2. Nonmetallic conduits and fittings.
3. Optical-fiber-cable pathways and fittings.
4. Metal wireways and auxiliary gutters.
5. Nonmetallic wireways and auxiliary gutters.
6. Metallic surface pathways.
7. Nonmetallic surface pathways.
8. Tele-power poles.
9. Hooks.
10. Boxes, enclosures, and cabinets.
11. Polymer-concrete handholes and boxes for exterior underground cabling.
12. Fiberglass handholes and boxes for exterior underground cabling.

1.3 DEFINITIONS

A. ARC: Aluminum rigid conduit.

B. GRC: Galvanized rigid conduit.

C. IMC: Intermediate metal conduit.

D. RTRC: Reinforced thermosetting resin conduit.

1.4 ACTION SUBMITTALS

A. Product data for the following:

1. Surface pathways
2. Wireways and fittings.
3. Tele-power poles.
4. Boxes, enclosures, and cabinets.
5. Underground handholes and boxes.

B. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.

C. Samples: For wireways nonmetallic wireways surface pathways and tele-power poles and for each color and texture specified, 12 inches (300 mm) long.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Pathway routing plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of items involved:

1. Structural members in paths of pathway groups with common supports.
2. HVAC and plumbing items and architectural features in paths of conduit groups with common supports.
3. Underground ducts, piping, and structures in location of underground enclosures and handholes.

B. Qualification Data: For professional engineer.

C. Source quality-control reports.

PART 2 - PRODUCTS

2.1 SURFACE METAL PATHWAYS

A. Description: Galvanized steel with snap-on covers, complying with UL 5.

B. Finish: Manufacturer's standard enamel finish in color selected by Architect.

C. Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.

D. Comply with TIA-569-D.

2.2 SURFACE NONMETALLIC PATHWAYS:

A. Description: Two- or three-piece construction, complying with UL 5A, and manufactured of rigid PVC.

B. Finish: Texture and color selected by Architect from manufacturer's standard colors.

C. Product shall comply with UL 94 V-0 requirements for self-extinguishing characteristics.

D. Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.

E. Comply with TIA-569-D.

2.3 HOOKS

A. Description: Prefabricated sheet metal cable supports for telecommunications cable.

B. Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.

C. Comply with TIA-569-D.

D. Galvanized steel.

E. J shape.

PART 3 - EXECUTION

3.1 PATHWAY APPLICATION

A. Indoors: Apply pathway products as specified below unless otherwise indicated:

1. Exposed, Not Subject to Physical Damage: EMT.
2. Exposed, Not Subject to Severe Physical Damage: Use RMC below 10'-0" and EMT above 10'-0", except that EMT may be used below 10'-0" in designated equipment rooms and closets, utility chases and similar locations.
3. Pathway locations include the following:

    a. Receiving D102.
    b. Garage B106.
    c. Shop B112
    d. Metals E111.
    e. Metals E117.
    f. Auto Shop F109.
    g. Auto Shop F107.
    h. Bldg Trades F106.

4. Pathways for Optical-Fiber or Communications Cable in Spaces Used for Environmental Air: Plenum-type, optical-fiber-cable pathway Plenum-type, communications-cable pathway.
5. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 stainless steel units in institutional and commercial kitchens and damp or wet locations.

B. Minimum Pathway Size: 3/4-inch (21-mm) trade size for copper and aluminum cables, and 1 inch (25 mm) for optical-fiber cables.

C. Pathway Fittings: Compatible with pathways and suitable for use and location.

1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
2. EMT: Use set-screw or compression, steel fittings. Comply with NEMA FB 2.10.

D. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.

E. Install surface pathways only where indicated on Drawings.

F. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F (49 deg C).

3.2 INSTALLATION

A. Comply with the following standards for installation requirements except where requirements on Drawings or in this Section are stricter:

1. NECA 1.
2. NECA/BICSI 568.
3. TIA-569-D.
4. NECA 101
5. NECA 102.
6. NECA 105.
7. NECA 111.

B. Comply with NFPA 70 limitations for types of pathways allowed in specific occupancies and number of floors.

C. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping materials and installation for penetrations through fire-rated walls, ceilings, and assemblies.

D. Comply with requirements in Section 270529 "Hangers and Supports for Communications Systems" for hangers and supports.

E. Comply with requirements in Section 270544 "Sleeves and Sleeve Seals for Communications Pathways and Cabling" for sleeves and sleeve seals for communications.

F. Keep pathways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal pathway runs above water and steam piping.

G. Complete pathway installation before starting conductor installation.

H. Arrange stub-ups so curved portions of bends are not visible above finished slab.

I. Install no more than the equivalent of two 90-degree bends in any pathway run. Support within 12 inches (300 mm) of changes in direction. Utilize long radius ells for all optical-fiber cables.

J. Conceal rigid conduit within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.

K. Support conduit within 12 inches (300 mm) of enclosures to which attached.

L. Stub-ups to Above Recessed Ceilings:

1. Use EMT, IMC, or RMC for pathways.
2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

M. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of pathway and fittings before making up joints. Follow compound manufacturer's written instructions.

N. Coat field-cut threads on PVC-coated pathway with a corrosion-preventing conductive compound prior to assembly.

O. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install insulated bushings on conduits terminated with locknuts.

P. Install pathways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus one additional quarter-turn.

Q. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure, to assure a continuous ground path.

R. Cut conduit perpendicular to the length. For conduits of 2-inch (50-mm) trade size and larger, use roll cutter or a guide to ensure cut is straight and perpendicular to the length.

S. Install pull wires in empty pathways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire. Secure pull wire, so it cannot fall into conduit. Cap pathways designated as spare alongside pathways in use.

T. Surface Pathways:

1. Install surface pathway for surface telecommunications outlet boxes only where indicated on Drawings.
2. Install surface pathway with a minimum 2-inch (50-mm) radius control at bend points.
3. Secure surface pathway with screws or other anchor-type devices at intervals not exceeding 48 inches (1200 mm) and with no less than two supports per straight pathway section. Support surface pathway according to manufacturer's written instructions. Tape and glue are not acceptable support methods.

U. Pathways for Optical-Fiber and Communications Cable: Install pathways, metal and nonmetallic, rigid and flexible, as follows:

1. 3/4-Inch (21-mm) Trade Size and Smaller: Install pathways in maximum lengths of 50 feet (15 m).
2. 1-Inch (25-mm) Trade Size and Larger: Install pathways in maximum lengths of 75 feet (23 m).
3. Install with a maximum of two 90-degree bends or equivalent for each length of pathway unless Drawings show stricter requirements. Separate lengths with pull or junction boxes or terminations at distribution frames or cabinets where necessary to comply with these requirements.

V. Install pathway-sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed pathways, install each fitting in a flush

steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install pathway-sealing fittings according to NFPA 70.

W. Install devices to seal pathway interiors at accessible locations. Locate seals, so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all pathways at the following points:

1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
2. Where an underground service pathway enters a building or structure.
3. Where otherwise required by NFPA 70.

X. Comply with manufacturer's written instructions for solvent welding PVC conduit and fittings.

Y. Hooks:

1. Size to allow a minimum of 25 percent future capacity without exceeding design capacity limits.
2. Shall be supported by dedicated support wires. Do not use ceiling grid support wire or support rods.
3. Hook spacing shall allow no more than 6 inches (150 mm) of slack. The lowest point of the cables shall be no less than 6 inches (150 mm) adjacent to ceilings, mechanical ductwork and fittings, luminaires, power conduits, power and telecommunications outlets, and other electrical and communications equipment.
4. Space hooks no more than 5 feet (1.5 m) o.c.
5. Provide a hook at each change in direction.

Z. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements.

AA. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surface to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box.

BB. Horizontally separate boxes mounted on opposite sides of walls, so they are not in the same vertical channel.

CC. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.

DD. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

EE. Set metal floor boxes level and flush with finished floor surface.

FF. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

3.3 FIRESTOPPING

A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.4 PROTECTION

A. Protect coatings, finishes, and cabinets from damage or deterioration.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 27 05 28

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SECTION 27 05 29
HANGERS AND SUPPORTS FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Steel slotted support systems for communication raceways.
2. Aluminum slotted support systems for communication raceways.
3. Nonmetallic slotted support systems for communication raceways.
4. Conduit and cable support devices.
5. Support for conductors in vertical conduit.
6. Structural steel for fabricated supports and restraints.
7. Mounting, anchoring, and attachment components, including powder-actuated fasteners, mechanical expansion anchors, concrete inserts, clamps, through bolts, toggle bolts, and hanger rods.
8. Fabricated metal equipment support assemblies.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for the following:

    a. Slotted support systems, hardware, and accessories.
    b. Clamps.
    c. Hangers.
    d. Sockets.
    e. Eye nuts.
    f. Fasteners.
    g. Anchors.
    h. Saddles.
    i. Brackets.

2. Include rated capacities and furnished specialties and accessories.

B. Shop Drawings: For fabrication and installation details for communications hangers and support systems.

1. Trapeze hangers. Include product data for components.
2. Steel slotted-channel systems.
3. Aluminum slotted-channel systems.

4. Nonmetallic slotted-channel systems.
5. Equipment supports.
6. Vibration Isolation Base Details: Detail fabrication, including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.

C. Delegated-Design Submittal: For hangers and supports for communications systems.

1. Include design calculations and details of trapeze hangers.
2. Include design calculations for seismic restraints.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Suspended ceiling components.
2. Ductwork, piping, fittings, and supports.
3. Structural members to which hangers and supports will be attached.
4. Size and location of initial access modules for acoustical tile.
5. Items penetrating finished ceiling, including the following:

    a. Luminaires.
    b. Air outlets and inlets.
    c. Speakers.
    d. Sprinklers.
    e. Access panels.
    f. Projectors.
    g. Wireless Access Points.
    h. Cameras.

B. Seismic Qualification Data: Certificates, for hangers and supports for communications equipment and systems, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

C. Welding certificates.

1.5 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M.

B. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M.
2. AWS D1.2/D1.2M.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design hanger and support system.

B. Seismic Performance: Hangers and supports shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means "the supported equipment and systems will remain in place without separation of any parts when subjected to the seismic forces specified and the system will be fully operational after the seismic event."
2. Component Importance Factor: 1.0.

C. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame Rating: Class 1.
2. Self-extinguishing according to ASTM D635.

2.2 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Preformed steel channels and angles with minimum 13/32-inch- (10-mm-) diameter holes at a maximum of 8 inches (200 mm) o.c. in at least one surface.

1. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
2. Material for Channel, Fittings, and Accessories: Galvanized steel.
3. Channel Width: Selected for applicable load criteria.
4. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
5. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
6. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
7. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
8. Channel Dimensions: Selected for applicable load criteria.

B. Aluminum Slotted Support Systems: Extruded aluminum channels and angles with minimum 13/32-inch- (10-mm-) diameter holes at a maximum of 8 inches (200 mm) o.c. in at least one surface.

1. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
2. Channel Material: 6063-T6 aluminum alloy.
3. Fittings and Accessories Material: 5052-H32 aluminum alloy.
4. Channel Width: Selected for applicable load criteria.
5. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
6. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
7. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
8. Channel Dimensions: Selected for applicable load criteria.

C. Nonmetallic Slotted Support Systems: Structural-grade, factory-formed, glass-fiber-resin channels and angles with minimum 13/32-inch- (10-mm-) diameter holes at a maximum of 8 inches (200 mm) o.c., in at least one surface.

1. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
2. Channel Width: Selected for applicable load criteria.
3. Fittings and Accessories: Products provided by channel and angle manufacturer and designed for use with those items.
4. Fitting and Accessory Materials: Same as those for channels and angles, except metal items may be stainless steel.
5. Rated Strength: Selected to suit applicable load criteria.
6. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

D. Conduit and Cable Support Devices: Steel clamps, hangers, and associated fittings, designed for types and sizes of raceway or cable to be supported.

E. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for nonarmored communications conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be made of malleable iron.

F. Structural Steel for Fabricated Supports and Restraints: ASTM A36/A36M steel plates, shapes, and bars; black and galvanized.

G. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

1. Powder-Actuated Fasteners: Threaded-steel stud for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
2. Mechanical-Expansion Anchors: Insert-wedge-type zinc-coated steel for use in hardened portland cement concrete, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.

3. Concrete Inserts: Steel or malleable-iron, slotted support system units are similar to MSS Type 18 units and comply with MFMA-4 or MSS SP-58.
4. Clamps for Attachment to Steel Structural Elements: MSS SP-58 units are suitable for attached structural element.
5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM F3125/F3125M,Grade A325 (Grade A325M).
6. Toggle Bolts: All-steel springhead type.
7. Hanger Rods: Threaded steel.

2.3 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

A. Description: Welded or bolted structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

B. Materials: Comply with requirements in Section 055000 "Metal Fabrications" for steel shapes and plates.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with the following standards for application and installation requirements of hangers and supports, except where requirements on Drawings or in this Section are stricter:

1. NECA 1.
2. NECA/BICSI 568.
3. TIA-569-D.
4. NECA 101.
5. NECA 102.
6. NECA 105.
7. NECA 111.

B. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping materials and installation for penetrations through fire-rated walls, ceilings, and assemblies.

C. Comply with requirements for pathways specified in Section 270528 "Pathways for Communications Systems."

D. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMTs, IMCs, and RMCs as required by NFPA 70. Minimum rod size shall be 1/4 inch (6 mm) in diameter.

E. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted or other support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.

1. Secure raceways and cables to these supports with single-bolt conduit clamps.

F. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch (38-mm) and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

3.2 SUPPORT INSTALLATION

A. Raceway Support Methods: In addition to methods described in NECA 1, EMT may be supported by openings through structure members, according to NFPA 70.

B. Strength of Support Assemblies: Where not indicated, select sizes of components, so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb (90 kg).

C. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten communications items and their supports to building structural elements by the following methods unless otherwise indicated by code:

1. To Wood: Fasten with lag screws or through bolts.
2. To New Concrete: Bolt to concrete inserts.
3. To Masonry: Use approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
4. To Existing Concrete: Use expansion anchor fasteners.
5. Instead of expansion anchors, powder-actuated-driven threaded studs, provided with lock washers and nuts, may be used in existing standard-weight concrete 4 inches (100 mm) thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches (100 mm) thick.
6. To Steel: Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts or Beam clamps (MSS SP-58, Type 19, 21, 23, 25, or 27), complying with MSS SP-69 Spring-tension clamps.
7. To Light Steel: Sheet metal screws.
8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate.

D. Drill holes for expansion anchors in concrete at locations and to depths that avoid the need for reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

A. Comply with installation requirements in Section 055000 "Metal Fabrications" for site-fabricated metal supports.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor communications materials and equipment.

C. Field Welding: Comply with AWS D1.1/D1.1M.

3.4 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils (0.05 mm).

B. Touchup: Comply with requirements in Division 09 specifications for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas, and apply galvanizing-repair paint to comply with ASTM A780.

END OF SECTION 27 05 29

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SECTION 27 05 53
IDENTIFICATION FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Color and legend requirements for labels and signs.
2. Labels.
3. Bands and tubes.
4. Tapes.
5. Signs.
6. Cable ties.
7. Fasteners for labels and signs.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for communications identification products.

B. Samples: For each type of label and sign to illustrate composition, size, colors, lettering style, mounting provisions, and graphic features of identification products.

C. Identification Schedule:

1. Outlets: Scaled drawings indicating location and proposed designation.
2. Backbone Cabling: Riser diagram showing each communications room, backbone cable, and proposed backbone cable designation.
3. Racks: Scaled drawings indicating location and proposed designation.
4. Patch Panels: Enlarged scaled drawings showing rack row, number, and proposed designations.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Comply with NFPA 70 and TIA 606-B.

B. Comply with ANSI Z535.4 for safety signs and labels.

C. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 COLOR AND LEGEND REQUIREMENTS

A. Equipment Identification Labels:

1. Black letters on a white field.

2.3 LABELS

A. Vinyl Wraparound Labels: Preprinted, flexible labels laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing label ends.

B. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeves, with diameters sized to suit diameters of raceway or cable they identify, that stay in place by gripping action.

C. Self-Adhesive Wraparound Labels: Preprinted, 3-mil- (0.08-mm-) thick, polyester flexible labels with acrylic pressure-sensitive adhesive.

1. Self-Lamination: Clear; UV-, weather- and chemical-resistant; self-laminating protective shields over the legend. Labels sized such that the clear shield overlaps the entire printed legend.
2. Marker for Labels: Permanent, waterproof black ink marker recommended by tag manufacturer.
3. Marker for Labels: Machine-printed, permanent, waterproof black ink recommended by printer manufacturer.

D. Self-Adhesive Labels: Polyester, thermal, transfer-printed, 3-mil- (0.08-mm-) thick, multicolor, weather- and UV-resistant, pressure-sensitive adhesive labels, configured for intended use and location.

1. Minimum Nominal Size:

a. 1-1/2 by 6 inches (37 by 150 mm) for raceway and conductors.
b. 3-1/2 by 5 inches (76 by 127 mm) for equipment.
c. As required by authorities having jurisdiction.

2.4 CABLE TIES

A. General-Purpose Cable Ties: Fungus inert, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.

1. Minimum Width: 3/16 inch (5 mm).

2. Tensile Strength at 73 deg F (23 deg C) according to ASTM D638: 12,000 psi (82.7 MPa).
3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).
4. Color: Black, except where used for color-coding.

B. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.

1. Minimum Width: 3/16 inch (5 mm).
2. Tensile Strength at 73 deg F (23 deg C) according to ASTM D638: 12,000 psi (82.7 MPa).
3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).
4. Color: Black.

C. Plenum-Rated Cable Ties: Self-extinguishing, UV stabilized, one piece, and self-locking.

1. Minimum Width: 3/16 inch (5 mm).
2. Tensile Strength at 73 deg F (23 deg C) according to ASTM D638: 7000 psi (48.2 MPa).
3. UL 94 Flame Rating: 94V-0.
4. Temperature Range: Minus 50 to plus 284 deg F (Minus 46 to plus 140 deg C).
5. Color: Black.

2.5 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Retain paint system applicable for surface material and location (exterior or interior).

B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 PREPARATION

A. Self-Adhesive Identification Products: Before applying communications identification products, clean substrates of substances that could impair bond, using materials and methods recommended by manufacturer of identification product.

3.2 INSTALLATION

A. Verify and coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and operation and maintenance manual. Use consistent designations throughout Project.

B. Install identifying devices before installing acoustical ceilings and similar concealment.

C. Verify identity of each item before installing identification products.

D. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and operation and maintenance manual.

E. Apply identification devices to surfaces that require finish after completing finish work.

F. Install signs with approved legend to facilitate proper identification, operation, and maintenance of communications systems and connected items.

G. Elevated Components: Increase sizes of labels, signs, and letters to those appropriate for viewing from the floor.

H. Vinyl Wraparound Labels:

1. Secure tight to surface of raceway or cable at a location with high visibility and accessibility.
2. Attach labels that are not self-adhesive type with clear vinyl tape, with adhesive appropriate to the location and substrate.
3. Provide label 6 inches (150 mm) from cable end.

I. Snap-Around Labels:

1. Secure tight to surface at a location with high visibility and accessibility.
2. Provide label 6 inches (150 mm) from cable end.

J. Self-Adhesive Wraparound Labels:

1. Secure tight to surface at a location with high visibility and accessibility.
2. Provide label 6 inches (150 mm) from cable end.

K. Self-Adhesive Labels:

1. On each item, install unique designation label that is consistent with wiring diagrams, schedules, and operation and maintenance manual.
2. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on 1-1/2-inch- (38-mm-) high label; where two lines of text are required, use labels 2 inches (50 mm) high.

L. Cable Ties: General purpose, except as listed below:

1. Outdoors: UV-stabilized nylon.
2. In Spaces Handling Environmental Air: Plenum rated.

3.3 IDENTIFICATION SCHEDULE

A. Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment. Install access doors or panels to provide view of identifying devices.

B. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, pull points, and locations with high visibility. Identify by system and circuit designation.

C. Accessible Fittings for Raceways and Cables within Buildings: Identify covers of each junction and pull box with self-adhesive labels containing wiring system legend.

1. System legends shall be as follows:

a. Telecommunications.

D. Faceplates: Label individual faceplates with self-adhesive labels. Place label at top of faceplate. Each faceplate shall be labeled with its individual, sequential designation of the following, in the order listed:

1. Room number designation.
2. Dash.
3. Cable number.

E. Equipment Room Labeling:

1. Racks, Frames, and Enclosures: Identify front and rear of each with self-adhesive labels.
2. Patch Panels: Label individual rows and outlets, starting at the left and working down, with self-adhesive labels.
3. Data Outlets: Label each outlet with a self-adhesive label indicating the following, in the order listed:

a. Room number designation.
b. Colon.
c. Cable number.

F. Backbone Cables: Label each cable with a vinyl-wraparound label indicating the location of the far or other end of the backbone cable. Patch panel or punch down block where cable is terminated should be labeled identically.

G. Horizontal Cables: Label each cable with a vinyl-wraparound label indicating the following, in the order listed:

1. Room number.
2. Dash.
3. Cable number.

END OF SECTION 27 05 53

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SECTION 27 11 00
COMMUNICATIONS EQUIPMENT ROOM FITTINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Backboards.
2. Boxes, enclosures, and cabinets.
3. Power strips.

B. Related Requirements:

1. Section 271313 "Communications Copper Backbone Cabling" for copper data cabling associated with system panels and devices.
2. Section 271323 "Communications Optical Fiber Backbone Cabling" for optical-fiber data cabling associated with system panels and devices.
3. Section 271513 "Communications Copper Horizontal Cabling" for copper data cabling associated with system panels and devices.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For communications equipment room fittings. Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Equipment Racks and Cabinets: Include workspace requirements and access for cable connections.
3. Grounding: Indicate location of grounding bus bar and its mounting detail showing standoff insulators and wall mounting brackets.

PART 2 - PRODUCTS

2.1 BACKBOARDS

A. Backboards: Plywood, fire-retardant treated, 3/4 by 48 by 96 inches (19 by 1220 by 2440 mm).

B. Backboard Paint: Light-colored fire-retardant paint.

2.2 BOXES, ENCLOSURES, AND CABINETS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. FSR Inc.
2. Hubbell Incorporated.
3. Thomas & Betts Corporation; A Member of the ABB Group.
4. Wiremold / Legrand.

B. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets shall be listed and labeled for intended location and use.

C. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, Type FD, aluminum, with gasketed cover.

E. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.

F. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

G. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, cast aluminum with gasketed cover.

H. Box extensions used to accommodate new building finishes shall be of same material as recessed box.

I. Device Box Dimensions: 4 inches by 2-1/8 inches by 2-1/8 inches deep (100 mm by 60 mm by 60 mm deep).

J. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 4 with continuous-hinge cover with flush latch unless otherwise indicated.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
2. Nonmetallic Enclosures: Plastic.
3. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.

2.3 POWER STRIPS

A. Comply with requirements in Section 271116 "Communications Racks, Frames, and Enclosures."

B. Power Strips: Comply with UL 1363.

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Rack mounting, with detachable flanges.
3. Height: 1 RU.
4. Housing: Metal.
5. Six, 15-A, 120-V ac, NEMA WD 6, Configuration 5-15R 20-A, 120-V ac, NEMA WD 6, Configuration 5-20R receptacles.
6. Rear-facing receptacles.
7. LED indicator lights for power and protection status.
8. LED indicator lights for reverse polarity and open outlet ground.

9. Circuit Breaker and Thermal Fusing: When protection is lost, circuit opens and cannot be reset.
10. Circuit Breaker and Thermal Fusing: Unit continues to supply power if protection is lost.
11. Close-coupled, direct plug-in line cord.
12. Rocker-type on-off switch, illuminated when in on position.
13. Surge Protection: UL 1449, Type 3.

    a. Maximum Surge Current, Line to Neutral: 27 kA.
    b. Protection modes shall be line to neutral, line to ground, and neutral to ground.
    c. UL 1449 Voltage Protection Rating for line to neutral and line to ground shall be 600 V and 500 V. for neutral to ground.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1.

B. Comply with BICSI's "Telecommunications Distribution Methods Manual" for layout of communications equipment spaces.

C. Comply with BICSI's "Information Technology Systems Installation Methods Manual" for installation of equipment in communications equipment spaces.

D. Bundle, lace, and train conductors and cables to terminal points without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.

E. Coordinate layout and installation of communications equipment in tracks and in room. Coordinate service entrance configuration with service provider.

F. Coordinate location of power raceways and receptacles with locations of communications equipment requiring electrical power to operate.

G. Backboards:

1. Install from 6 inches (150 mm) to 8 feet, 6 inches (2588 mm) above finished floor. If plywood is fire rated, ensure that fire-rating stamp is visible after installation.
2. Paint all sides of backboard with two coats of paint, leaving fire rating stamp visible.
3. Comply with requirements for backboard installation in BICSI's "Information Technology Systems Installation Methods Manual" and TIA-569-D.

3.2 FIRESTOPPING

A. Comply with requirements in Section 078413 "Penetration Firestopping."

B. Comply with TIA-569-D, Annex A, "Firestopping."

C. Comply with BICSI's "Information Technology Systems Installation Methods Manual", "Firestopping Practices" Ch.

END OF SECTION 27 11 00

SECTION 27 11 16
COMMUNICATIONS RACKS, FRAMES, AND ENCLOSURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. 19-inch equipment racks.
2. 19-inch freestanding and wall-mounted equipment cabinets.
3. Power strips.
4. Grounding.
5. Labeling.

1.2 DEFINITIONS

A. Access Provider: An operator that provides a circuit path or facility between the service provider and user. An access provider can also be a service provider.

B. Service Provider: The operator of a telecommunications transmission service delivered through access provider facilities.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For communications racks, frames, and enclosures. Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Equipment Racks and Cabinets: Include workspace requirements and access for cable connections.
3. Grounding: Indicate location of TGB and its mounting detail showing standoff insulators and wall-mounting brackets.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For installer, qualified layout technician, installation supervisor, and field inspector.

B. Seismic Qualification Data: Certificates, from manufacturer.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Cabling installer must have personnel certified by BICSI on staff.

1. Layout Responsibility: Preparation of Shop Drawings shall be under direct supervision of RCDD.

2. Installation Supervision: Installation shall be under direct supervision of Installer 2, Copper or Fiber, who shall be present at all times when Work of this Section is performed at Project site.
3. Field Inspector: Currently registered by BICSI as RCDD to perform on-site inspection.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Equipment shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means "the unit will remain in place without separation of any parts when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

B. UL listed.

C. RoHS compliant.

D. Compliant with requirements of the Payment Card Industry Data Security Standard.

2.2 19-INCH EQUIPMENT RACKS

A. Description: Two- post racks with threaded rails designed for mounting telecommunications equipment. Width is compatible with EIA/ECIA 310-E, 19-inch (482.6-mm) equipment mounting with an opening of 17.72-inches (450-mm) between rails.

B. General Requirements:

1. Frames: Modular units designed for telecommunications terminal support and coordinated with dimensions of units to be supported.
2. Material: Sheet aluminum.
3. Finish: Manufacturer's standard, baked-polyester powder coat.
4. Color: Black.

C. Floor-Mounted Racks:

1. Overall Height: 72 inches (1828.8 mm).
2. Overall Depth: 23 inches (584.2 mm).
3. Upright Depth: 3 inches (76.2 mm).
4. Two-Post Load Rating: 400 lb (181 kg).
5. Number of Rack Units per Rack: 38 or as indicated on Drawings.

    a. Numbering: Every rack units, on interior of rack.

6. Threads: 10-32.
7. Vertical and horizontal cable management channels, top and bottom cable troughs, grounding lug, and a power strip.

8. Base shall have a minimum of four mounting holes for permanent attachment to floor.
9. Top shall have provisions for attaching to cable tray or ceiling.
10. Self-leveling.

D. Wall-Mounted Racks:

1. Height: 22 inches (558.8 mm).
2. Depth: 23 inches (584.2 mm).
3. Load Rating: 150 lb (65 kg).
4. Number of Rack Units per Rack: 22.
5. Threads: 10-32.
6. Wall Attachment: Four mounting holes.
7. Equipment Access: Integral swing.

E. Cable Management:

1. Metal, with integral wire retaining fingers.
2. Baked-polyester powder coat finish.
3. Vertical cable management panels shall have front and rear channels, with covers.
4. Provide horizontal crossover cable manager at the top of each relay rack, with a minimum height of two rack units each.

F. Modular Wall Cabinets:

1. Height: 22 inches (558.8 mm).
2. Depth: 23 inches (584.2 mm).
3. Load Rating: 150 lb (65 kg).
4. Number of Rack Units: 22.
5. Threads: 10-32.
6. Lockable front doors.
7. Louvered side panels.
8. Cable access provisions top and bottom.
9. Grounding lug.
10. Roof-mounted, 250-cfm (118-L/s) fan.
11. Power strip.
12. All cabinets keyed alike.

G. Cable Management:

1. Metal, with integral wire retaining fingers.
2. Baked-polyester powder coat finish.
3. Vertical cable management panels shall have front and rear channels, with covers.
4. Provide horizontal crossover cable manager at top of each relay rack, with a minimum height of two rack units each.

2.3 POWER STRIPS

A. Power Strips: Comply with UL 1363.

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Rack mounting, with detachable flanges.
3. Height: 1 RU.
4. Housing: Metal.
5. Six, 15-A, 120-V ac, NEMA WD 6, Configuration 5-15R receptacles.
6. Rear-facing receptacles.
7. LED indicator lights for power and protection status.
8. LED indicator lights for reverse polarity and open outlet ground.
9. Circuit Breaker and Thermal Fusing: When protection is lost, circuit opens and cannot be reset.
10. Circuit Breaker and Thermal Fusing: Unit continues to supply power if protection is lost.
11. Close-coupled, direct plug-in line cord.
12. Rocker-type on-off switch, illuminated when in on position.
13. Surge Protection: UL 1449, Type 3.

    a. Maximum Surge Current, Line to Neutral: 27 kA.
    b. Protection modes shall be line to neutral, line to ground, and neutral to ground.
    c. UL 1449 Voltage Protection Rating for line to neutral and line to ground shall be 600 V and 500 V for neutral to ground.

2.4 GROUNDING

A. Comply with requirements in Section 270526 "Grounding and Bonding for Communications Systems" for grounding conductors and connectors.

B. Rack and Cabinet TGBs: Rectangular bars of hard-drawn solid copper, accepting conductors ranging from No. 14 to No. 2/0 AWG, NRTL listed as complying with UL 467, and complying with TIA-606-B. Predrilling shall be with holes for use with lugs specified in this Section.

1. Cabinet-Mounted TGB: Terminal block, with stainless-steel or copper-plated hardware for attachment to cabinet.
2. Rack-Mounted Horizontal TGB: Designed for mounting in 19- or 23-inch (482.6- or 584.2-mm) equipment racks. Include a copper splice bar for transitioning to an adjoining rack, and stainless-steel or copper-plated hardware for attachment to the rack.
3. Rack-Mounted Vertical TGB: 72 or 36 inches (1828.8 or 914.4 mm) long, with stainless-steel or copper-plated hardware for attachment to rack.

2.5 LABELING

A. Comply with TIA-606-B and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1.

B. Comply with BICSI TDMM for layout of communications equipment spaces.

C. Comply with BICSI ITSIMM for installation of communications equipment spaces.

D. Bundle, lace, and train conductors and cables to terminal points without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.

E. Coordinate layout and installation of communications equipment in racks and room. Coordinate service entrance configuration with service provider.

1. Meet jointly with system providers, equipment suppliers, and Owner to exchange information and agree on details of equipment configurations and installation interfaces.
2. Record agreements reached in meetings and distribute them to other participants.
3. Adjust configurations and locations of distribution frames, cross-connects, and patch panels in equipment spaces to accommodate and optimize configuration and space requirements of telecommunications equipment.
4. Adjust configurations and locations of equipment with distribution frames, cross-connects, and patch panels of cabling systems of other communications, electronic safety and security, and related systems that share space in equipment room.

F. Coordinate location of power raceways and receptacles with locations of communications equipment requiring electrical power to operate.

3.2 GROUNDING

A. Comply with NECA/BICSI 607.

B. Install grounding according to BICSI ITSIMM, "Bonding, Grounding (Earthing) and Electrical Protection" Ch.

C. Locate TGB to minimize length of bonding conductors. Fasten to wall, allowing at least 2 inches (50 mm) of clearance behind TGB. Connect TGB with a minimum No. 4 AWG grounding electrode conductor from TGB to suitable electrical building ground. Connect rack TGB to near TGB or the TMGB.

1. Bond the shield of shielded cable to patch panel, and bond patch panel to TGB or TMGB.

3.3 IDENTIFICATION

A. Coordinate system components, wiring, and cabling complying with TIA-606-B. Comply with requirements in Section 270553 "Identification for Electrical Systems."

B. Comply with requirements in Section 099123 "Interior Painting" for painting backboards. For fire-resistant plywood, do not paint over manufacturer's label.

C. Paint and label colors for equipment identification shall comply with TIA-606-B for Class 2 level of administration, including optional identification requirements of this standard.

D. Labels shall be machine printed. Type shall be 3/16 inch (5 mm) in height.

END OF SECTION 27 11 16

SECTION 27 13 13 - COMMUNICATIONS COPPER BACKBONE CABLING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. High-count Category 3 twisted pair cable.
2. Cabling identification.
3. Source quality control requirements for twisted pair cable.

B. Related Requirements:

1. Section 260519 "Low-Voltage Electrical Power Conductors and Cables" for data cabling associated with system panels and devices.

1.3 DEFINITIONS

A. Cross-Connect: A facility enabling the termination of cable elements and their interconnection or cross-connection.

B. EMI: Electromagnetic interference.

C. F/FTP: Overall foil screened cable with foil screened twisted pair.

D. FTP: Shielded twisted pair.

E. F/UTP: Overall foil screened cable with unscreened twisted pair.

F. IDC: Insulation displacement connector.

G. Jack: Also commonly called an "outlet," it is the fixed, female connector.

H. LAN: Local area network.

I. Plug: Also commonly called a "connector," it is the removable, male telecommunications connector.

J. RCDD: Registered Communications Distribution Designer.

K. Screen: A metallic layer, either a foil or braid, placed around a pair or group of conductors.

L. S/FTP: Overall braid screened cable with foil screened twisted pair.

M. Shield: A metallic layer, either a foil or braid, placed around a pair or group of conductors.

N. S/UTP: Overall braid screened cable with unscreened twisted pairs.

O. UTP: Unscreened (unshielded) twisted pair.

1.4 COPPER BACKBONE CABLING DESCRIPTION

A. Copper backbone cabling system shall provide interconnections between communications equipment rooms, main terminal space, and entrance facilities in the telecommunications cabling system structure. Cabling system consists of backbone cables, intermediate and main cross-connects, mechanical terminations, and patch cords or jumpers used for backbone-to-backbone cross-connection.

B. Backbone cabling cross-connects may be located in communications equipment rooms or at entrance facilities. Bridged taps and splitters shall not be used as part of backbone cabling.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Reviewed and stamped by RCDD.

1. System Labeling Schedules: Electronic copy of labeling schedules, in software and format selected by Owner.
2. System Labeling Schedules: Electronic copy of labeling schedules that are part of the cabling and asset identification system of the software.
3. Cabling administration Drawings and printouts.
4. Wiring diagrams to show typical wiring schematics, including the following:

    a. Telecommunications rooms plans and elevations.
    b. Telecommunications pathways.
    c. Telecommunications system access points.
    d. Telecommunications grounding system
    e. Cross-connects.
    f. Patch panels.
    g. Patch cords.

5. Cross-Connects and Patch Panels: Detail mounting assemblies and show elevations and physical relationship between the installed components.

C. Twisted pair cable testing plan.

1.6 INFORMATIONAL SUBMITTALS

A. Source quality-control reports.

B. Product Certificates: For each type of product.

C. Field quality-control reports.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For splices and connectors to include in maintenance manuals.

B. Software and Firmware Operational Documentation:

1. Software operating and upgrade manuals.
2. Program Software Backup: On USB media or compact disk, complete with data files.
3. Device address list.
4. Printout of software application and graphic screens.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.

B. Testing Agency Qualifications: Testing agency must have personnel certified by BICSI on staff.

1. Testing Agency's Field Supervisor: Currently certified by BICSI as an RCDD.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Test cables upon receipt at Project site.

1. Test each pair of twisted pair cable for open and short circuits.

1.10 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install cables and connecting materials until wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.11 COORDINATION

A. Coordinate layout and installation of telecommunications pathways and cabling with Owner's telecommunications and LAN equipment and service suppliers.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Backbone cabling system shall comply with transmission standards in TIA-568-C.1, when tested according to test procedures of this standard.

B. Telecommunications Pathways and Spaces: Comply with TIA-569-D.

C. Grounding: Comply with TIA-607-B.

2.2 GENERAL CABLE CHARACTERISTICS

A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with the applicable standard and NFPA 70 for the following types:

1. Communications, Plenum Rated: Type CMP complying with UL 1685 or Type CMP in listed plenum communications raceway.

B. RoHS compliant.

2.3 HIGH-COUNT CATEGORY 3 TWISTED PAIR CABLE

A. Description: 25-pair, balanced-twisted pair cable, certified to meet transmission characteristics of Category 3 cable at frequencies up to 16MHz.

B. Standard: Comply with ICEA S-90-661, NEMA WC 63.1, and TIA-568-C.2 for Category 3 cables.

C. Conductors: 100-ohm, 24 AWG solid copper.

D. Cable Rating: Plenum.

E. Jacket: Gray thermoplastic.

2.4 TWISTED PAIR CABLE HARDWARE

A. Description: Hardware designed to connect, splice, and terminate twisted pair copper communications cable.

B. General Requirements for Cable Connecting Hardware:
1. Comply with TIA-568-C.2, IDC type, with modules designed for punch-down caps or tools.
2. Cables shall be terminated with connecting hardware of same category or higher.

C. Connecting Blocks: 110-style IDC for Category 5e. Provide blocks for the number of cables terminated on the block, plus 25 percent spare, integral with connector bodies, including plugs and jacks where indicated.

2.5 CABLING IDENTIFICATION

A. Comply with TIA-606-B and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

2.6 GROUNDING

A. Comply with requirements in Section 270526 "Grounding and Bonding for Communications Systems" for grounding conductors and connectors.

B. Comply with TIA-607-B.

2.7 SOURCE QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to evaluate cables.

B. Factory test cables on reels according to TIA-568-C.1.

C. Factory test cables according to TIA-568-C.2.

D. Cable will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 WIRING METHODS

A. Wiring Method: Install cables in raceways and cable trays, except within consoles, cabinets, desks, and counters. Conceal raceway and cables, except in unfinished spaces.

1. Install plenum cable in environmental air spaces, including plenum ceilings.
2. Comply with requirements for raceways and boxes specified in Section 270528 "Pathways for Communications Systems."

B. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.

C. Wiring within Enclosures: Bundle, lace, and train cables within enclosures. Connect to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools. Install cables parallel with or at right angles to sides and back of enclosure.

3.2 INSTALLATION OF PATHWAYS

A. Comply with requirements for demarcation point, cabinets, and racks specified in Section 271100 "Communications Equipment Room Fittings."

B. Comply with Section 270528 "Pathways for Communications Systems."

C. Comply with Section 270529 "Hangers and Supports for Communications Systems."

D. Comply with Section 270536 "Cable Trays for Communications Systems."

E. Drawings indicate general arrangement of pathways and fittings.

3.3 INSTALLATION OF COPPER BACKBONE CABLES

A. Comply with NECA 1 and NECA/BICSI 568.

B. General Requirements for Cabling:

1. Comply with TIA-568-C.0, TIA-568-C.1, and TIA-568-C.2.
2. Comply with BICSI's "Information Transport Systems Installation Methods Manual (ITSIMM)," Ch. 5, "Copper Structured Cabling Systems," "Cable Termination Practices" Section.
3. Install 110-style IDC termination hardware unless otherwise indicated.

4. Do not untwist twisted pair cables more than 1/2 inch (12 mm) from the point of termination to maintain cable geometry.
5. Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
6. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches (760 mm) and not more than 6 inches (150 mm) from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
7. Install lacing bars to restrain cables, prevent straining connections, and prevent bending cables to smaller radii than minimums recommended by manufacturer.
8. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems," "Cable Termination Practices" Section Use lacing bars and distribution spools.
9. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation, and replace it with new cable.
10. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
11. In the communications equipment room, install a 10-foot- (3-m-) long service loop on each end of cable.
12. Pulling Cable: Comply with BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems," "Pulling and Installing Cable" Section. Monitor cable pull tensions.

C. Open-Cable Installation:

1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
2. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.

D. Group connecting hardware for cables into separate logical fields.

E. Separation from EMI Sources:

1. Comply with recommendations from BICSI's "Telecommunications Distribution Methods Manual" and TIA-569-D for separating unshielded copper communication cable from potential EMI sources, including electrical power lines and equipment.
2. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:

    a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches (127 mm).
    b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches (300 mm).
    c. Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches (600 mm).

3. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:

a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1/2 inches (64 mm).
b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches (150 mm).
c. Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches (300 mm).

4. Separation between communications cables in grounded metallic raceways, power lines, and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:

a. Electrical Equipment Rating Less Than 2 kVA: No requirement.
b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches (76 mm).
c. Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches (150 mm).

5. Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches (1200 mm).
6. Separation between Communications Cables and Fluorescent Fixtures: A minimum of 5 inches (127 mm).

3.4 FIRESTOPPING

A. Comply with requirements in Section 078413 "Penetration Firestopping."

B. Comply with TIA-569-D, Annex A, "Firestopping."

C. Comply with "Firestopping Systems" Article in BISCI's "Telecommunications Distribution Methods Manual."

3.5 GROUNDING

A. Install grounding according to the "Grounding, Bonding, and Electrical Protection" chapter in BICSI's "Telecommunications Distribution Methods Manual."

B. Comply with TIA-607-B and NECA/BICSI-607.

C. Locate grounding bus bar to minimize the length of bonding conductors. Fasten to wall, allowing at least a 2-inch (50-mm) clearance behind the grounding bus bar. Connect grounding bus bar to suitable electrical building ground, using a minimum No. 4 AWG grounding electrode conductor.

D. Bond metallic equipment to the grounding bus bar, using not smaller than a No. 6 AWG equipment grounding conductor.

3.6 IDENTIFICATION

A. Identify system components, wiring, and cabling complying with TIA-606-B. Comply with requirements for identification specified in Section 270553 "Identification for Communications Systems."

1. Color-code cross-connect fields and apply colors to voice and data service backboards, connections, covers, and labels.

B. Comply with requirements in Section 271513 "Communications Copper Horizontal Cabling" for cable and asset management software.

C. Cable Schedule: Install in a prominent location in each equipment room and wiring closet. List incoming and outgoing cables and their designations, origins, and destinations. Protect with rigid frame and clear plastic cover. Furnish an electronic copy of final comprehensive schedules for Project.

D. Cable and Wire Identification:

1. Label each cable within 4 inches (100 mm) of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
2. Each wire connected to building-mounted devices is not required to be numbered at the device if wire color is consistent with associated wire connected and numbered within panel or cabinet.
3. Exposed Cables and Cables in Cable Trays and Wire Troughs: Label each cable at intervals not exceeding 15 feet (4.5 m).
4. Label each terminal strip, and screw terminal in each cabinet, rack, or panel.
    a. Individually number wiring conductors connected to terminal strips, and identify each cable or wiring group, extended from a panel or cabinet to a building-mounted device, with the name and number of a particular device.
    b. Label each unit and field within distribution racks and frames.
5. Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and -connecting hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use a different color for jacks and plugs of each service.

E. Labels shall be preprinted or computer-printed type, with a printing area and font color that contrast with cable jacket color but still comply with TIA-606-B requirements for the following:

1. Cables use flexible vinyl or polyester that flexes as cables are bent.

3.7 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

C. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

D. Tests and Inspections:

1. Visually inspect jacket materials for NRTL certification markings. Inspect cabling terminations in communications equipment rooms for compliance with color-coding for pin assignments and inspect cabling connections for compliance with TIA-568-C.1.
2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
3. Test cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not cross-connection.

    a. Test instruments shall meet or exceed applicable requirements in TIA-568-C.2. Perform tests with a tester that complies with performance requirements in "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.

E. Data for each measurement shall be documented. Data for submittals shall be printed in a summary report that is formatted similarly to Table 10.1 in BICSI's "Telecommunications Distribution Methods Manual," or shall be transferred from the instrument to the computer, saved as text files, printed, and submitted.

F. Remove and replace cabling where test results indicate that they do not comply with specified requirements.

G. End-to-end cabling will be considered defective if it does not pass tests and inspections.

H. Prepare test and inspection reports.

END OF SECTION 27 13 13

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SECTION 27 13 23 - COMMUNICATIONS OPTICAL FIBER BACKBONE CABLING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. 62.5/125-micrometer, multimode, optical fiber cable (OM1).
2. 50/125 micrometer, multimode, optical fiber cable (OM2).
3. 850 nanometer laser-optimized 50/125 micrometer multimode optical fiber cable (OM3).
4. 850 nanometer laser-optimized 50/125 micrometer multimode optical fiber cable (OM4).
5. 9/125 micrometer single-mode, indoor-outdoor optical fiber cable (OS1).
6. 9/125 micrometer single-mode, indoor-outdoor optical fiber cable (OS2).
7. 9/125 micrometer single-mode, inside plant optical fiber cable (OS1).
8. 9/125 micrometer single-mode, inside plant optical fiber cable (OS2).
9. 9/125 micrometer single-mode, outside plant optical fiber cable (OS1).
10. 9/125 micrometer single-mode, outside plant optical fiber cable (OS2).
11. Optical fiber cable connecting hardware, patch panels, and cross-connects.
12. Cabling identification products.

1.3 DEFINITIONS

A. BICSI: Building Industry Consulting Service International.

B. Cross-Connect: A facility enabling the termination of cable elements and their interconnection or cross-connection.

C. RCDD: Registered Communications Distribution Designer.

1.4 OPTICAL FIBER BACKBONE CABLING DESCRIPTION

A. Optical fiber backbone cabling system shall provide interconnections between communications equipment rooms, main terminal space, and entrance facilities in the telecommunications cabling system structure. Cabling system consists of backbone cables, intermediate and main cross-connects, mechanical terminations, and patch cords or jumpers used for backbone-to-backbone cross-connection.

B. Backbone cabling cross-connects may be located in communications equipment rooms or at entrance facilities. Bridged taps and splitters shall not be used as part of backbone cabling.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Reviewed and stamped by RCDD.

1. System Labeling Schedules: Electronic copy of labeling schedules, in software and format selected by Owner.
2. System Labeling Schedules: Electronic copy of labeling schedules that are part of the cabling and asset identification system of the software.
3. Cabling administration drawings and printouts.
4. Wiring diagrams to show typical wiring schematics including the following:

    a. Telecommunications rooms plans and elevations.
    b. Telecommunications pathways.
    c. Telecommunications system access points.
    d. Telecommunications grounding system.
    e. Cross-connects.
    f. Patch panels.
    g. Patch cords.

5. Cross-connects and patch panels. Detail mounting assemblies, and show elevations and physical relationship between the installed components.

C. Optical fiber cable testing plan.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For RCDD, installation supervisor, and field inspector.

B. Source quality-control reports.

C. Product Certificates: For each type of product.

D. Field quality-control reports.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For optical fiber cable, splices, and connectors to include in maintenance manuals.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.

1. Layout Responsibility: Preparation of Shop Drawings by an RCDD.
2. Installation Supervision: Installation shall be under the direct supervision of Technician, who shall be present at all times when Work of this Section is performed at Project site.
3. Testing Supervisor: Currently certified by BICSI as an RCDD to supervise on-site testing.

B. Testing Agency Qualifications: Testing agency must have personnel certified by BICSI on staff.

1. Testing Agency's Field Supervisor: Currently certified by BICSI as an RCDD.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Test cables upon receipt at Project site.

1. Test optical fiber cable to determine the continuity of the strand end to end. Use optical loss test set.
2. Test optical fiber cable while on reels. Use an optical time domain reflectometer to verify the cable length and locate cable defects, splices, and connector, including the loss value of each. Retain test data and include the record in maintenance data.

1.10 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install cables and connecting materials until wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.11 COORDINATION

A. Coordinate layout and installation of telecommunications pathways and cabling with Owner's telecommunications and LAN equipment and service suppliers.

1.12 SOFTWARE SERVICE AGREEMENT

A. Technical Support: Beginning with Substantial Completion, provide software support for two years.

B. Upgrade Service: Update software to latest version at Project completion. Install and program software upgrades that become available within two years from date of

Substantial Completion. Upgrading software shall include operating system. Upgrade shall include new or revised licenses for use of software.

1. Provide 30 days' notice to Owner to allow scheduling and access to system and to allow Owner to upgrade computer equipment if necessary.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Backbone cabling system shall comply with transmission standards in TIA-568-C.1, when tested according to test procedures of this standard.

B. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 50 or less.

C. Telecommunications Pathways and Spaces: Comply with TIA-569-D.

D. Grounding: Comply with TIA-607-B.

2.2 850 NANOMETER LASER-OPTIMIZED, 50/125 MICROMETER, MULTIMODE OPTICAL FIBER CABLE (OM3)

A. Description: Multimode, 50/125-micrometer 12-fiber, nonconductive, tight buffer, optical fiber cable.

B. Standards:

1. Comply with ICEA S-83-596 for mechanical properties.
2. Comply with TIA-568-C.3 for performance specifications.
3. Comply with TIA-492AAAC for detailed specifications.

C. Maximum Attenuation: 3.50 dB/km at 850 nm; 1.5 dB/km at 1300 nm.

D. Minimum Overfilled Modal Bandwidth-length Product: 1500 MHz-km at 850 nm; 500 MHz-km at 1300 nm.

E. Minimum Effective Modal Bandwidth-length Product: 2000 MHz-km at 850 nm.

F. Jacket:

1. Jacket Color: Aqua.
2. Cable cordage jacket, fiber, unit, and group color shall be according to TIA-598-D.

3. Imprinted with fiber count, fiber type, and aggregate length at regular intervals not to exceed 40 inches (1000 mm).

G. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444, UL 1651, and NFPA 70 for the following types:

1. Plenum Rated, Nonconductive: Type OFNP, complying with NFPA 262.
2. Plenum Rated, Nonconductive: Type OFNP in listed plenum communications raceway.

2.3 OPTICAL FIBER CABLE HARDWARE

A. Standards:

1. Comply with Fiber Optic Connector Intermateability Standard (FOCIS) specifications of the TIA-604 series.
2. Comply with TIA-568-C.3.

B. Cross-Connects and Patch Panels: Modular panels housing multiple-numbered, duplex cable connectors.

1. Number of Connectors per Field: [**One**] <**Insert number**> for each fiber of cable or cables assigned to field, plus spares and blank positions adequate to suit specified expansion criteria.

C. Patch Cords: Factory-made, dual-fiber cables in 36-inch (900-mm) lengths.

D. Connector Type: Type SC complying with TIA-604-3-B, connectors.

E. Plugs and Plug Assemblies:

1. Male; color-coded modular telecommunications connector designed for termination of a single optical fiber cable.
2. Insertion loss not more than 0.25 dB.
3. Marked to indicate transmission performance.

F. Jacks and Jack Assemblies:

1. Female; quick-connect, simplex and duplex; fixed telecommunications connector designed for termination of a single optical fiber cable.
2. Insertion loss not more than 0.25 dB.
3. Marked to indicate transmission performance.
4. Designed to snap-in to a patch panel or faceplate.

2.4 GROUNDING

A. Comply with requirements in Section 270526 "Grounding and Bonding for Communications Systems" for grounding conductors and connectors.

B. Comply with TIA-607-B.

2.5 IDENTIFICATION PRODUCTS

A. Comply with TIA-606-B and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

2.6 SOURCE QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to evaluate cables.

B. Factory test multimode optical fiber cables according to TIA-526-14-B and TIA-568-C.3.

C. Factory test pre-terminated optical fiber cable assemblies according to TIA-526-14-B and TIA-568-C.3.

D. Cable will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 ENTRANCE FACILITIES

A. Coordinate backbone cabling with the protectors and demarcation point provided by communications service provider.

3.2 WIRING METHODS

A. Wiring Method: Install cables in raceways and cable trays except within consoles, cabinets, desks, and counters. Conceal raceway and cables except in unfinished spaces.

1. Install plenum cable in environmental air spaces, including plenum ceilings.
2. Comply with requirements for pathways specified in Section 270528 "Pathways for Communications Systems."

B. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.

C. Wiring within Enclosures: Bundle, lace, and train cables within enclosures. Connect to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

3.3 INSTALLATION OF OPTICAL FIBER BACKBONE CABLES

A. Comply with NECA 1, NECA 301, and NECA/BICSI 568.

B. General Requirements for Optical Fiber Cabling Installation:

1. Comply with TIA-568-C.1 and TIA-568-C.3.
2. Comply with BICSI ITSIMM, Ch. 6, "Cable Termination Practices."
3. Terminate all cables; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
4. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches (760 mm) and not more than 6 inches (150 mm) from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
5. Install lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.
6. Bundle, lace, and train cable to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIMM, "Cabling Termination Practices" Chapter. Use lacing bars and distribution spools.
7. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
8. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
9. In the communications equipment room, provide a 10-foot- (3-m-) long service loop on each end of cable.
10. Pulling Cable: Comply with BICSI ITSIMM, Ch. 4, "Pulling Cable." Monitor cable pull tensions.
11. Cable may be terminated on connecting hardware that is rack or cabinet mounted.

C. Open-Cable Installation:

1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
2. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.

D. Group connecting hardware for cables into separate logical fields.

3.4 FIRESTOPPING

A. Comply with requirements in Section 078413 "Penetration Firestopping."

B. Comply with TIA-569-D, Annex A, "Firestopping."

C. Comply with BICSI ITSIMM, "Firestopping" Chapter.

3.5 GROUNDING

A. Install grounding according to BICSI ITSIMM, "Grounding (Earthing), Bonding, and Electrical Protection" Chapter.

B. Comply with TIA-607-B and NECA/BICSI-607.

C. Locate grounding bus bar to minimize the length of bonding conductors. Fasten to wall allowing at least 2-inch (50-mm) clearance behind the grounding bus bar. Connect grounding bus bar with a minimum No. 4 AWG grounding electrode conductor from grounding bus bar to suitable electrical building ground.

D. Bond metallic equipment to the grounding bus bar, using not smaller than No. 6 AWG equipment grounding conductor.

3.6 IDENTIFICATION

A. Identify system components, wiring, and cabling complying with TIA-606-B. Comply with requirements for identification specified in Section 270553 "Identification for Communications Systems."

1. Administration Class: Class 3.
2. Color-code cross-connect fields and apply colors to voice and data service backboards, connections, covers, and labels.

B. Cable Schedule: Install in a prominent location in each equipment room and wiring closet. List incoming and outgoing cables and their designations, origins, and destinations. Protect with rigid frame and clear plastic cover. Furnish an electronic copy of final comprehensive schedules for Project.

C. Cabling Administration Drawings: Show building floor plans with cabling administration-point labeling. Identify labeling convention and show labels for telecommunications closets, backbone pathways and cables, terminal hardware and positions, horizontal cables, work areas and workstation terminal positions, grounding buses and pathways, and equipment grounding conductors.

D. Cable and Wire Identification:

1. Label each cable within 4 inches (100 mm) of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
2. Each wire connected to building-mounted devices is not required to be numbered at device if color of wire is consistent with associated wire connected and numbered within panel or cabinet.
3. Exposed Cables and Cables in Cable Trays and Wire Troughs: Label each cable at intervals not exceeding 15 feet (4.5 m).
4. Label each unit and field within distribution racks and frames.
5. Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and connecting hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use a different color for jacks and plugs of each service.

E. Labels shall be preprinted or computer-printed type with printing area and font color that contrasts with cable jacket color but still complies with requirements in TIA 606-B, for the following:

1. Flexible vinyl or polyester that flexes as cables are bent.

3.7 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

C. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

D. Tests and Inspections:

1. Visually inspect optical fiber jacket materials for NRTL certification markings. Inspect cabling terminations in communications equipment rooms for compliance with color-coding for pin assignments, and inspect cabling connections for compliance with TIA-568-C.1.
2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
3. Optical Fiber Cable Tests:

    a. Test instruments shall meet or exceed applicable requirements in TIA-568-C.1. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
    b. Link End-to-End Attenuation Tests:

        1) Horizontal and multimode backbone link measurements: Test at 850 or 1300 nm in one direction according to TIA-526-14-B, Method B, One Reference Jumper.
        2) Attenuation test results for backbone links shall be less than 2.0 dB. Attenuation test results shall be less than those calculated according to equation in TIA-568-C.1.

E. Data for each measurement shall be documented. Data for submittals shall be printed in a summary report that is formatted similar to Table 10.1 in BICSI TDMM, or transferred from the instrument to the computer, saved as text files, and printed and submitted.

F. Remove and replace cabling where test results indicate that it does not comply with specified requirements.

G. End-to-end cabling will be considered defective if it does not pass tests and inspections.

H. Prepare test and inspection reports.

END OF SECTION 27 13 23

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SECTION 27 15 13
COMMUNICATIONS COPPER HORIZONTAL CABLING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Category 3 twisted pair cable.
2. Category 5e twisted pair cable.
3. Category 6 twisted pair cable.
4. Category 6a twisted pair cable.
5. Twisted pair cable hardware, including plugs and jacks.
6. Cable management system.
7. Cabling identification products.
8. Grounding provisions for twisted pair cable.
9. Source quality control requirements for twisted pair cable.

1.3 DEFINITIONS

A. Cross-Connect: A facility enabling the termination of cable elements and their interconnection or cross-connection.

B. EMI: Electromagnetic interference.

C. FTP: Shielded twisted pair.

D. F/FTP: Overall foil screened cable with foil screened twisted pair.

E. F/UTP: Overall foil screened cable with unscreened twisted pair.

F. IDC: Insulation displacement connector.

G. LAN: Local area network.

H. Jack: Fixed female connector, also commonly called an "outlet."

I. Plug: The removable, male telecommunications connector, also commonly called a "connector."

J. RCDD: Registered Communications Distribution Designer.

K. Screen: A metallic layer, either a foil or braid, placed around a pair or group of conductors.

L. Shield: A metallic layer, either a foil or braid, placed around a pair or group of conductors.

M. S/FTP: Overall braid screened cable with foil screened twisted pair.

N. S/UTP: Overall braid screened cable with unscreened twisted pairs.

O. UTP: Unscreened (unshielded) twisted pair.

1.4 COPPER HORIZONTAL CABLING DESCRIPTION

A. Horizontal cable cabling system shall provide interconnections between IT Rooms and the equipment outlet, otherwise known as "Cabling Subsystem 1," in the telecommunications cabling system structure. Cabling system consists of horizontal cables, intermediate and main cross-connects, mechanical terminations, and patch cords or jumpers used for horizontal-to-horizontal cross-connection.

1. TIA-568-C.1 requires that a minimum of two equipment outlets be installed for each work area.
2. Horizontal cabling shall contain no more than one transition point or consolidation point between the horizontal cross-connect and the telecommunications equipment outlet.
3. Bridged taps and splices shall not be installed in the horizontal cabling.

B. The maximum allowable horizontal cable length is 295 feet (90 m). This maximum allowable length does not include an allowance for the length of 16 feet (4.9 m) to the workstation equipment or in the horizontal cross-connect.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Reviewed and stamped by RCDD.

1. System Labeling Schedules: Electronic copy of labeling schedules, in software and format selected by Owner.
2. System Labeling Schedules: Electronic copy of labeling schedules that are part of the cabling and asset identification system of the software.
3. Cabling administration Drawings and printouts.
4. Wiring diagrams and installation details of telecommunications equipment, to show location and layout of telecommunications equipment, including the following:

    a. Telecommunications rooms plans and elevations.
    b. Telecommunications pathways.
    c. Telecommunications system access points.
    d. Telecommunications grounding system.
    e. Telecommunications conductor drop locations.
    f. Typical telecommunications details.
    g. Mechanical, electrical, and plumbing systems.

C. Twisted pair cable testing plan.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For RCDD, Installer, installation supervisor, and field inspector.

B. Product Certificates: For each type of product.

C. Source quality-control reports.

D. Field quality-control reports.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For splices and connectors to include in maintenance manuals.

B. Software and Firmware Operational Documentation:

1. Software operating and upgrade manuals.
2. Program Software Backup: On USB media or compact disk, complete with data files.
3. Device address list.
4. Printout of software application and graphic screens.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.

1. Layout Responsibility: Preparation of Shop Drawings, cabling administration Drawings, and field testing program development by an RCDD.
2. Installation Supervision: Installation shall be under the direct supervision of Technician, who shall be present at all times when Work of this Section is performed at Project site.
3. Testing Supervisor: Currently certified by BICSI as an RCDD to supervise on-site testing.

B. Testing Agency Qualifications: Testing agency must have personnel certified by BICSI on staff.

1. Testing Agency's Field Supervisor: Currently certified by BICSI as an RCDD.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Test cables upon receipt at Project site.

1. Test each pair of twisted pair cable for open and short circuits.

1.10 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install cables and connecting materials until wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.11 COORDINATION

A. Coordinate layout and installation of telecommunications pathways and cabling with Owner's telecommunications and LAN equipment and service suppliers.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Horizontal cabling system shall comply with transmission standards in TIA-568-C.1, when tested according to test procedures of this standard.

B. Telecommunications Pathways and Spaces: Comply with TIA-569-D.

C. Grounding: Comply with TIA-607-B.

2.2 GENERAL CABLE CHARACTERISTICS

A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with the applicable standard and NFPA 70 for the following types:

1. Communications, Plenum Rated: Type CMP complying with UL 1685.
2. Communications, Plenum Rated: Type CM, Type CMG, Type CMP, Type CMR, or Type CMX in metallic conduit installed according to NFPA 70, Article 300.22, "Wiring in Ducts, Plenums, and Other Air-Handling Spaces."

B. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 50 or less.

C. RoHS compliant.

2.3 CATEGORY 6 TWISTED PAIR CABLE

A. Description: Four-pair, balanced-twisted pair cable, certified to meet transmission characteristics of Category 6 cable at frequencies up to 250MHz.

B. Standard: Comply with NEMA WC 66/ICEA S-116-732 and TIA-568-C.2 for Category 6 cables.

C. Conductors: 100-ohm, 23 AWG solid copper.

D. Shielding/Screening: Unshielded twisted pairs (UTP).

E. Cable Rating: Plenum.

F. Jacket: Blue thermoplastic.

2.4 TWISTED PAIR CABLE HARDWARE

A. Description: Hardware designed to connect, splice, and terminate twisted pair copper communications cable.

B. General Requirements for Twisted Pair Cable Hardware:

1. Comply with the performance requirements of Category 6.
2. Comply with TIA-568-C.2, IDC type, with modules designed for punch-down caps or tools.
3. Cables shall be terminated with connecting hardware of same category or higher.

C. Source Limitations: Obtain twisted pair cable hardware from same manufacturer as twisted pair cable, or from a certified partner of the twisted pair cable.

D. Connecting Blocks:
1. 110-style IDC for Category 6.

E. Cross-Connect: Modular array of connecting blocks arranged to terminate building cables and permit interconnection between cables.

1. Number of Terminals per Field: One for each conductor in assigned cables.

F. Patch Panel: Modular panels housing numbered jack units with IDC-type connectors at each jack location for permanent termination of pair groups of installed cables.

1. Features:

a. Universal T568A and T568B wiring labels.
b. Labeling areas adjacent to conductors.
c. Replaceable connectors.
d. 24 or 48 ports.

2. Construction: 16-gauge steel and mountable on 19-inch (483 mm) equipment racks.
3. Number of Jacks per Field: One for each four-pair cable indicated.

G. Patch Cords: Factory-made, four-pair cables in 36-inch (900-mm)lengths; terminated with an eight-position modular plug at each end.

1. Patch cords shall have bend-relief-compliant boots and color-coded icons to ensure performance. Patch cords shall have latch guards to protect against snagging.
2. Patch cords shall have color-coded boots for circuit identification.

H. Plugs and Plug Assemblies:

1. Male; eight position; color-coded modular telecommunications connector designed for termination of a single four-pair, 100-ohm, unshielded or shielded twisted pair cable.
2. Standard: Comply with TIA-568-C.2.
3. Marked to indicate transmission performance.

I. Jacks and Jack Assemblies:

1. Female; eight position; modular; fixed telecommunications connector designed for termination of a single four-pair, 100-ohm, unshielded or shielded twisted pair cable.
2. Designed to snap-in to a patch panel or faceplate.
3. Standard: Comply with TIA-568-C.2.
4. Marked to indicate transmission performance.

J. Faceplate:

1. Four port, vertical single gang faceplates designed to mount to single gang wall boxes.
2. Plastic Faceplate: High-impact plastic. Coordinate color with Section 262726 "Wiring Devices."
3. Metal Faceplate: Stainless steel, complying with requirements in Section 262726 "Wiring Devices."
4. For use with snap-in jacks accommodating any combination of twisted pair, optical fiber, and coaxial work area cords.

    a. Flush mounting jacks, positioning the cord at a 45-degree angle.

K. Legend:

1. Machine printed, in the field, using adhesive-tape label.
2. Snap-in, clear-label covers and machine-printed paper inserts.

2.5 IDENTIFICATION PRODUCTS

A. Comply with TIA-606-B and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

2.6 GROUNDING

A. Comply with TIA-607-B.

2.7 SOURCE QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to evaluate cables.

B. Factory test cables on reels according to TIA-568-C.1.

C. Factory test twisted pair cables according to TIA-568-C.2.

D. Cable will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 WIRING METHODS

A. Wiring Method: Install cables in raceways and cable trays, except within consoles, cabinets, desks, and counters. Conceal raceway and cables, except in unfinished spaces.

1. Install plenum cable in environmental air spaces, including plenum ceilings.
2. Comply with requirements for raceways and boxes specified in Section 270528 "Pathways for Communications Systems."

B. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.

C. Wiring within Enclosures: Bundle, lace, and train cables within enclosures. Connect to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools. Install conductors parallel with or at right angles to sides and back of enclosure.

3.2 INSTALLATION OF PATHWAYS

A. Comply with requirements for demarcation point, cabinets, and racks specified in Section 271100 "Communications Equipment Room Fittings."

B. Drawings indicate general arrangement of pathways and fittings.

3.3 INSTALLATION OF TWISTED-PAIR HORIZONTAL CABLES

A. Comply with NECA 1 and NECA/BICSI 568.

B. General Requirements for Cabling:

1. Comply with TIA-568-C.0, TIA-568-C.1, and TIA-568-C.2.
2. Comply with BICSI's "Information Transport Systems Installation Methods Manual (ITSIMM), Ch. 5, "Copper Structured Cabling Systems," "Cable Termination Practices" Section.
3. Install 110-style IDC termination hardware unless otherwise indicated.
4. Do not untwist twisted pair cables more than 1/2 inch (12 mm) from the point of termination to maintain cable geometry.
5. Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
6. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches (760 mm) and not more than 6 inches (150 mm) from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
7. Install lacing bars to restrain cables, prevent straining connections, and prevent bending cables to smaller radii than minimums recommended by manufacturer.
8. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI Information Transport Systems Installation Methods Manual, Ch. 5, "Copper Structured Cabling Systems," "Cable Termination Practices" Section. Use lacing bars and distribution spools.
9. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation,and replace it with new cable.

10. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
11. In the communications equipment room, install a 10-foot- (3-m-) long service loop on each end of cable.
12. Pulling Cable: Comply with BICSI Information Transport Systems Installation Methods Manual, , "Copper Structured Cabling Systems," "Pulling and Installing Cable" Section. Monitor cable pull tensions.

C. Open-Cable Installation:

1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
2. Suspend twisted pair cabling, not in a wireway or pathway, a minimum of 8 inches (200 mm) above ceilings by cable supports not more than 48 inches apart.
3. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.

D. Group connecting hardware for cables into separate logical fields.

E. Separation from EMI Sources:

1. Comply with recommendations from BICSI's "Telecommunications Distribution Methods Manual" and TIA-569-D for separating unshielded copper communication cable from potential EMI sources, including electrical power lines and equipment.
2. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:

    a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches (127 mm).
    b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches (300 mm).
    c. Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches (600 mm).

3. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:

    a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1/2 inches (64 mm).
    b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches (150 mm).
    c. Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches (300 mm).

4. Separation between communications cables in grounded metallic raceways, power lines, and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:

    a. Electrical Equipment Rating Less Than 2 kVA: No requirement.

b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches (76 mm).
c. Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches (150 mm).

5. Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches (1200 mm).
6. Separation between Communications Cables and Fluorescent Fixtures: A minimum of 5 inches (127 mm).

3.4 FIRESTOPPING

A. Comply with requirements in Section 078413 "Penetration Firestopping."

B. Comply with TIA-569-D, Annex A, "Firestopping."

C. Comply with "Firestopping Systems" Article in BISCI's "Telecommunications Distribution Methods Manual."

3.5 GROUNDING

A. Install grounding according to the "Grounding, Bonding, and Electrical Protection" chapter in BICSI's "Telecommunications Distribution Methods Manual."

B. Comply with TIA-607-B and NECA/BICSI-607.

C. Locate grounding bus bar to minimize the length of bonding conductors. Fasten to wall, allowing at least a 2-inch (50-mm) clearance behind the grounding bus bar. Connect grounding bus bar to suitable electrical building ground, using a minimum No. 4 AWG grounding electrode conductor.

D. Bond metallic equipment to the grounding bus bar, using not smaller than a No. 6 AWG equipment grounding conductor.

3.6 IDENTIFICATION

A. Identify system components, wiring, and cabling complying with TIA-606-B. Comply with requirements for identification specified in Section 270553 "Identification for Communications Systems."

1. Administration Class: Class 2.
2. Color-code cross-connect fields and apply colors to voice and data service backboards, connections, covers, and labels.

B. Paint and label colors for equipment identification shall comply with TIA-606-B for Class 2 level of administration.

C. Cable Schedule: Install in a prominent location in each equipment room and wiring closet. List incoming and outgoing cables and their designations, origins, and destinations. Protect with rigid frame and clear plastic cover. Furnish an electronic copy of final comprehensive schedules for Project.

D. Cabling Administration Drawings: Show building floor plans with cabling administration-point labeling. Identify labeling convention and show labels for telecommunications closets, terminal hardware and positions, horizontal cables, work areas and workstation terminal positions, grounding buses and pathways, and equipment grounding conductors.

E. Cable and Wire Identification:

1. Label each cable within 4 inches (100 mm) of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
2. Each wire connected to building-mounted devices is not required to be numbered at the device if wire color is consistent with associated wire connected and numbered within panel or cabinet.
3. Exposed Cables and Cables in Cable Trays and Wire Troughs: Label each cable at intervals not exceeding 15 feet (4.5 m).
4. Label each terminal strip, and screw terminal in each cabinet, rack, or panel.

    a. Individually number wiring conductors connected to terminal strips, and identify each cable or wiring group, extended from a panel or cabinet to a building-mounted device, with the name and number of a particular device.
    b. Label each unit and field within distribution racks and frames.

5. Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and -connecting hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use a different color for jacks and plugs of each service.

F. Labels shall be preprinted or computer-printed type, with a printing area and font color that contrast with cable jacket color but still comply with TIA-606-B requirements for the following:

1. Cables use flexible vinyl or polyester that flexes as cables are bent.

3.7 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

C. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

D. Perform tests and inspections.

E. Tests and Inspections:

1. Visually inspect jacket materials for NRTL certification markings. Inspect cabling terminations in communications equipment rooms for compliance with color-

coding for pin assignments,and inspect cabling connections for compliance with TIA-568-C.1.

2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
3. Test twisted pair cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not cross-connection.

    a. Test instruments shall meet or exceed applicable requirements in TIA-568-C.2. Perform tests with a tester that complies with performance requirements in "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.

F. Data for each measurement shall be documented. Data for submittals shall be printed in a summary report that is formatted similarly to Table 10.1 in BICSI's "Telecommunications Distribution Methods Manual," or shall be transferred from the instrument to the computer, saved as text files, printed, and submitted.

G. Remove and replace cabling where test results indicate that they do not comply with specified requirements.

H. End-to-end cabling will be considered defective if it does not pass tests and inspections.

I. Prepare test and inspection reports.

END OF SECTION 27 15 13

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SECTION 27 15 33
COMMUNICATIONS COAXIAL HORIZONTAL CABLING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Communications coaxial cable.
2. CATV coaxial cable.
3. Coaxial cable hardware.
4. Grounding.
5. Identification products.

1.3 DEFINITIONS

A. BICSI: Building Industry Consulting Service International.

B. EMI: Electromagnetic interference.

C. IDC: Insulation displacement connector.

D. LAN: Local area network.

E. RCDD: Registered Communications Distribution Designer.

1.4 COAXIAL HORIZONTAL CABLING DESCRIPTION

A. Coaxial horizontal cabling system shall provide interconnections between Distributor A, Distributor B, or Distributor C and the equipment outlet, otherwise known as "Cabling Subsystem 1" in the telecommunications cabling system structure. Cabling system consists of horizontal cables, mechanical terminations, and patch cords or jumpers used for horizontal-to-horizontal cross-connection.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Nominal OD.
2. Minimum bending radius.
3. Maximum pulling tension.

B. Shop Drawings:

1. System Labeling Schedules: Electronic copy of labeling schedules, in software and format selected by Owner.
2. System Labeling Schedules: Electronic copy of labeling schedules that are part of the cabling and asset identification system of the software.
3. Cabling administration drawings and printouts.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For installation supervisor, and field inspector.

B. Source quality-control reports.

C. Field quality-control reports.

D. Maintenance Data: For splices and connectors to include in maintenance manuals.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For coaxial cable, splices, and connectors to include in maintenance manuals.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.

1. Layout Responsibility: Preparation of Shop Drawings, Cabling Administration Drawings, and field testing program development by an RCDD.
2. Installation Supervision: Installation shall be under the direct supervision of Technician, who shall be present at all times when Work of this Section is performed at Project site.

B. Testing Agency Qualifications: Testing agency must have personnel certified by BICSI on staff.

1. Testing Agency's Field Supervisor: Currently certified by BICSI as an RCDD.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Test cables upon receipt at Project site.

1. Test each coaxial cable for continuity.

1.10 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install cables and connecting materials until wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.11 COORDINATION

A. Coordinate layout and installation of telecommunications pathways and cabling with Owner's telecommunications and LAN equipment and service suppliers.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Horizontal cabling system shall comply with transmission standards in TIA-568-C.1, when tested according to test procedures of this standard, and the requirements of TIA-568-C.4.

B. Telecommunications Pathways and Spaces: Comply with TIA-569-D.

C. Grounding: Comply with TIA-607-B.

2.2 GENERAL CABLE CHARACTERISTICS

A. Communications Cable: Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with the applicable standard and NFPA 70 for the following types:

1. Communications, Plenum Rated: Type CMP complying with UL 1685.
2. Communications, Plenum Rated: Type CM, Type CMG, Type CMP, Type CMR, or Type CMX in metallic conduit installed per NFPA 70, Article 300.22, "Wiring in Ducts, Plenums, and Other Air-Handling Spaces."

B. CATV Cable: Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with the applicable standard and NFPA 70 for the following types:

1. CATV Plenum Rated: Type CATVP, complying with NFPA 262.

2.3 CATV COAXIAL CABLE

A. Description: Coaxial cable with a 75-ohm characteristic impedance designed for CATV transmission.

B. NFPA and UL compliance, listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 1655 and with NFPA 70, "Community Antenna Television and Radio Distribution Systems" Article. Types are as follows:

1. RG-6/U: UL Type CATVP.

    a. No. 18 AWG, solid, copper-covered steel conductor.
    b. Plenum rated.
    c. Gas-injected, foam-PE insulation.
    d. Shielded with 100 percent aluminum tape and 60 percent aluminum braid.
    e. Double shielded with 100 percent aluminum foil shield, 60 percent aluminum braided inner shield, and 40 percent aluminum braided outer shield.
    f. Jacketed with black PVC or PE.
    g. Suitable for indoor installations.

2.4 COAXIAL CABLE HARDWARE

A. Description: Hardware designed to connect, splice, and terminate coaxial cable with a 75-ohm characteristic impedance.

B. Coaxial-Cable Connectors: Type F, 75 ohms.

C. Jacks and Jack Assemblies: Modular, color-coded, with female Type BNC connectors.

D. Faceplates:

1. Plastic Faceplate: High-impact plastic. Coordinate color with Section 262726 "Wiring Devices."
2. For use with snap-in jacks accommodating any combination of twisted pair, optical-fiber, and coaxial work area cords.
    a. Flush-mounted jacks, positioning the cord at a 90-degree angle from faceplate surface.
3. Legend:
    a. Machine printed, in the field, using adhesive-tape label.
    b. Snap-in, clear-label covers and machine-printed paper inserts.

2.5 GROUNDING

A. Comply with requirements in Section 270526 "Grounding and Bonding for Communications Systems" for grounding conductors and connectors.

B. Comply with TIA-607-B.

2.6 IDENTIFICATION PRODUCTS

A. Comply with TIA-606-B and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

2.7 SOURCE QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to evaluate cables.

B. Cable will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 WIRING METHODS

A. Wiring Method: Install cables in raceways and cable trays except within consoles, cabinets, desks, and counters. Conceal raceway and cables except in unfinished spaces.

1. Install plenum cable in environmental air spaces, including plenum ceilings.
2. Comply with requirements for raceways and boxes specified in Section 270528 "Pathways for Communications Systems."

B. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.

C. Wiring within Enclosures: Bundle, lace, and train cables within enclosures. Connect to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

3.2 INSTALLATION OF PATHWAYS

A. Comply with Section 271100 "Communications Equipment Room Fittings." Comply with requirements in Section 270528 "Pathways for Communications Systems" for installation of conduits and wireways.

B. Comply with Section 270528.29 "Hangers and Supports for Communications Systems."

C. Drawings indicate general arrangement of pathways and fittings.

D. Comply with NFPA 70 for pull-box sizing and length of conduit and number of bends between pull points.

E. Install manufactured conduit sweeps and long-radius elbows whenever possible.

F. Pathway Installation in Communications Equipment Rooms:

1. Position conduit ends adjacent to a corner on backboard where a single piece of plywood is installed, or in the corner of room where multiple sheets of plywood are installed around perimeter walls of room.
2. Install cable trays to route cables if conduits cannot be located in these positions.
3. Secure conduits to backboard when entering room from overhead.
4. Extend conduits 6 inches above finished floor.
5. Install metal conduits with grounding bushings and connect with grounding conductor to grounding system.

G. Backboards: Install backboards with 96-inch (2440-mm) dimension vertical. Butt adjacent sheets tightly, and form smooth gap-free corners and joints.

3.3 INSTALLATION OF COAXIAL HORIZONTAL CABLES

A. Comply with NECA 1 and NECA/BICSI 568.

B. General Requirements for Cabling:

1. Comply with BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems," "Cable Termination Practices" Section.
2. Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, and patch panels.

3. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches (760 mm) and not more than 6 inches (150 mm) from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
4. Install lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.
5. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems," "Cable Termination Practices" Section. Use lacing bars and distribution spools.
6. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
7. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
8. In the communications equipment room, install a 10-foot- (3-m-) long service loop on each end of cable.
9. Pulling Cable: Comply with BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems," "Pulling Cable" Section. Monitor cable pull tensions.

C. Open-Cable Installation:

1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
2. Suspend coaxial cable not in a wireway or pathway a minimum of 8 inches (200 mm) above ceilings by cable supports not more than 48 inches apart.
3. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.

D. Group connecting hardware for cables into separate logical fields.

E. Separation from EMI Sources:

1. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:

    a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches (127 mm).
    b. Electrical Equipment Rating Between 2 and 5 kVA: A minimum of 12 inches (300 mm).
    c. Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches (610 mm).

2. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:

    a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1/2 inches (64 mm).
    b. Electrical Equipment Rating Between 2 and 5 kVA: A minimum of 6 inches (150 mm).

c. Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches (300 mm).

3. Separation between communications cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:

a. Electrical Equipment Rating Less Than 2 kVA: No requirement.
b. Electrical Equipment Rating Between 2 and 5 kVA: A minimum of 3 inches (76 mm).
c. Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches (150 mm).

4. Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches (1200 mm).
5. Separation between Communications Cables and Fluorescent Fixtures: A minimum of 5 inches (127 mm).

3.4 FIRESTOPPING

A. Comply with requirements in Section 078413 "Penetration Firestopping."

B. Comply with TIA-569-D, Annex A, "Firestopping."

C. Comply with BICSI TDMM, "Firestopping Systems" Article.

3.5 GROUNDING

A. Install grounding according to BICSI TDMM, "Grounding, Bonding, and Electrical Protection" Chapter.

B. Comply with TIA-607-B and NECA/BICSI-607.

C. Locate grounding bus bar to minimize the length of bonding conductors. Fasten to wall allowing at least 2-inch (50-mm) clearance behind the grounding bus bar. Connect grounding bus bar with a minimum No. 4 AWG grounding electrode conductor from grounding bus bar to suitable electrical building ground.

D. Bond metallic equipment to the grounding bus bar, using not smaller than No. 6 AWG equipment grounding conductor.

3.6 IDENTIFICATION

A. Identify system components, wiring, and cabling complying with TIA-606-B. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

1. Administration Class: Class 2.
2. Color-code fields and apply colors to voice and data service backboards, connections, covers, and labels.

B. Cable Schedule: Install in a prominent location in each equipment room and wiring closet. List incoming and outgoing cables and their designations, origins, and destinations. Protect with rigid frame and clear plastic cover. Furnish an electronic copy of final comprehensive schedules for Project.

C. Cabling Administration Drawings: Show building floor plans with cabling administration-point labeling. Identify labeling convention and show labels for telecommunications closets, horizontal pathways and cables, terminal hardware and positions, horizontal cables, work areas and workstation terminal positions, grounding buses and pathways, and equipment grounding conductors.

D. Cable and Wire Identification:

1. Label each cable within 4 inches (100 mm) of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
2. Each wire connected to building-mounted devices is not required to be numbered at device if color of wire is consistent with associated wire connected and numbered within panel or cabinet.
3. Exposed Cables and Cables in Cable Trays and Wire Troughs: Label each cable at intervals not exceeding 15 feet (4.5 m).
4. Label each terminal strip and screw terminal in each cabinet, rack, or panel.

    a. Individually number wiring conductors connected to terminal strips and identify each cable or wiring group being extended from a panel or cabinet to a building-mounted device with name and number of particular device as shown.
    b. Label each unit and field within distribution racks and frames.

5. Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and connecting hardware. Where similar jacks and plugs are used for both voice and data communications cabling, use a different color for jacks and plugs of each service.

E. Labels shall be preprinted or computer-printed type with printing area and font color that contrasts with cable jacket color but still complies with requirements in TIA 606-B, for the following:

1. Cables use flexible vinyl or polyester that flexes as cables are bent.

3.7 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

C. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

D. Perform the following tests and inspections.

E. Tests and Inspections:

1. Visually inspect coaxial jacket materials for NRTL certification markings.
2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
3. Test coaxial horizontal copper cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination.

F. Data for each measurement shall be documented. Data for submittals shall be printed in a summary report that is formatted similar to Table 10.1 in BICSI TDMM, or transferred from the instrument to the computer, saved as text files, and printed and submitted.

G. Remove and replace cabling where test results indicate that they do not comply with specified requirements.

H. End-to-end cabling will be considered defective if it does not pass tests and inspections.

I. Prepare test and inspection reports.

END OF SECTION 27 15 33

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SECTION 27 51 16
PUBLIC ADDRESS SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Preamplifiers.
2. Power amplifiers.
3. Equipment cabinet.
4. Telephone paging adapters.
5. Loudspeakers.
6. Conductors and cables.
7. Pathways.

1.3 DEFINITIONS

A. Channels: Separate parallel signal paths, from sources to loudspeakers or loudspeaker zones, with separate amplification and switching that permit selection between paths for speaker alternative program signals.

B. VU: Volume unit.

C. Zone: Separate group of loudspeakers and associated supply wiring that may be arranged for selective switching between different channels.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Power, signal, and control wiring.
1. Wiring Diagrams: For power, signal, and control wiring.

a. Identify terminals to facilitate installation, operation, and maintenance.
b. Single-line diagram showing interconnection of components.
c. Cabling diagram showing cable routing.

C. Delegated-Design Submittal: For supports and seismic restraints for control consoles, equipment cabinets and racks, and components indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Detail fabrication and assembly of supports and seismic restraints for control consoles, equipment cabinets and racks, and components.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Existing Simplex Series 5100 System

B. Source Limitations: Obtain public address system from single manufacturer.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Comply with NFPA 70.

2.2 FUNCTIONAL DESCRIPTION OF SYSTEM

A. System Functions:

1. Selectively connect any zone to any available signal channel.
2. Selectively control sound from microphone outlets and other inputs.
3. "All-call" feature shall connect the all-call sound signal simultaneously to all zones regardless of zone or channel switch settings.
4. Telephone paging adapter shall allow paging by dialing an extension from any local telephone instrument and speaking into the telephone.
5. Produce a program-signal tone that is amplified and sounded over all speakers, overriding signals currently being distributed.
6. Reproduce high-quality sound that is free of noise and distortion at all loudspeakers at all times during equipment operation including standby mode with inputs off; output free of nonuniform coverage of amplified sound.

2.3 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design supports and seismic restraints for control consoles, equipment cabinets and racks, and components, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

2.4 SYSTEM DESCRIPTION

A. Compatibility of Components: Coordinate component features to form an integrated system. Match components and interconnections for optimum performance of specified functions with existing Simplex system.

B. Equipment: Comply with UL 813. Equipment shall be modular, using solid-state components, and fully rated for continuous duty unless otherwise indicated. Select equipment for normal operation on input power usually supplied at 110 to 130 V, 60 Hz.

C. Equipment Mounting: Where rack, cabinet, or console mounting is indicated, equipment shall be designed to mount in a 19-inch (483-mm) housing complying with EIA/ECA-310-E.

D. Weather-Resistant Equipment: Listed and labeled by a qualified testing agency for duty outdoors or in damp locations.

2.5 POWER AMPLIFIERS

A. Mounting: Rack.

B. Output Power: 70-V balanced line. 80 percent of the sum of wattage settings of connected for each station and speaker connected in all-call mode of operation, plus a 15 percent allowance for future stations.

C. Total Harmonic Distortion: Less than 3 percent at rated power output from 50 to 12,000 Hz.

D. Minimum Signal-to-Noise Ratio: 80 dB, at rated output.

E. Frequency Response: Within plus or minus 3 dB from 20 to 12,000 Hz.

F. Output Regulation: Less than 2 dB from full to no load.

G. Controls: On-off, input levels, and low-cut filter.

H. Input Sensitivity: Matched to preamplifier and to provide full-rated output with sound-pressure level of less than 10 dynes/sq. cm impinging on speaker microphone or handset transmitter.

2.6 EQUIPMENT CABINET

A. Existing cabinet to be relocated and re-used.

B. Comply with EIA/ECA-310-E.

C. House amplifiers and auxiliary equipment at each location.

2.7 LOUDSPEAKERS

A. Cone-Type Loudspeakers:

1. Minimum Axial Sensitivity: 91 dB at 1 m, with 1-W input.
2. Frequency Response: Within plus or minus 3 dB from 50 to 15,000 Hz.
3. Size: 8 inches (200 mm) with 1-inch (25-mm) voice coil and minimum 5-oz. (140-g) ceramic magnet.
4. Rated Output Level: 8 W.
5. Minimum Dispersion Angle: 100 degrees.
6. Matching Transformer: Full-power rated with four taps. Maximum insertion loss of 0.5 dB.
7. Surface-Mounted Units: Ceiling, wall, or pendant mounted, as indicated, in steel back boxes, acoustically dampened. Front face of at least 0.0478-inch (1.2-mm) steel and whole assembly rust proofed and shop primed for field painting.
8. Flush-Ceiling-Mounted Units: In steel back boxes, acoustically dampened. Metal ceiling grille with white baked enamel.

B. Horn-Type Loudspeakers:

1. Type: Single-horn units, double-reentrant design, with minimum full-range power rating of 15 W.
2. Matching Transformer: Full-power rated with four standard taps. Maximum insertion loss of 0.5 dB.
3. Frequency Response: Within plus or minus 3 dB from 250 to 12,000 Hz.
4. Dispersion Angle: 130 by 110 degrees.
5. Mounting: Integral bracket.
6. Units in Damp, Wet, or Outdoor Locations: Listed and labeled for environment in which they are located.
7. Units in Hazardous (Classified) Locations: Listed and labeled for environment in which they are located. Provide any accessories required to maintain listing.

2.8 OUTLETS

A. Volume Attenuator Station: Wall-plate-mounted autotransformer type with paging priority feature.

1. Wattage Rating: 10 W unless otherwise indicated.
2. Attenuation per Step: 3 dB, with positive off position.
3. Insertion Loss: 0.4 dB maximum.
4. Attenuation Bypass Relay: SPDT. Connected to operate and bypass attenuation when all-call, paging, program signal, or prerecorded message features are used. Relay returns to normal position at end of priority transmission.
5. Label: "PA Volume."

2.9 CONDUCTORS AND CABLES

A. Jacketed, twisted pair and twisted multipair, untinned solid copper.

1. Insulation for Wire in Conduit: Thermoplastic, not less than 1/32 inch (0.8 mm) thick.
2. Plenum Cable: Listed and labeled for plenum installation.

2.10 PATHWAYS

A. Conduit and Boxes: Comply with Section 270528 "Pathways for Communications Systems."

1. Outlet boxes shall be not less than 2 inches (50 mm) wide, 3 inches (75 mm) high, and 2-1/2 inches (64 mm) deep.

PART 3 - EXECUTION

3.1 WIRING METHODS

A. Wiring Method: Install cables in pathways and cable trays except within consoles, cabinets, desks, and counters. Conceal pathway and cables except in unfinished spaces.

1. Install plenum cable in environmental air spaces, including plenum ceilings.
2. Comply with requirements for pathways and boxes specified in Section 270528 "Pathways for Communications Systems."

B. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.

C. Wiring within Enclosures: Bundle, lace, and train cables to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

3.2 INSTALLATION OF PATHWAYS

A. Install manufactured conduit sweeps and long-radius elbows whenever possible.

3.3 INSTALLATION OF CABLES

A. Comply with NECA 1.

B. General Cable Installation Requirements:

1. Terminate conductors; no cable shall contain unterminated elements. Make terminations only at outlets and terminals.
2. Splices, Taps, and Terminations: Arrange on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures. Cables may not be spliced.
3. Secure and support cables at intervals not exceeding 30 inches (760 mm) and not more than 6 inches (150 mm) from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
4. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.
5. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
6. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used.

C. Open-Cable Installation:

1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
2. Suspend speaker cable not in a wireway or pathway a minimum of 8 inches (200 mm) above ceiling by cable supports not more than 60 inches (1524 mm) apart.
3. Cable shall not be run through structural members or be in contact with pipes, ducts, or other potentially damaging items.

D. Separation of Wires: Separate speaker-microphone, line-level, speaker-level, and power wiring runs. Install in separate pathways or, where exposed or in same enclosure, separate conductors at least 12 inches (300 mm) apart for speaker microphones and

adjacent parallel power and telephone wiring. Separate other communication equipment conductors as recommended by equipment manufacturer.

3.4 INSTALLATION

A. System will be a relocation and expansion of existing Simplex System.

B. Coordinate layout and installation of system components and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

C. Match input and output impedances and signal levels at signal interfaces. Provide matching networks where required.

D. Identification of Conductors and Cables: Color-code conductors and apply wire and cable marking tape to designate wires and cables so they identify media in coordination with system wiring diagrams.

E. Equipment Cabinets and Racks:

1. Group items of same function together, either vertically or side by side, and arrange controls symmetrically. Mount monitor panel above the amplifiers.
2. Arrange all inputs, outputs, interconnections, and test points so they are accessible at rear of rack for maintenance and testing, with each item removable from rack without disturbing other items or connections.
3. Blank Panels: Cover empty space in equipment racks so entire front of rack is occupied by panels.

F. Volume Limiter/Compressor: Equip each zone with a volume limiter/compressor. Install in central equipment cabinet. Arrange to provide a constant input to power amplifiers.

G. Conductor Sizing: Unless otherwise indicated, size speaker circuit conductors from racks to loudspeaker outlets not smaller than No. 18 AWG and conductors from microphone receptacles to amplifiers not smaller than No. 22 AWG.

H. Speaker-Line Matching Transformer Connections: Make initial connections using tap settings indicated on Drawings.

I. Connect wiring according to Section 271500 "Communications Horizontal Cabling"

3.5 GROUNDING

A. Ground cable shields and equipment to eliminate shock hazard and to minimize ground loops, common-mode returns, noise pickup, cross talk, and other impairments.

B. Signal Ground Terminal: Locate at main equipment cabinet. Isolate from power system and equipment grounding.

3.6 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

C. Perform tests and inspections.

D. Tests and Inspections:

1. Schedule tests with at least seven days' advance notice of test performance.
2. After installing public address system and after electrical circuitry has been energized, test for compliance with requirements.
3. Operational Test: Perform tests that include originating program and page messages at microphone outlets, preamplifier program inputs, and other inputs. Verify proper routing and volume levels and that system is free of noise and distortion.
4. Distortion Test: Measure distortion at normal gain settings and rated power. Feed signals at frequencies of 50, 200, 400, 1000, 3000, 8000, and 12,000 Hz into each preamplifier channel. For each frequency, measure distortion in the paging and all-call amplifier outputs. Maximum acceptable distortion at any frequency is 3 percent total harmonics.
5. Power Output Test: Measure electrical power output of each power amplifier at normal gain settings of 50, 1000, and 12,000 Hz. Maximum variation in power output at these frequencies must not exceed plus or minus 1 dB.
6. Signal Ground Test: Measure and report ground resistance at public address equipment signal ground. Comply with testing requirements specified in Section 270526 "Grounding and Bonding for Communications Systems."

E. Inspection: Verify that units and controls are properly labeled and interconnecting wires and terminals are identified. Prepare a list of final tap settings of paging speaker-line matching transformers.

F. Public address system will be considered defective if it does not pass tests and inspections.

G. Prepare test and inspection reports.

1. Include a record of final speaker-line matching transformer-tap settings and signal ground-resistance measurement certified by Installer.

END OF SECTION 27 51 16

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SECTION 27 53 13
WIRELESS CLOCK SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplemental Conditions and Division o1 Specification Section shall apply to this Section

1.2 SUMMARY

A. Provide a complete new Wireless Clock System using the Primex OneVue™ platform.

B. The Owner will Furnish all system devices and components. The Contractor will install and wire all components requiring power and data connectivity, and will provide all miscellaneous accessories, and materials in accordance with these specifications and drawings to provide a complete and operating Wireless Clock System.

C. All bids shall be based on the equipment as specified herein. The model designations are that of Primex. The specifying authority must approve any alternate Wireless Clock System.

D. The Owner will furnish the system Devices listed below in quantities as required:

1. Bridge with 802.11 Wi-Fi and Bluetooth® low energy wireless technology (to be furnished by the Owner, installed and wired by the Electrical Contractor)
2. Battery operated Analog Clocks with Bluetooth® low energy wireless technology (to be installed by the Owner). Battery shall be furnished by the supplier of the clocks.
3. Digital Clocks with Bluetooth® low energy wireless technology (to be installed and wired by the Electrical Contractor).

E. Section Includes:

1. Program signal devices.
2. Clock circuit power boosters.
3. System wire and cable.

1.3 RELATED SECTIONS

A. Division 26 Section “Common Work Results for Electrical”

B. Division 27 Section "Common Work Results for Communications"

C. Division 27 Section "Communications Horizontal Cabling"

1.4 ACTION SUBMITTALS

A. Product Data: Submit complete catalog data for each system device and components, describing physical characteristics and method of installation.

B. Shop Drawings: Showing the following.

1. Diagram of proposed system showing communication pathway and schedule of individual system device installation locations.
2. Indicate integration with the Owner's network. Include a line diagram of network relationships.
3. Show system device power requirements.

C. Samples: Submit one specified system device model(s) for approval. Approved sample(s) shall be tagged and shall be installed at location directed.

D. Manufacturer Instructions: Submit complete installation, set-up and maintenance instructions electronically.

1.5 INFORMATIONAL SUBMITTALS

A. Manufacturer Sample Warranty

B. Manufacturer Technical Support Agreement (TSA)

1.6 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.7 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

1.8 REFERENCES

A. Federal Communications Division (FCC); Part 15 - Code of Federal Regulations.

B. National Fire Protection Association (NFPA); NFPA 70E- [2012], Standard for Electrical safety in the Workplace.

C. Institute of Electrical and Electronics Engineers (IEEE); IEEE 802.3af- [1998], Standard for Information Technology - Telecommunications and Information Exchange Between Systems.

D. Bluetooth® wireless technology standard 4.1

1.9 DEFENITIONS

A. TSA: Technical Support Agreement

B. AWS: Amazon Web Services

C. TLS: Transport Layer Security

D. HTTPS: Hypertext Transfer Protocol Secure

E. Bluetooth® low energy - a wireless technology protocol which can be used for communication between embedded devices and smart devices.

F. SNTP – Simple Network Time Protocol.

G. PoE - Power over Ethernet

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Master clock and housing shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."

2.2 WIRELESS CLOCK SYSTEM

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. PRIMEX – Bluetooth – One-Vue platform.

B. System Functions and Features:

1. System shall provide synchronized time by way of system devices and a cloud-based system software, hosted by the Manufacturer, that allows Owner to manage and monitor system devices.
2. System can be scaled from a single building to a network of buildings, or an enterprise spread across many time zones, providing traceable of accuracy, data and performance.
3. System shall consist of system clock devices enabled with Bluetooth low energy wireless technology or enabled with Power over Ethernet (PoE) technology.
4. System Bluetooth clocks shall not be required to have a direct connection to the Owner’s existing Power over Ethernet (PoE) or 802.11 wireless network.
5. System devices enabled with 802.11, Power over Ethernet (PoE) technology shall be required to have a direct connection to the Owner’s existing network.
6. System Bluetooth clocks shall form a system Bluetooth wireless network by way of the proprietary Bluetooth Network Protocol designed and developed by the Manufacturer, that allows system Bluetooth clocks to form a Bluetooth wireless technology network to allow a communication path to send clock data to the system Bridge devices.
7. System Bridge(s) shall receive data from system Bluetooth clocks and send the data to the system software. Bridge shall download settings from the system software and send settings to the system Bluetooth clocks.

8. System shall not require the installation of any on-site system hardware or software, with the exception of the specified system devices.

9. Supply power to all Bluetooth One-Vue components and digital clocks.

10. Maintain correct synchronized time and transmit time-correction signals over dedicated system wiring from a master clock to any one type(s) of secondary indicating clocks, including the following:

    a. Analog Synchronous Clocks: Correct for minute- and second-hand synchronization at least once each hour and for hour-hand synchronization at least once each day.
    b. Digital Clocks: Test clocks automatically for synchronization with master time control at least once every hour and automatically correct those not synchronized with the time reference unit. Automatically correct clocks immediately when power is restored after an outage of power to the master clock.

11. Initiate and execute programs for scheduled automatic operation of remote devices. Include visual signal devices.
12. Communicate with remote PC for access to UTC time base and to permit programming from remote location.
13. Maintain system access security with a minimum of two levels of user-access control to restrict use of system controls to authorized personnel. Levels of access apply to both local access and access from a remote computer. Access to user programming and control functions is accomplished by entering a minimum three-digit code. Access levels include the following:

    a. Access to review existing programs only.
    b. Access to normal system operating controls.
    c. Access to all user-programming and control functions.

14. Regulate system timing functions using power-line frequency, backed up for power outages by an internal battery-powered, crystal-controlled oscillator.
15. Provide for programming multiple independent event schedules into memory and running them simultaneously for different output circuits.

    a. Quantity of Programmable Schedules: Eight, minimum.
    b. Number of Weekly Events That Can Be Programmed for Each Schedule: 64, minimum.
    c. Simultaneous operation of independent schedules shall be limited only by the number of signal-device and equipment-switching output circuits.
    d. Advance Programming for Automatic Holiday Schedule Changes: Number of schedule changes that can be programmed to suit holidays and vacations shall be 10, and each change may be programmed up to a year in advance to occur on any day of the calendar year.

16. Provide programming for automatic daylight savings time correction.
17. Provide for adjustments to master clock output signals. Duration of momentary signal shall be individually programmable for each signal and equipment-control

output circuit from 1 to 99 seconds. Signals shall be programmable for either on or off switching to suit equipment-operation scheduling.

C. System Bluetooth Wireless network platform

1. System Bluetooth wireless network shall be able to adjust and synchronize system Bluetooth clocks to specified Time Zone Offset and DST rules; time zone settings are managed within the system software and sent to the system Bluetooth clocks over the system Bluetooth wireless network.
2. System Bluetooth wireless network protocol shall form a tree-type topology; where clock data transfer is up or down in a tree structure topology; a path with highest Bluetooth Wireless Signal level quality is chosen at any time.
3. System Bluetooth wireless network shall have the capability to distinguish the system Bluetooth devices with Bluetooth wireless technology by the system devices' unique Device ID and/or Network ID; allowing only system Bluetooth devices to authenticate to the system Bluetooth wireless network.
4. At a system set daily time interval, the system Bluetooth clocks shall advertise their Bluetooth signal to form a system Bluetooth wireless network.
5. System Bluetooth wireless network shall be self-forming, self-healing, and self-organizing.
6. Self-healing: in the event of a system Bluetooth clock hardware failure or loss of Bluetooth wireless signal, a connection previously handled by it is rerouted to another clock within the system Bluetooth wireless network.
7. Self-forming: a system Bluetooth wireless network is automatically formed once daily at a system set time to allow system Bluetooth clocks to advertise their status to form the system Bluetooth wireless network.
8. Self-organizing: The System Bluetooth wireless network protocol automatically connects system Bluetooth clocks, that are within Bluetooth wireless range, to form a data transmission path within the system Bluetooth wireless network.

2.3 BRIDGE

A. Bridge shall be equipped with Bluetooth enabled gateway; which allows the device to send and receive communication to and from system Bluetooth clocks.

B. Bridge devices shall connect to the Owner’s existing wired Ethernet, PoE, or 802.11 wireless network to send its device data and system Bluetooth clock data to the system software and download its device settings and clock settings from the system software.

C. Bridge shall send settings to system Bluetooth clocks within the system Bluetooth wireless network. Each system Bluetooth clock is identified by a unique Device ID allowing each clock to receive its unique Device ID settings. Device ID settings shall be managed in the system software. Bluetooth Analog Clock Device ID settings include its Time Zone Offset setting and DST rules. Bluetooth Digital Clock/Timer Device ID settings include its Time Zone Offset setting and DST rules and display settings.

D. Bridge shall listen and receive system Bluetooth clock data advertised in the system Bluetooth wireless network. During its 8-hour deployment mode, a Bridge shall send a new Bluetooth clock Device IDs to the system software within 30 minutes of receiving it. If not in 8-hour deployment mode, new Bluetooth clock data is sent the system software within 24 hours.

E. Bridge shall obtain Coordinated Universal Time (UTC) derived from a Network Time Protocol (NTP) Server (either internal or external); up to three designated NTP Servers may be specified to ensure continuity of time synchronization. The Bridge shall send obtained UTC time received from its NTP Server to the system Bluetooth clocks and the clocks shall synchronize the received UTC time to their Time Zone Offset setting and DST rules.

F. Bridge devices shall be primarily powered by [ac-power] [Power over Ethernet]. Battery-power shall be used only as a backup power source for a relatively short period of time.

G. Bridge devices that connect to a Wi-Fi or Non-DHCP network can be preconfigured by the Manufacturer with Owner provided settings before shipment to Owner facility or configured locally at the device by the Owner on-site.

H. Bridge devices shall have a LCD screen that displays connection status, and indicate when in an error or alarm state.

I. Bridge devices shall have LED indicators, located on the front of the device, that provide a visual indicator of its current status and operating state.

J. Bridge device shall have the ability to store configuration data for up to 1400 Bluetooth clocks in its local device memory; to avoid loss of data if a network connectivity issue prevents data to be sent to the system software.

K. Check-in interval setting shall be set by the system. Check-in Interval is the frequency the Bridge device is scheduled establish a network connection to Owners network to send data to and download data from the system software.

L. Unresponsive timeout setting shall be set by the system. Unresponsive timeout is defined as the amount of time a device can go without a connection to the system software; when this time is exceeded, the system sets the device to a warning state.

2.4 SECONDARY INDICATING CLOCKS

A. Analog Clock:

1. Equipped with a sweep second hand. Movement shall be driven by self-starting, permanently lubricated, sealed synchronous motor equipped with a correcting solenoid actuator, or be a microprocessor-based, second impulse unit, compatible with the Bridge Bluetooth.
2. Clocks (single sided) shall be wall mounted.
3. Additional colors, finishes, and dial faces are available from Manufacturer.
4. Clock faces can be customized by Manufacturer to display organization name or logo as specified.
5. Clock frames and lenses are of durable thermoplastic.
6. Clocks shall have a tamper proof/theft resistant clock-lock mounting slots.
7. A dual-mount kit is available from the Manufacturer that combines two single clocks to create a dual-sided clock.
8. Clocks shall be capable of automatically adjusting for Daylight Saving Time.
9. Size 16”, Color BLACK housing with WHITE face.
10. Battery-operated analog clocks shall have a 5-year nominal battery life.

11. Clock System Supplier to furnish clock batteries.

B. Digital Clock:

1. Microprocessor-controlled unit complying with Class A device requirements in 47 CFR 15, with red LED digital time display of hours and minutes.
2. The clock LED display must include a 12- or 24-hour time display, a PM indicator light, and an alternating time and date display option.
3. A dual-mount kit is available from the Manufacturer that combines two single clocks into a dual-sided clock.
4. Clock shall be capable of automatically adjusting for Daylight Saving Time.
5. AC (120 VAC/50-60 cycle) models, with Bluetooth wireless technology, shall include a 10’ (3m) power cord with a plug
6. The power plug may be removed and cord cut to length for hardwired (pigtail) installation. Pigtail installation requires a 120V~ power line in a junction box installed by a licensed electrician.
7. Flush mount models, with Bluetooth wireless technology, shall have a 30" (44.72 cm) AC-power cord with pigtail.
8. Clock shall have a power outage memory backup and maintain correct time up to a minimum of 1 hour without power.
9. Clock shall be viewable from 150 feet (45.7m).
10. Clock shall have highly visible 7-segment LED digits.
11. Clock shall have display dimmer options, including 100%, 75%, 50%, and 25%.
12. Additional LED colors, sizes, digit layouts, mounts, and timer options are available from the Manufacturer.
13. Clock enclosure shall be ABS plastic and junction box shall be UL listed (UL 50E 1st Ed).
14. Color -BLACK with RED LETTERING
15. Surface mount -4” Digits single or double faced as indicated on the plans.

2.5 PROGRAM SIGNAL DEVICES

A. Bells: Heavy-duty, modular, vibrating type with the following sound-output ratings measured at 10 feet (3 m):

1. 4-Inch (100-mm) Bell: 90 dB.
2. 6-Inch (150-mm) Bell: 95 dB.
3. 10-Inch (250-mm) Bell: 104 dB.

B. Chimes: Heavy-duty, modular, vibrating chimes with polished-chrome tone bar and enamel-finished housing. Minimum sound-output rating measured at 10 feet (3 m) shall be 75 dB.

C. Clock Buzzers: Adjustable output signal device designed for mounting within clock housing or outlet box.

1. Sound-Output Rating Measured at 3 Feet (1 m): 75 dB.
2. Audible Tone Frequency: Manufacturer's standard between 120 Hz and 2 kHz.

D. Horns: Modular, adjustable-output, vibrating type with minimum full-intensity-rated sound output of 103 dB measured at 10 feet (3 m).

E. Projector Horns: Adjustable-output, vibrating type with single projector arranged to channel sound in the direction of the projector axis, and with minimum full-intensity-rated sound output of 104 dB measured at 10 feet (3 m).

F. Loudspeakers for audible tones.

G. Visible Signal Devices: Strobe lights with blue polycarbonate lens and xenon flash tube, with lens mounted on an aluminum faceplate and the word "Program" engraved in letters at least 1 inch (25 mm) high on lens. Lamp unit shall have a minimum rated light output of 75 candela.

H. Combination Audible and Visible Signal Devices: Factory-integrated horn and strobe light in a single mounting assembly.

I. Outdoor Signal Equipment: Weatherproof models listed for outdoor use.

J. Mounting Arrangement for Signal Devices: Designed for attachment with screws on the mounting plate of a flush-mounted back box unless otherwise indicated.

K. Enclosures for Flush-Mounting Bells and Horns: Enclosure, mounting plate, and grille assembly shall be furnished by device manufacturer to match features of the device to be mounted. Enclosure shall be recessed in wall, completely enclosing the device, with grille mounting over the open side of the enclosure and flush with the wall.

L. Connection Provision for Signal-Indicating Devices: Plug connector.

2.6 CLOCK CIRCUIT POWER BOOSTER

A. Description: Transformer power supply, mounted in steel cabinet with hinged door, and having fuse-protected input and output circuits.

2.7 BACK BOXES FOR SECONDARY INDICATING CLOCKS AND PROGRAM DEVICES

A. Description: Box and cover-plate assembly shall be furnished by device manufacturer and be suitable for device to be mounted. Back boxes shall be equipped with knockouts and hanger straps or mounting adapters arranged for flush mounting the device unless otherwise indicated.

2.8 GUARDS

A. Description: Formed-steel wire, shaped to fit around guarded device, with 1-inch (25-mm) maximum clearance.

1. Mounting Provisions: Fixed tabs, welded to guard and arranged for screw attachment to mounting surface.
2. Finish for Indoor Devices: Clear epoxy lacquer over zinc plating.
3. Finish for Outdoor Devices: Black powder coat over zinc plating and primer.

2.9 CONDUCTORS AND CABLES

A. Conductors: Jacketed, twisted pair and twisted multipair, untinned solid copper. Sizes as recommended by system manufacturer, but not smaller than No. 18 AWG. Voltage drop

for signal, control, and clock correction circuits shall not exceed 10 percent under peak load conditions.

B. 120-V AC and Class 1 Signal and Control Circuits: Stranded, single conductors of size and type recommended by system manufacturer.

C. Class 2 and Class 3 Signal and Control Circuits: Single conductor or twisted-pair cable, unshielded, unless manufacturer recommends shielded cable.

D. Data Circuits: Category 6 minimum, unshielded, balanced twisted-pair cable, unless manufacturer recommends shielded cable.

E. Insulation: Thermoplastic, not less than 1/32 inch (0.8 mm) thick.

F. Plenum Cable: Listed and labeled for plenum installation.

G. Conductor Color-Coding: Uniformly identified and coordinated with wiring diagrams.

PART 3 - EXECUTION

3.1 WIRING METHODS

A. Wiring Method: Install cables in raceways and cable trays except within consoles, cabinets, desks, and counters and except in accessible ceiling spaces and in gypsum board partitions where unenclosed wiring method may be used. Conceal raceway and cables except in unfinished spaces.

1. Install plenum cable in environmental air spaces, including plenum ceilings.

B. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.

C. Wiring within Enclosures: Bundle, lace, and train cables to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

D. Support cables not enclosed in raceways on J-Hooks. Install, size, and space J-Hooks to comply with TIA/EIA-568-B.

3.2 ELECTRICAL CONNECTIONS

A. Make splices, taps, and terminations on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

B. Use plug connectors for connections to clocks and signal devices.

C. Ground clocks, programming equipment, and conductor and cable shields to eliminate shock hazard and to minimize ground loops, common-mode returns, noise pickup, cross talk, and other impairments.

3.3 IDENTIFICATION

A. Comply with Section 260553 "Identification for Electrical Systems."

B. Color-code wires and apply wire and cable marking tape to designate wires and cables so they are uniformly identified and coordinated with wiring diagrams throughout the system.

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Tests and Inspections:

1. Perform operational-system tests to verify compliance with the Specifications and make adjustments to bring system into compliance. Include operation of all modes of clock correction and all programming and manually programmed signal and relay operating functions.
2. Verify that units and controls are properly labeled, and interconnecting wires and terminals are identified.

C. Clock system will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.5 ADJUSTING

A. Program system according to Owner's requirements. Set system so signal devices operate on Owner-required schedules and are activated for durations selected by Owner. Program equipment-control output circuits to suit Owner's operating schedule for equipment controlled.

B. Adjust sound-output level of adjustable signal devices to suit Owner's requirements.

C. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain clock-and-program-control system components.

3.7 SERVICES

A. Manufacturer system software user guides and system device installation guides shall be provided electronically.

B. Provide system commissioning in accordance with Manufacturer written recommendations. Perform operational testing to verify compliance with requirements. Adjust as required.

END OF SECTION 27 53 13

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SECTION 28 13 00
ACCESS CONTROL SOFTWARE AND DATABASE MANAGEMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Security access central-control station.
2. One or more security access networked workstations.
3. Security access operating system and application software.
4. Security access controllers connected to high-speed electronic-data transmission network.

B. Related Requirements:

1. Section 281500 "Access Control System Hardware Devices" for access control system hardware, such as keypads, card readers, and biometric identity devices.

1.3 DEFINITIONS

A. Credential: Data assigned to an entity and used to identify that entity.

B. DTS: Digital Termination Service. A microwave-based, line-of-sight communication provided directly to the end user.

C. Identifier: A credential card; keypad personal identification number; or code, biometric characteristic, or other unique identification entered as data into the entry-control database for the purpose of identifying an individual. Where this term is presented with an initial capital letter, this definition applies.

D. Location: A Location on the network having a workstation-to-controller communications link, with additional controllers at the Location connected to the workstation-to-controller link with a TIA 485-A communications loop. Where this term is presented with an initial capital letter, this definition applies.

E. Workstation: Personal computer. Applies to the central station, workstations, and file servers.

F. RAS: Remote access services.

G. RF: Radio frequency.

H. ROM: Read-only memory. ROM data are maintained through losses of power.

I. TCP/IP: Transport control protocol/Internet protocol.

J. TWAIN: Technology without an Interesting Name. A programming interface that lets a graphics application, such as an image editing program or desktop publishing program, activate a scanner, frame grabber, or other image-capturing device.

K. WMP: Windows media player.

L. Wiegand: Patented magnetic principle that uses specially treated wires embedded in the credential card.

M. WYSIWYG: What You See Is What You Get. Text and graphics appear on the screen the same as they will in print.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. Reference each product to a location on Drawings. Test and evaluation data presented in Product Data shall comply with SIA BIO-01.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Diagrams for cable management system.
2. System labeling schedules, including electronic copy of labeling schedules that are part of the cable and asset identification system of the software specified in Parts 2 and 3.
3. Wiring Diagrams. For power, signal, and control wiring. Show typical wiring schematics including the following:

    a. Workstation outlets, jacks, and jack assemblies.
    b. Patch cords.
    c. Patch panels.

4. Cable Administration Drawings: As specified in "Identification" Article.
5. Battery and charger calculations for central station, workstations, and controllers.

C. Product Schedules.

D. Samples: For workstation outlets, jacks, jack assemblies, and faceplates. For each exposed product and for each color and texture specified.

1.5 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For security system to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

1. Workstation operating system documentation.
2. Workstation installation and operating documentation, manuals, and software for the workstation and all installed peripherals. Software shall include system restore, emergency boot diskettes, and drivers for all installed hardware. Provide separately for each workstation.
3. Hard copies of manufacturer's specification sheets, operating specifications, design guides, user's guides for software and hardware, and PDF files on USB media of the hard-copy submittal.
4. System installation and setup guides with data forms to plan and record options and setup decisions.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer.

1. Cable installer must have on staff an RCDD certified by Building Industry Consulting Service International.

B. Source Limitations: Obtain central station, workstations, controllers, Identifier readers, and all software through one source from single manufacturer.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Central Station, Workstations, and Controllers:

1. Store in temperature- and humidity-controlled environment in original manufacturer's sealed containers. Maintain ambient temperature between 50 and 85 deg F (10 and 30 deg C), and not more than 80 percent relative humidity, noncondensing.
2. Open each container; verify contents against packing list; and file copy of packing list, complete with container identification, for inclusion in operation and maintenance data.
3. Mark packing list with the same designations assigned to materials and equipment for recording in the system labeling schedules that are generated by software specified in "Cable and Asset Management Software" Article.
4. Save original manufacturer's containers and packing materials and deliver as directed under provisions covering extra materials.

1.9 PROJECT CONDITIONS

A. Environmental Conditions: System shall be capable of withstanding the following environmental conditions without mechanical or electrical damage or degradation of operating capability:

1. Control Station: Rated for continuous operation in ambient conditions of 60 to 85 deg F (16 to 30 deg C) and a relative humidity of 20 to 80 percent, noncondensing.
2. Indoor, Controlled Environment: NEMA 250, Type 1 enclosure. System components, except the central-station control unit, installed in temperature-controlled indoor environments shall be rated for continuous operation in ambient

conditions of 36 to 122 deg F (2 to 50 deg C) dry bulb and 20 to 90 percent relative humidity, noncondensing.

3. Indoor, Uncontrolled Environment: NEMA 250, Type 3R enclosures. System components installed in non-temperature-controlled indoor environments shall be rated for continuous operation in ambient conditions of 0 to 122 deg F (minus 18 to plus 50 deg C) dry bulb and 20 to 90 percent relative humidity, noncondensing.

PART 2 - PRODUCTS

2.1 ACCESS CONTROL SOFTWARE

A. Existing Brivo Access Control System

2.2 DESCRIPTION

A. Security Access System: New doors will connect into existing Brivo Access Control System.

2.3 OPERATION

A. Security access system shall use a single database for access-control and credential-creation functions.

B. Central station shall provide operator interface, interaction, display, control, and dynamic and real-time monitoring. Central station shall control system networks to interconnect all system components, including workstations and field-installed controllers.

C. Field equipment shall include controllers, sensors, and controls.

1. Controllers shall serve as an interface between the central station and sensors and controls.
2. Data exchange between the central station and the controllers shall include down-line transmission of commands, software, and databases to controllers.
3. The up-line data exchange from the controller to the central station shall include status data such as intrusion alarms, status reports, and entry-control records.
4. Controllers are classified as alarm-annunciation or entry-control type.

D. Door Hardware Interface:

1. Comply with requirements in Section 087100 "Door Hardware" and Section 087111 "Door Hardware (Descriptive Specification)" for door hardware required to be monitored or controlled by the security access system.
2. Electrical characteristics of controllers shall match the signal and power requirements of door hardware.

2.4 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70, "National Electrical Code."

C. Comply with SIA DC-01 and SIA DC-03 and SIA DC-07.

2.5 SYSTEM DATABASE

A. System to utilize existing Brivo Database.

B. Verify license requirements and provide adequate license for additional doors as indicated on drawings.

C. Database and database management software shall define and modify each point in

2.6 SURGE AND TAMPER PROTECTION

A. Surge Protection: Protect components from voltage surges originating external to equipment housing and entering through power, communication, signal, control, or sensing leads. Include surge protection for external wiring of each conductor-entry connection to components.

1. Minimum Protection for Power Connections 120 V and More: Auxiliary panel suppressors complying with requirements in Section 264313 "Surge Protection for Low-Voltage Electrical Power Circuits."
2. Minimum Protection for Communication, Signal, Control, and Low-Voltage Power Connections: Comply with requirements in Section 264313 "Surge Protection for Low-Voltage Electrical Power Circuits" as recommended by manufacturer for type of line being protected.

B. Tamper Protection: Tamper switches on enclosures, control units, pull boxes, junction boxes, cabinets, and other system components shall initiate a tamper-alarm signal when unit is opened or partially disassembled. Control-station control-unit alarm display shall identify tamper alarms and indicate locations.

2.7 CONTROLLERS

A. Controllers: Intelligent peripheral control unit, complying with UL 294, that stores time, date, valid codes, access levels, and similar data downloaded from the central station or workstation for controlling its operation.

B. Subject to compliance with requirements in this article, manufacturers may use multipurpose controllers.

C. Battery Backup: Sealed, lead acid; sized to provide run time during a power outage of 90 minutes, complying with UL 924.

D. Entry-Control Controller:

1. Function: Provide local entry-control functions including one- and two-way communications with access-control devices such as card readers, keypads, biometric personnel identity-verification devices, door strikes, magnetic latches, gate and door operators, and exit push buttons.

    a. Operate as a stand-alone portal controller using the downloaded database during periods of communication loss between the controller and the field-device network.
    b. Accept information generated by the entry-control devices; automatically process this information to determine valid identification of the individual present at the portal:

        1) On authentication of the credentials or information presented, check privileges of the identified individual, allowing only those actions granted as privileges.
        2) Privileges shall include, but are not limited to, time of day control, day of week control, group control, and visitor escort control.

    c. Maintain a date-, time-, and Location-stamped record of each transaction. A transaction is defined as any successful or unsuccessful attempt to gain access through a controlled portal by the presentation of credentials or other identifying information.

2. Inputs:

    a. Data from entry-control devices; use this input to change modes between access and secure.
    b. Database downloads and updates from the central station that include enrollment and privilege information.

3. With power supplies sufficient to power at voltage and frequency required for field devices and portal-control devices.

4. Controller Power: NFPA 70, Class II power-supply transformer, with 12- or 24-V ac secondary, backup battery and charger.

    a. Backup Battery: Valve-regulated, recombinant-sealed, lead-calcium battery; spill proof; with a full one-year warranty and a pro rata 9-year warranty. With single-stage, constant-voltage-current, limited battery charger, comply with battery manufacturer's written instructions for battery terminal voltage and charging current recommendations for maximum battery life.
    b. Backup Battery: Valve-regulated, recombinant-sealed, lead-acid battery; spill proof. With single-stage, constant-voltage-current, limited battery charger, comply with battery manufacturer's written instructions for battery terminal voltage and charging current recommendations for maximum battery life.
    c. Backup Power-Supply Capacity: Five minutes of battery supply. Submit battery and charger calculations.
    d. Power Monitoring: Provide manual, dynamic battery-load test, initiated and monitored at the control center; with automatic disconnection of the

controller when battery voltage drops below controller limits. Report by using local controller-mounted digital displays and by communicating status to central station. Indicate normal power on and battery charger on trickle charge. Indicate and report the following:

1) Trouble Alarm: Normal power-off load assumed by battery.
2) Trouble Alarm: Low battery.
3) Alarm: Power off.

2.8 DOOR AND GATE HARDWARE INTERFACE

A. Exit Device with Alarm: Operation of the exit device shall generate an alarm and annunciate a local alarm. Exit device and alarm contacts are specified in Section 087100 "Door Hardware."

B. Exit Alarm: Operation of a monitored door shall generate an alarm. Exit devices and alarm contacts are specified in Section 087100 "Door Hardware."

C. Electric Door Strikes: Use end-of-line resistors to provide power-line supervision. Signal switches shall transmit data to controller to indicate when the bolt is not engaged and the strike mechanism is unlocked, and they shall report a forced entry. Power and signal shall be from the controller. Electric strikes are specified in Section 087100 "Door Hardware."

D. Electromagnetic Locks: End-of-line resistors shall provide power-line supervision. Lock status sensing signal shall positively indicate door is secure. Power and signal shall be from the controller. Electromagnetic locks are specified in Section 087100 "Door Hardware."

E. Vehicle Gate Operator: Interface electrical operation of gate with controls in this Section. Vehicle gate operators shall be connected, monitored, and controlled by the security access controllers. Vehicle gate and accessories are specified in Section 323113 "Chain Link Fences and Gates."

2.9 FIELD-PROCESSING HARDWARE

A. Alarm Annunciation Local Processor:

1. Respond to interrogations from the field device network, recognize and store alarm status inputs until they are transmitted to the central station, and change outputs based on commands received from the central station.
2. Local processor shall also automatically restore communication within 10 seconds after an interruption with the field device network and provide dc line supervision on each of its alarm inputs.
3. Local processor inputs shall monitor dry contacts for changes of state that reflect alarm conditions.
4. Local processor shall have at least eight alarm inputs which allow wiring contacts as normally open or normally closed for alarm conditions; and shall provide line supervision for each input by monitoring each input for abnormal open, grounded, or shorted conditions using dc current change measurements.
5. Local processor shall report line supervision alarms to the central station.

6. Alarms shall be reported for any condition that remains abnormal at an input for longer than 500 milliseconds.
7. Alarm condition shall be transmitted to the central computer during the next interrogation cycle.
8. Local processor outputs shall reflect the state of commands issued by the central station.
9. Outputs shall be a form C contact and shall include normally open and normally closed contacts.
10. Local processor shall have at least four command outputs.
11. Local processor shall be able to communicate with the central station via RS-485 or TCP/IP as a minimum.

B. Processor Power Supply:

1. Local processor and sensors shall be powered from an uninterruptible power source.
2. Uninterruptible power source shall provide eight hours of battery back-up power in the event of primary power failure and shall automatically fully recharge the batteries within 12 hours after primary power is restored.
3. If the facility is without an emergency generator, the uninterruptible power source shall provide 24 hours of battery backup power.
4. There shall be no equipment malfunctions or perturbations or loss of data during the switch from primary to battery power and vice versa.
5. Batteries shall be sealed, non-outgassing type.
6. Power supply shall be equipped with an indicator for ac input power and an indicator for dc output power.
7. Loss of primary power shall be reported to the central station as an alarm.

C. Auxiliary Equipment Power: A GFI service outlet shall be furnished inside the local processor's enclosure.

D. Entry-Control Local Processor:

1. Entry-control local processor shall respond to interrogations from the field device network, recognize and store alarm status inputs until they are transmitted to the central station, and change outputs based on commands received from the central station.
2. Local processor shall also automatically restore communication within 10 seconds after an interruption with the field device network and provide dc line supervision on each of its alarm inputs.
3. Entry-control local processor shall provide local entry-control functions including communicating with field devices such as card readers, keypads, biometric personnel identity-verification devices, door strikes, magnetic latches, gate and door operators, and exit push buttons.
4. Processor shall also accept data from entry-control field devices as well as database downloads and updates from the central station that include enrollment and privilege information.
5. Processor shall send indications of successful or failed attempts to use entry-control field devices and shall make comparisons of presented information with stored identification information.

6. Processor shall grant or deny entry by sending control signals to portal-control devices and mask intrusion-alarm annunciation from sensors stimulated by authorized entries.
7. Entry-control local processor shall use inputs from entry-control devices to change modes between access and secure.
8. Local processor shall maintain a date-time- and location-stamped record of each transaction and transmit transaction records to the central station.
9. Processor shall operate as a stand-alone portal controller using the downloaded database during periods of communication loss between the local processor and the central station.
10. Processor shall store a minimum of 4000 transactions during periods of communication loss between the local processor and the central station for subsequent upload to the central station upon restoration of communication.
11. Local processor inputs shall monitor dry contacts for changes of state that reflect alarm conditions.
12. Local processor shall have at least eight alarm inputs which allow wiring contacts as normally open or normally closed for alarm conditions; and shall also provide line supervision for each input by monitoring each input for abnormal open, grounded, or shorted conditions using dc current change measurements.
13. Local processor shall report line supervision alarms to the central station.
14. Alarms shall be reported for any condition that remains abnormal at an input for longer than 500 ms.
15. Alarm condition shall be transmitted to the central station during the next interrogation cycle.
16. Entry-control local processor shall include the necessary software drivers to communicate with entry-control field devices. Information generated by the entry-control field devices shall be accepted by the local processor and automatically processed to determine valid identification of the individual present at the portal.
17. Upon authentication of the credentials or information presented, the local processor shall automatically check privileges of the identified individual, allowing only those actions granted as privileges.
18. Privileges shall include, but are not limited to, time of day control, day of week control, group control, and visitor escort control. The local processor shall maintain a date-time- and location-stamped record of each transaction.
19. Transaction is defined as any successful or unsuccessful attempt to gain access through a controlled portal by the presentation of credentials or other identifying information.
20. Local processor outputs shall reflect the state of commands issued by the central station.
21. Outputs shall be a form C contact and shall include normally open and normally closed contacts.
22. Local processor shall have at least four addressable outputs.
23. The entry-control local processor shall also provide control outputs to portal-control devices.
24. Local processor shall be able to communicate with the central station via RS-485 or TCP/IP as a minimum.
25. The system manufacturer shall provide strategies for downloading database information for panel configurations and cardholder data to minimize the required download time when using IP connectivity.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine pathway elements intended for cables. Check raceways, cable trays, and other elements for compliance with space allocations, installation tolerances, hazards to cable installation, and other conditions affecting installation.

B. Examine roughing-in for LAN and control cable conduit systems to workstations, controllers, card readers, and other cable-connected devices to verify actual locations of conduit and back boxes before device installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Comply with recommendations in SIA CP-01.

B. Comply with TIA 606-B, "Administration Standard for Commercial Telecommunications Infrastructure."

C. Product Schedules: Obtain detailed product schedules from manufacturer of access-control system or develop product schedules to suit Project. Fill in all data available from Project plans and specifications and publish as Product Schedules for review and approval.

1. Record setup data for control station and workstations.
2. For each Location, record setup of controller features and access requirements.
3. Propose start and stop times for time zones and holidays, and match up access levels for doors.
4. Set up groups, facility codes, linking, and list inputs and outputs for each controller.
5. Assign action message names and compose messages.
6. Set up alarms. Establish interlocks between alarms, intruder detection, and video surveillance features.
7. Prepare and install alarm graphic maps.
8. Develop user-defined fields.
9. Develop screen layout formats.
10. Propose setups for guard tours and key control.
11. Discuss badge layout options; design badges.
12. Complete system diagnostics and operation verification.
13. Prepare a specific plan for system testing, startup, and demonstration.
14. Develop acceptance test concept and, on approval, develop specifics of the test.
15. Develop cable and asset-management system details; input data from construction documents. Include system schematics and Visio Technical Drawings in electronic format.

D. In meetings with Architect and Owner, present Product Schedules and review, adjust, and prepare final setup documents. Use approved, final Product Schedules to set up system software.

3.3 IDENTIFICATION

A. In addition to requirements in this article, comply with applicable requirements in Section 270553 "Identification for Communications Systems" and with TIA 606-B.

B. Label each terminal strip and screw terminal in each cabinet, rack, or panel.

1. All wiring conductors connected to terminal strips shall be individually numbered, and each cable or wiring group being extended from a panel or cabinet to a building-mounted device shall be identified with the name and number of the particular device as shown.
2. Each wire connected to building-mounted devices is not required to be numbered at the device if the color of the wire is consistent with the associated wire connected and numbered within the panel or cabinet.

C. At completion, cable and asset management software shall reflect as-built conditions.

3.4 SYSTEM SOFTWARE AND HARDWARE

A. Utilize existing Brivo Software. Assign software license to Owner.

3.5 PROTECTION

A. Maintain strict security during the installation of equipment and software. Rooms housing the control station, and workstations that have been powered up shall be locked and secured with an activated burglar alarm and access-control system reporting to a central station complying with UL 1610, "Central-Station Burglar-Alarm Units," during periods when a qualified operator in the employ of Contractor is not present.

END OF SECTION 28 13 00

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SECTION 26 31 11
DIGITAL, ADDRESSABLE FIRE-ALARM SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 REFERENCE CODES AND LISTINGS

A. National Fire Protection Association (NFPA) – The latest adopted edition of the code referenced:
   1. NFPA 1 – National Fire Code
   2. NFPA 13 – Standard for the Installation of Sprinkler Systems
   3. NFPA 70 – National Electrical Code
   4. NFPA 72 – National Fire Alarm Code
   5. NFPA 90A – Standard for the Installation of Air Conditioning and Ventilating Systems
   6. NFPA 101 – Life Safety Code

B. Federal Guidelines for Accessibility for Americans with Disabilities

C. Building Code **-** 2015

D. STATE OF WISCONSIN – DEPARTMENT OF SAFETY AND PROFESSIONAL SERVICES (DSPS) –
   1. SPS 361.30 - Plan Review Approval

E. The system as a whole and the individual system components shall comply with applicable listings of Underwriter's Laboratories (UL), including but not limited to the following.

   1. UL864/UOJZ, APOU – Control Units for Fire Protective Signaling Systems
   2. UL 268A – Smoke Detectors for Fire Protective Signaling Systems
   3. UL268A – Smoke Detectors for Duct Applications
   4. UL 228 – Door Holders for Fire Protective Signaling Systems
   5. UL 464 – Audible Signaling Appliances
   6. UL 1638 – Visual Signaling Appliances
   7. UL 38 – Manually Activated Signaling Boxes
   8. UL 346 – Water flow Indicators for Fire Protective Signaling Systems
   9. UL 1971 – Standard for Signaling Devices for the Hearing Impaired
   10. UL 1481 – Power Supplies for Fire Protective Signaling Systems
   11. UL 521 – Heat Detectors for Fire Protective Systems

1.3 SUMMARY

A. Section Includes:
   1. Fire-alarm control unit.

2. Manual fire alarm pull stations.
3. System smoke detectors.
4. Intelligent addressable heat detectors.
5. Notification devices.
6. Magnetic door holders.
7. Remote annunciator.
8. Air handling system shutdown relays
9. Addressable interface devices
10. Water flow detector pressure switches
11. Sprinkler supervisory switches
12. Digital alarm communicator transmitter.
13. Device guards

B. Related Sections include the following:

1. Division 26 Section “Low-Voltage Electrical Power Conductors and Cables”
2. Division 26 Section “Grounding and Bonding for Electrical Systems”
3. Division 26 Section “Raceways and Boxes for Electrical Systems”

1.4 DEFINITIONS

A. LED: Light-emitting diode.

B. NICET: National Institute for Certification in Engineering Technologies.

1.5 SYSTEM DESCRIPTION

A. PROVIDE (Furnish and install and wire) a complete UL certified, non-coded, point addressable, intelligent Fire Alarm and Smoke Detection System with one-way voice communications as described herein and as shown on the plans.

B. System shall be dedicated to fire service only.

C. The fire alarm control unit shall have an operator interface to allow for loading or editing special instructions and system operating sequences as required. The system shall be capable of onsite programming to accommodate and facilitate expansion, building parameter changes and changes as required by local codes. All software operations are to be stored in a non-volatile programmable memory within the fire alarm control unit. Loss of primary and secondary power shall not erase the system programs stored in memory.

D. The fire alarm control unit shall allow for operator to set detector sensitivity ratings for each device, within code allowed parameters.

E. To accommodate and facilitate job site changes, initiation circuits shall be individually configurable on site to provide either alarm/trouble operation, alarm only, trouble only, current limited alarm, no alarm, normally closed device monitoring, a non-latching circuit or an alarm verification circuit.

F. All control equipment shall have transient protection devices to comply with UL864 requirements.

G. Fire alarm control unit shall accept addressable analog detectors and addressable monitor modules for dry contact devices.

H. Bypass switches shall be included for system testing to prevent audible/visual signal operation, HVAC control activation, and remote fire department notification. Bypass switches for fire alarm system testing shall be located in main fire alarm control unit. Activation of bypass switches shall cause system trouble alarm.

I. Notification Appliance Circuits (NACs) shall be configured as NFPA Style 1 Y (Class "B"). Audible NACs serving Speakers shall be installed using shielded cable, such that the speakers do not generate 3 unwanted noises, due to cross-talk with other circuits.

1. The High School shall be divided into the following Zones:

a. Shops
b. Gymnasium
c. New Fitness Center addition
d. Commons/Auditorium and adjacent kitchen areas
e. New Addition on the north side
f. Library and adjacent rooms
g. Remainder of the First-floor spaces
h. Lower Level

J. Isolated SLC Circuits, or circuit branches shall be provided, such that as a minimum, the following areas are independently isolated (a single Short Circuit or Ground Fault, on the SLC wiring of one area/floor shall not affect the proper operation of the SLC serving any area/floor):

1. High School:

a. Shops
b. Gymnasium
c. New Fitness Center addition
d. Commons/Auditorium and adjacent kitchen areas
e. New Addition on the north side
f. Library and adjacent rooms
g. Remainder of the First-floor spaces
h. Lower Level
i.

1.6 SYSTEMS CONTRACTOR QUALIFICATIONS.

A. The contractor directly responsible for this work shall be a systems contractor, who is and who has been regularly engaged in the furnishing and installation of commercial and industrial fire alarm systems of this type and size for at least the immediate past 5 years. All equipment shall be installed by a technician trained by the equipment manufacturer or a recognized training school or course for the installations of this type system.

B. The contractor shall, if requested by the engineer, show proof of a specific individual's training. The system's contractor shall directly employ a suitable number of skilled

systems installers whose normal work is systems installation and who shall install and make the wire and cable connections thereto.

C. As part of the project submittal, it shall be demonstrated to the satisfaction of the engineer that the systems contractor has adequate plant and equipment to do the work properly and expeditiously, adequate staff and technical experience.

1.7 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For fire-alarm system. Include plans, elevations, sections, details, and attachments to other work.

1. Comply with recommendations in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter in NFPA 72.
2. Include voltage drop calculations for notification appliance circuits.
3. Include 25% spare capacity on each signal circuit so that additional devices can be added.
4. Include substantiating emergency (battery) and normal power supply calculations for supervisory and alarm power requirements and calculations of notification device circuit loading (end of circuit voltage drop) to ensure proper operation of all devices.
5. Include performance parameters and installation details for each detector, verifying that each detector is listed for complete range of air velocity, temperature, and humidity possible when air-handling system is operating.
6. Include floor plans to indicate final outlet locations showing address of each addressable device. Show size and route of cable and conduits. Drawing scale shall match engineers design drawings.
7. Include voice/alarm signaling-service equipment rack or console layout, grounding schematic, amplifier power calculation, and single-line connection diagram.
8. Include complete schematic circuit diagrams for system, including all equipment. Wiring diagram shall show point to point connections between all system components
9. Include descriptions of system operation, annunciator schedule showing titles for each zone, and manufacturer’s literature marked to show model and catalog number for all equipment.
10. Include complete riser diagrams for system indicating wiring sequence of all alarm devices and control equipment shall be included with submittal data.

C. General Submittal Requirements:

1. Shop Drawings shall be prepared by persons with the following qualifications:

    a. Trained and certified by manufacturer in fire-alarm system design.
    b. NICET-certified fire-alarm technician, Level III minimum.

D. Department of Safety and Professional Services Plan Review Required Documents (per building). Please review the document in this link for more information:

http://dsps.wi.gov/Documents/Industry%20Services/Forms/Fire%20Protection/SB-FireProAlarmSubmGuides.pdf

E. Contractor's Responsibility:

1. Department of Safety and Professional Services approval is required prior to the start of fire alarm system construction. The contractor shall prepare and submit the required documents in a timely fashion to meet this requirement. If the contractor starts fire alarm system construction before approval is given by the Department of Safety and Professional Services, the contractor is responsible for all additional fees required by the Department of Safety and Professional Services.
2. Initially, prepare one set of the Department of Safety and Professional Services fire alarm submittals and send it to the A/E for approval before proceeding with actual submittal to DSPS.
3. After obtaining A/E approval to proceed with the Department of Safety and Professional Services fire alarm submittal, prepare four (4) sets of the fire alarm shop drawings as approved by the A/E that will be sent to the Department of Safety and Professional Services by the contractor. These shop drawings shall be stamped, signed and dated by a Wisconsin registered architect, professional engineer or electrical designer taking responsibility for the shop drawings.
4. Signing and sealing shall comply with SPS 361.31(1). Note that each shop drawing copy must be stamped, signed and dated unless there is a drawing index sheet, in which case only the four index sheets need to be stamped, signed and dated. Where the submitter is both the designer and installer of the fire alarm system, a signature only will suffice [ch. 443.14(6), Stats.]. It shall be an original signature and date.
5. Prepare one bound booklet of the fire alarm system device cut sheets and all calculations (indicating device power calculations, voltage drop calculations and battery calculations). These booklets do not need to be stamped, signed or dated.
6. Prepare a letter of transmittal listing all items being sent to the Department of Safety and Professional Services. Copy the A/E on the letter of transmittal only.
7. Complete the Application for Review, Buildings, HVAC, Fire and Components – SBD-118 form.
8. Calculate the SDB-118 submittal fee; write a check for the appropriate amount, payable to Safety and Professional Services.
9. Schedule a plan review date with Department of Safety and Professional Services, Division of Safety and Buildings by visiting this website and completing the online request form.
   http://apps2.commerce.wi.gov/SB_PlanReviewApp/Bldg/TaskList?ptid=0&action=new
10. Assemble the submittal and send the documents described in items 1 thru 9 above to the Department of Safety and Professional Services at the appropriate address shown on at the bottom of DBS-118.

F. Plan Review Fees:

1. Fees shall be determined in accordance with Table 302.31-1 or Table 302.31-2 found in Chapter SPS 302 of the Wisconsin Administrative Code.

2. Reduced plan review fees (Table 302.31-2) may be utilized for projects in municipalities that perform inspections as an agent of the Division of Safety & Buildings.
3. Per SPS 302.10, plan review fees shall be doubled for projects where the installation, erection or construction was initiated without the required Departmental approval.

G. Forms:

1. SBD-118 (R11/11) can be downloaded from: http://dsps.wi.gov/sb/docs/sb-Form118App.pdf(PDF) or http://dsps.wi.gov/sb/docs/SB-Form118App.doc (Word)
2. Visit Department of Safety and Professional Services, Division of Safety and Buildings Commercial Buildings Plan Review info website for additional information: http://dsps.wi.gov/Plan-Review
3. For scheduling of building, HVAC, and fire plans, use the electronic online request for commercial building plan appointment http://apps2.commerce.wi.gov/SB_PlanReviewApp/Bldg/TaskList?ptid=0&action=new
4. Once approved, Safety and Buildings will retain one of the sets, and will return three sets, which shall be distributed as follows:

    a. One (1) copy shall be retained by the Electrical Contractor on-site and shall be used as a reference / made available to any Department of Safety and Professional Services inspectors, who may make periodic inspection visits to the site.
    b. One (1) copy shall be forwarded to the Owner for their records.
    c. One (1) copy shall be kept on site, at or near to the FIRE Alarm Control Panel.

1.8 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Detailed description of equipment anchorage Field quality-control reports.

1.9 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fire-alarm systems and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:

1. Comply with the "Records" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.
2. Provide "Record of Completion Documents" according to NFPA 72 article "Permanent Records" in the "Records" Section of the "Inspection, Testing and Maintenance" Chapter.
3. Record copy of site-specific software.
4. Provide "Maintenance, Inspection and Testing Records" according to NFPA 72 article of the same name and include the following:

a. Frequency of testing of installed components.
b. Frequency of inspection of installed components.
c. Requirements and recommendations related to results of maintenance.
d. Manufacturer's user training manuals.

5. Manufacturer's required maintenance related to system warranty requirements.
6. Abbreviated operating instructions for mounting at fire-alarm control unit.
7. Copy of NFPA 25.

B. Software and Firmware Operational Documentation:

1. Software operating and upgrade manuals.
2. Program Software Backup: On magnetic media or compact disk, complete with data files.
3. Device address list.
4. Printout of software application and graphic screens.

C. The Contractor shall provide three bound copies of the following, to be forwarded to the Owner at completion of project:

1. As-built wiring and conduit layout diagrams showing all fire alarm devices on floor plans, including wire color code and terminal numbers, and showing all interconnections in the system.
2. Electronic circuit diagrams of all FACP modules, power supplies, annunciator, data gathering panels, addressable interface modules, etc.
3. Technical literature on all major parts of the system, including control panels, smoke detectors, batteries, manual stations, alarm notification appliances, power supplies, and remote alarm transmission means.

1.10 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Lamps for Remote Indicating Lamp Units: Quantity equal to 10 percent of amount installed, but no fewer than 1 unit.
2. Lamps for Strobe Units: Quantity equal to 10 percent of amount installed, but no fewer than 1 unit.
3. Smoke Detectors, Fire Detectors: Quantity equal to 10 percent of amount of each type installed, but no fewer than 1 unit of each type.
4. Detector Bases: Quantity equal to 2 percent of amount of each type installed, but no fewer than 1 unit of each type.
5. Keys and Tools: One extra set for access to locked and tamper proofed components.
6. Audible and Visual Notification Appliances: Three of each type installed.
7. Fuses: Two of each type installed in the system.

1.11 QUALITY ASSURANCE

A. Installer Qualifications: Personnel shall be trained and certified by manufacturer for installation of units required for this Project.

B. Installer Qualifications: Installation shall be by personnel certified by NICET as fire-alarm Level II technician.

C. The addressable fire alarm system shall be connected, programmed, and tested only by the manufacturer or by an authorized distributor who stocks a full complement of spare parts for the system. Technicians performing this service shall be trained and individually certified by the manufacturer for the model of system being installed. Copies of their certifications must be included with the contractor's submittal to the engineer, prior to installation. The submittal cannot be approved without this information.

D. System equipment shall be from a single manufacturer and shall be supported by a manufacturer authorized, established service organization that shall stock parts for the equipment supplied.

E. Equipment shall be manufactured by a firm that has been actively manufacturing fire alarm systems for a minimum of 7 years and that offers a 3-year warranty on all control equipment.

F. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

G. NFPA Certification: Obtain certification according to NFPA 72 by a UL-listed alarm company.

1.12 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Receive equipment at jobsite; verify applicable components and quantity delivered per invoice.

B. Handle equipment to prevent internal components damage, breakage, denting, and scoring enclosure and finish.

C. Do not install damaged equipment.

D. Store equipment in a clean, dry space and protect from dirt, fumes, water, construction debris, and physical damage.

E. After installation, protect from damage by work of other trades.

1.13 SOFTWARE SERVICE AGREEMENT

A. Comply with UL 864.

B. Technical Support: Beginning with Substantial Completion, provide software support for two years.

C. Upgrade Service:

1. Update software to latest version at Project completion. Install and program software upgrades that become available within two years from date of

Substantial Completion. Upgrading software shall include operating system. Upgrade shall include new or revised licenses for use of software.

2. Provide 30 days' notice to Owner to allow scheduling and access to system and to allow Owner to upgrade computer equipment if necessary.

1.14 WARRANTY

A. Manufacturer's standard form in which manufacturer agrees to repair or replace components of system and associated auxiliary components that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Manufacturer's standard warranty period (minimum one year) from date of start-up.
2. Labor and travel time for necessary repairs at the job site shall be included.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Notifier Digital Addressable Fire Alarm/Smoke Detection System or approved equal by the following manufacturers:

1. Siemens
2. Honeywell
3. Edwards

2.2 SYSTEMS OPERATIONAL DESCRIPTION

A. Fire-alarm signal initiation shall be by one or more of the following devices and systems:

1. Manual stations.
2. Heat detectors.
3. Smoke detectors.
4. Duct smoke detectors.
5. Fire-extinguishing system operation.

B. Fire-alarm signal shall initiate the following actions:

1. Continuously operate alarm notification appliances.
2. Identify alarm at fire-alarm control unit and remote annunciators.
3. Transmit an alarm signal to the remote alarm receiving station.
4. Unlock electric door locks in designated egress paths.
5. Release fire and smoke doors held open by magnetic door holders.
6. Activate alarm communication system.
7. Close smoke dampers in air ducts of designated air-conditioning duct systems.
8. Record events in the system memory.
9. Record events by the system printer.
10. If fire alarm activation is caused by a duct smoke detector, the following actions shall be initiated:

a. Shut down associated air handling system.
b. Close all smoke dampers in ducts associated with the air handling unit.

C. System trouble signal initiation shall be by one or more of the following devices and actions:

1. Open circuits, shorts, and grounds in designated circuits.
2. Opening, tampering with, or removing alarm-initiating and supervisory signal-initiating devices.
3. Loss of primary power at fire-alarm control unit.
4. Ground or a single break in fire-alarm control unit internal circuits.
5. Abnormal ac voltage at fire-alarm control unit.
6. Break in standby battery circuitry.
7. Failure of battery charging.
8. Abnormal position of any switch at fire-alarm control unit or annunciator.

D. System installation shall allow remote restarting of all air handling systems after having been shut down by the Fire Alarm System. Air handling systems shall automatically restart after fire alarm system has been reset.

E. Smoke dampers in ducts shall close whenever associated air handling system is shut down either by fire alarm system activation or otherwise.

2.3 FIRE-ALARM CONTROL UNIT

A. General Requirements for Fire-Alarm Control Unit:

1. Field-programmable, microprocessor-based, modular, power-limited design with electronic modules, complying with UL 864 and listed and labeled by an NRTL.

a. System software and programs shall be held in flash electrically erasable programmable read-only memory (EEPROM), retaining the information through failure of primary and secondary power supplies.
b. Include a real-time clock for time annotation of events on the event recorder and printer.

2. Addressable initiation devices that communicate device identity and status.

a. Smoke sensors shall additionally communicate sensitivity setting and allow for adjustment of sensitivity at fire-alarm control unit.
b. Temperature sensors shall additionally test for and communicate the sensitivity range of the device.

3. Addressable control circuits for operation of mechanical equipment.

B. Alphanumeric Display and System Controls: Arranged for interface between human operator at fire-alarm control unit and addressable system components including annunciation and supervision. Display alarm, supervisory, and component status messages and the programming and control menu.

1. Annunciator and Display: Liquid-crystal type, 2 line(s) of 80 characters, minimum.
2. Keypad: Arranged to permit entry and execution of programming, display, and control commands and to indicate control commands to be entered into the system for control of smoke-detector sensitivity and other parameters.

C. Circuits:

1. Initiating Device, Notification Appliance, and Signaling Line Circuits: NFPA 72, Class B.

    a. Initiating Device Circuits: Style B.
    b. Notification Appliance Circuits: Style Y.
    c. Signaling Line Circuits: Style 4.
    d. Provide 25% spare capacity on circuits for additional devices.

2. Serial Interfaces: Two RS-232 ports for printers.

D. Transmission to Remote Alarm Receiving Station: Automatically transmit alarm, supervisory, and trouble signals to a remote alarm station.

E. Power Supplies:

1. Primary Power: 24-V dc obtained from 120-V ac service and a power-supply module. Initiating devices, notification appliances, signaling lines, trouble signals, supervisory and digital alarm communicator transmitters shall be powered by 24-V dc source.

    a. Alarm current draw of entire fire-alarm system shall not exceed 80 percent of the power-supply module rating.

2. Secondary Power: 24-V dc supply system with batteries, automatic battery charger, and automatic transfer switch.

    a. Batteries: Sealed lead calcium.

3. After 24 hours, the battery backup supply shall be capable of energizing all signal devices for a period of at least five minutes. In addition, the low battery backup supply monitor shall supervise and automatically sound System Trouble in the event that a trouble occurs in the system (i.e., the batteries being disconnected or discharging to 85% of full charge). Battery and power supply capacity shall provide an additional 25% spare capacity for additional alarm signal devices that may be added to the system.
4. Provide power supply and battery capacity for system operation. Power supply and battery capacity shall be sized to allow an additional 25% spare capacity for future growth. The power supply shall be able to perform an automatic load test of batteries and indicate a trouble condition if the batteries fall outside a predetermined range. Power supplies shall incorporate the ability to adjust the charge rate of batteries based on ambient temperatures. Exact locations and quantities of power supplies shall be as determined by the contractor.

F. Surge Protection Devices

1. The system shall be provided with the following protective devices to prevent damage of nuisance alarms by nearby lightning strikes, stray currents, or voltage transients. They are to be provided by the fire alarm equipment supplier:

   a. On AC Input: Ditek DTK-120HW or DTK-120/240 CM, EFI HWM-120, Leviton OEM-120EFI, Transtector ACO100BWN3, or equal UL Listed device approved by NCDoI. Installed at the electrical panelboard, and trim excess lead lengths. Wind small coil in the branch circuit conductor just downstream of the suppressor connection. Coil to be 5 to 10 turns of about 1" diameter, and tie-wrapped.
   b. On DC circuits Extending Outside Building: Adjacent to the FACP, and near the point of entry to the outlying building, provide a “pi” filter on each leg. This consists of a primary arrestor, a series impedance of 1 millihenry or more, and a fast-acting secondary arrestor which clamps between 30 and 40 volts. Acceptable models with these or equivalent features include Simplex 2081-9027 and 2081-9028, Transtector TSP8601, Ditek DTKxLVL series, Citel American B280 -24V, Edco P264 and P642, or equal. Submit specification on other candidate suppressors for approval.

2.4 NAC BOOSTER PANELS (Remote Power Supplies):

A. Where they are used, “NAC Power Booster Panels” shall be individually supervised. Interconnecting NAC Booster Panels in a manner, which prevents identification of individual panel TROUBLE conditions, shall not be approved. NAC Booster Panels shall be wired to dedicated Emergency Power Branch Circuits where available or shall be provided with sufficient battery back-up power.

B. NAC Booster Panels are are not shown on the construction drawings. The Electrical Contractor shall plan accordingly for the installation of NAC booster panel based on the FA manufacturer submittals. At such locations, the EC shall provide any required circuit breakers, associated power wiring, and local smoke detection within 5 feet of the panel. The cost of such equipment and installation shall be included within the base Electrical Bid.

2.5 MANUAL FIRE-ALARM BOXES

A. General Requirements for Manual Fire-Alarm Boxes: Comply with UL 38. Boxes shall be finished in red with molded, raised-letter operating instructions in contrasting color; shall show visible indication of operation; and shall be mounted on recessed outlet box. If indicated as surface mounted, provide manufacturer's surface back box.

1. Double-action mechanism requiring two actions to initiate an alarm, pull-lever type; with integral addressable module arranged to communicate manual-station status (normal, alarm, or trouble) to fire-alarm control unit.
2. Station Reset: Key- or wrench-operated switch.

2.6 SYSTEM SMOKE DETECTORS

A. General Requirements for System Smoke Detectors:

1. Comply with UL 268; operating at 24-V dc, nominal.
2. Base Mounting: Detector and associated electronic components shall be mounted in a twist-lock module that connects to a fixed base. Provide terminals in the fixed base for connection to building wiring.
3. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
4. Integral Visual-Indicating Light: LED type indicating detector has operated and power-on status.
5. Remote Control: Unless otherwise indicated, detectors shall be analog-addressable type, individually monitored at fire-alarm control unit for calibration, sensitivity, and alarm condition and individually adjustable for sensitivity by fire-alarm control unit.

    a. Rate-of-rise temperature characteristic shall be selectable at fire-alarm control unit for 15 or 20 deg F per minute.
    b. Fixed-temperature sensing shall be independent of rate-of-rise sensing and shall be settable at fire-alarm control unit to operate at 135 or 155 deg F.
    c. Provide multiple levels of detection sensitivity for each sensor.

B. Photoelectric Smoke Detectors:

1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:

    a. Primary status.
    b. Device type.
    c. Present average value.
    d. Present sensitivity selected.
    e. Sensor range (normal, dirty, etc.).

C. Projected Beam Type Smoke Detectors:

1. The Projected Beam Type Smoke Detectors shall be listed per UL 268 and shall functionally interface to the FACP as a standard, 4-wire type smoke detector. The Projected Beam Type Smoke Detectors shall incorporate built-in "aiming-aid" features, such as optical sights or indicator LEDs.
2. Where additional wiring or particular configurations are recommended by the manufacturer, in order to take advantage of built-in aiming features, such wiring or configurations shall be provided
3. Installation methods utilized with these units shall be in strict compliance with the manufacturer’s instructions.
4. A Remote Test Station shall be supplied for each TX / RX pair. Power to each TX / RX pair shall be supervised, by means of either built-in Trouble relay outputs at each detector, or by means of end-of-line relays at each detector.
5. Such Trouble Relay outputs and / or end-of line relays shall be connected to the IDC which monitors each TX / RX pair in a manner, such that Trouble conditions

indicated by such relays / outputs do not prevent the transmission of an Alarm over the IDC.

6. Each TX / RX pair shall be individually monitored for Alarm status conditions, via addressable Monitor Modules, or via dedicated IDC circuits. Each TX / RX pair shall be individually monitored for Trouble status conditions.

D. Duct Smoke Detectors: Photoelectric type complying with UL 268A.

1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:

    a. Primary status.
    b. Device type.
    c. Present average value.
    d. Present sensitivity selected.
    e. Sensor range (normal, dirty, etc.).

3. Weatherproof Duct Housing Enclosure: NEMA 250, Type 4X; NRTL listed for use with the supplied detector.
4. Each sensor shall have multiple levels of detection sensitivity.
5. Sampling Tubes: Design and dimensions as recommended by manufacturer for specific duct size, air velocity, and installation conditions where applied.
6. Provide remote indicator alarm for each duct detector. Mount on ceiling in corridor nearest to duct detector location.

2.7 HEAT DETECTORS

A. General Requirements for Heat Detectors: Comply with UL 521.

B. Heat Detector, Combination Type: Actuated by either a fixed temperature of 135 deg F or a rate of rise that exceeds 15 deg F per minute unless otherwise indicated.

1. Mounting: Twist-lock base interchangeable with smoke-detector bases.
2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.

2.8 NOTIFICATION APPLIANCES

A. General Requirements for Notification Appliances: Connected to notification appliance signal circuits, equipped for mounting as indicated and with screw terminals for system connections.

1. Device Color: Factory finished, coordinate red/white coloring with Architect.
2. Devices shall be flush mounted with surface.
3. Strobes shall be set at 75 candela, unless otherwise noted on drawings.
4. Exterior mounted devices shall be provided with flush mounted weatherproof backbox.

B. Visible Notification Appliances: Xenon strobe lights comply with UL 1971, with clear or nominal white polycarbonate lens mounted on an aluminum faceplate. The word "FIRE" is engraved in minimum 1-inch-high letters on the lens.

1. Rated Light Output:

    a. 15/30/75/110 cd, field selectable and synchronized.

2. Mounting: Wall mounted unless otherwise indicated.
3. For units with guards to prevent physical damage, light output ratings shall be determined with guards in place.
4. Flashing shall be in a temporal pattern, synchronized with other units.
5. Strobe Leads: Factory connected to screw terminals.

C. Audio Notification Appliances: Speakers shall have vandal resistant metal or Lexan white housing or grills with field adjustable output taps ranging from 1/4 watt to 2 watts. Speakers selected for this project shall produce a Sound Pressure Level, at the 1 watt tap of at least 86 dBA at 10 feet – as tested per UL Standard 1480. Speakers shall have sealed backs to protect the phenolic impregnated cone.

D. Supervised Horn Loudspeakers - Supervised horn loudspeakers shall be equipped with a compression driver providing up to 15-Watt RMS power handling capability. Horn loudspeakers when installed outdoors, shall be of the weather-resistant metal construction to provide protection against water, humidity, vermin, and corrosion. The mounting bracket allows directional sound dispersion via the vertical and the horizontal positioning. Provisions shall include for surface or strap mounting for the installation to pillars and I-beams. Horn loudspeakers shall include 25/70/100V transformer with adjustable 7-position Watt/ impedance selection switch.

E. Combination Devices: Factory-integrated audible and visible devices in a single-mounting assembly, equipped for mounting as indicated and with screw terminals for system connections.

1. The word "FIRE" is engraved in minimum 1-inch-high letters on the lens.

2.9 MAGNETIC DOOR HOLDERS

A. Description: Units are equipped for wall or floor mounting as indicated and are complete with matching doorplate.

1. Electromagnet: Requires no more than 3 W to develop 25-lbf holding force.
2. Wall-Mounted Units: Flush mounted unless otherwise indicated.
3. All holders shall be normally be energized, and a release shall be accomplished by interrupting the circuit.
4. Rating: 24-V dc.

B. Material and Finish: Match door hardware.

2.10 REMOTE ANNUNCIATOR

A. Description: Annunciator functions shall match those of fire-alarm control unit for alarm, supervisory, and trouble indications. Manual switching functions shall match those of fire-alarm control unit, including acknowledging, silencing, resetting, and testing.

1. Mounting: Flush cabinet, NEMA 250, Type 1.

B. Display Type and Functional Performance: Alphanumeric display and LED indicating lights shall match those of fire-alarm control unit. Provide controls to acknowledge, silence, reset, and test functions for alarm, supervisory, and trouble signals.

C. Provide annunciator panel with microphone to allow for announcements to be made remotely from main fire alarm control panel.

2.11 ADDRESSABLE INTERFACE DEVICE

A. Description: Microelectronic monitor module, NRTL listed for use in providing a system address for alarm-initiating devices for wired applications with normally open contacts.

B. Air Handling System Shutdown Relays: Provide and install a supervised addressable output relay at each Air Handling System for shutdown on alarm from fire alarm system as per system operation description. The unit shall be normally closed with a coil to match voltage of Fire Alarm Control Panel and interrupt starting circuit of Air Handling System unit fan(s). Provide and install a supervised addressable output relay at each exhaust fan for shutdown on alarm from fire alarm system as per system operation description, unless exhaust fan is interlocked with AHU.

C. Waterflow Detector/Pressure Switches: Waterflow or pressure switches to be supplied and installed by the fire protection system contractor and wired to the Fire Alarm System by this Contractor. Provide addressable water flow/tamper module for each switch so that each switch can be individually monitored.

2.12 DIGITAL ALARM COMMUNICATOR TRANSMITTER

A. Digital alarm communicator transmitter shall be acceptable to the remote central station and shall comply with UL 632 and be listed and labeled by an NRTL.

B. Functional Performance: Unit shall receive an alarm, supervisory, or trouble signal from fire-alarm control unit and automatically capture two telephone line(s) and dial a preset number for a remote central station. When contact is made with central station(s), signals shall be transmitted. If service on either line is interrupted for longer than 45 seconds, transmitter shall initiate a local trouble signal and transmit the signal indicating loss of telephone line to the remote alarm receiving station over the remaining line. Transmitter shall automatically report telephone service restoration to the central station. If service is lost on both telephone lines, transmitter shall initiate the local trouble signal.

C. Local functions and display at the digital alarm communicator transmitter shall include the following:

1. Verification that both telephone lines are available.
2. Programming device.
3. LED display.

4. Manual test report function and manual transmission clear indication.
5. Communications failure with the central station or fire-alarm control unit.

D. Digital data transmission shall include the following:

1. Address of the alarm-initiating device.
2. Address and/or Zone of the supervisory signal.
3. Address and/or Zone of the trouble-initiating device.
4. Loss of ac supply or loss of power.
5. Low battery.
6. Abnormal test signal.
7. Communication bus failure.

E. Self-Test: Conducted automatically every 24 hours with report transmitted to central station.

2.13 DEVICE GUARDS

A. Description: Welded wire mesh of size and shape for the manual station, smoke detector, gong, or other device requiring protection.

1. Factory fabricated and furnished by manufacturer of device.
2. Finish: Paint of color to match the protected device.

PART 3 - EXECUTION

3.1 EQUIPMENT INSTALLATION

A. Comply with NFPA 72 for installation of fire-alarm equipment.

B. All wiring shall be run “free-air”, in conduit or in surface raceway. "Free-air" wiring for horizontal cable runs of Power Limited FIRE Alarm (PLFA) DC circuits as approved by the Engineer shall be the method of installation only in the following areas: Finished accessible ceiling. All other wiring shall be installed in conduit.

C. Flexible connectors shall be used for all devices mounted in suspended lay-in ceiling panels. All conduit, mounting boxes, junction boxes and panels shall be securely hung and fastened with appropriate fittings to insure positive grounding throughout the entire system.

D. Where installed “free-air”, installation shall consider the following:

1. Cable shall run at right angles and be kept clear of other trades work.
2. All cable run as “Free-Air” shall be Tray Cable rated.
3. All splices shall be done in an approved junction box(es). Junction boxes or at a minimum the cover shall be red with FA inscribed on it.
4. Cables shall be supported according to code utilizing "Bridal-type" mounting rings or J hooks anchored to ceiling concrete, piping supports or structural steel beams. Rings shall be designed to maintain cables bend to larger than the minimum bend radius (typically 4 x cable diameter).

5. Supports should be spaced at a maximum 4-foot interval unless limited by building construction. If cable "sag" at mid-span exceeds 12-inches, another support shall be used.
6. Cable shall never be laid directly on the ceiling grid.
7. Cables shall not be attached to or supported by, existing cabling, plumbing or steam piping, ductwork, ceiling supports or electrical or communications conduit.

E. A coil of 4 feet in each cable shall be placed in the ceiling at each “free-air” wired fire alarm device. These "service loops" shall be secured at the last cable support before the cable reaches the device and shall be coiled from 100% to 200% of the cable recommended minimum bend radius.

F. Devices wired with conduit shall be provided with an 8-inch wire tail at each device box and 36-inch wire tails at the FACP and FAAP.

G. All cable shall be free of tension at both ends. In cases where the cable must bear some stress, Kellom grips may be used to spread the strain over a longer length of cable.

H. Manufacturers minimum bend radius specifications shall be observed in all instances. Care should be taken in the use of cable ties to secure and anchor the fire alarm cabling. Ties should not be over tightened as to compress the cable jacket. No sharp burrs should remain where excess length of the cable tie has been cut.

I. All vertical cable extensions to fire alarm devices located below the finished ceiling shall be in conduit.

J. It is the contractors' responsibility to survey the site and include all necessary costs to perform the installation as specified. This includes any modifications required to route and conceal horizontal distribution wiring.

K. Beginning installation means contractor accepts existing conditions.

L. Contractor shall furnish all required installation tools to facilitate cable pulling without damage to the cable jacket. Such equipment is to include, but not limited to, sheaves, winches, cable reels, cable reel jacks, duct entrance tunnels, pulling tension gauge and similar devices. All equipment shall be of substantial construction to allow steady progress once pulling has begun. Makeshift devices, which may move or wear in a manner to pose a hazard to the cable, shall not be used.

M. All cable shall be pulled by hand unless installation conditions require mechanical assistance. Where mechanical assistance is used, care shall be taken to ensure that the maximum tensile load for the cable as defined by the manufacturer is not exceeded. This may be in the form of continuous monitoring of pulling tension, use of a “break-away” or other approved method.

N. The contractor will be responsible for identifying and reporting to the Site Coordinator(s) any existing damage to walls, flooring, tiles and furnishings in the work area prior to start of work. The Contractor must repair all damage to interior spaces caused by the installation of cable; raceway or other hardware. Repairs must match preexisting color and finish of walls, floors and ceilings. Any contractor-damaged ceiling tiles are to be replaced to match color, size, style and texture.

O. Where unacceptable conditions are found, the Contractor shall bring this to the attention of the construction supervisor immediately. A written resolution will follow to determine the appropriate action to be taken.

P. Qualified personnel utilizing state-of-the-art equipment and techniques shall complete all installation work. During pulling operation an adequate number of workers shall be present to allow cable observation at all points of duct entry and exit as well as the feed cable and operate pulling machinery.

Q. Cable pulling shall be done in accordance with cable manufacturer's recommendations and ANSI/IEEE C2 standards. Manufacturer's recommendations shall be a part of the cable submittal. Recommended pulling tensions and pulling bending radius shall not be exceeded. Any cable bent or kinked to radius less than recommended dimension shall not be installed.

R. Avoid abrasion and other damage to cables during installation.

S. No wiring other than that directly associated with fire alarm or auxiliary fire protection functions shall be permitted in fire alarm conduits. There shall be NO splices in the system other than at terminal blocks. "Wire nuts" and crimp splices are NOT permitted. Permanent wire markers shall be used to identify all terminations for each circuit. For splices, use markers or other means to indicate which conductor leads to the FACP. All connections shall be made on terminal strips. All terminal block screws shall have pressure wire connectors of the self-lifting or box lug type. No more than two conductors under one connection. Wire on these terminals shall be labeled. Transposing or changing color coding of wires shall not be permitted. All conductors in conduit containing more than one wire shall be labeled on each end with "E-Z markers" or equivalent. Conductors in cabinets shall be carefully formed and harnessed so that each drops off directly opposite to its terminal. Cabinet terminals shall be numbered and coded. All controls, function switches, etc., shall be clearly labeled on all equipment panels. All wiring shall be checked and tested to ensure that there are no grounds, opens or shorts.

T. All wiring shall be color coded in accordance with the following scheme, which shall be maintained throughout the system, without color change in any wire run:

1.	Initiating Circuits	Yellow(+)/Brown (-)
2.	Alarm Indicating Appliance Circuits	Red(+)/Blue (-)
3.	AHU Shutdown Circuits	Orange
4.	Door Control Circuits	Gray
5.	Elevator Capture Circuits	Violet
6.	Exception: Addressable initiating circuits shall comply with Paragraph below.	

U. Wire shall be 14 AWG minimum, stranded or solid copper, type THHN or THWN except for addressable loop controller circuits. Addressable loop controller circuits are to be wired with type FPL/FPLR/FPLP fire alarm cable, solid copper, AWG 18 minimum, twisted pair, installed in conduit, instead of AWG 14 THHN/THWN stranded conductors. Provide shielded cable if required by manufacturer. If shielded cable is required by manufacturer, cable shield drain wires are to be connected at each device on the loop to maintain continuity and taped to insulate from ground. Terminate the shield at the FACP

in accordance with the manufacturer's instructions. The cable shall have red jacket, with yellow (+) and brown (-) conductors.

V. All addressable loop controller circuits shall have a minimum of 25% spare addresses for future use. "T" taps from the loop are permitted, but only if they serve no more than 30 initiating devices and/or control points, in an area which does not exceed approximately half of one story. To minimize the impact of a wiring fault on the system, isolation modules must be provided as follows:

1. After each 30 devices/control points on any addressable circuit, including taps.
2. At each "T" tap which feeds 5 or more devices/control points.
3. For each circuit extending outside the building.
4. All isolation modules must be clearly labeled, readily accessible for convenient inspection, and shown on the as-builts.

W. Initiating device or indicating appliance circuits must not be included in raceways containing AC power or AC control wiring. Within the FACP panel, any AC control wiring must be properly separated from other circuits. The enclosure must have an appropriate warning label to alert service personnel to the hazard.

X. A unique identification number shall be assigned to each detector. (Identification shall be by zone number and device number within the zone.) This number shall be noted on the submittals and as-built plans, and also be permanently mounted adjacent to the detector or affixed to its base.

Y. Install wall-mounted equipment, with tops of cabinets not more than 72 inches above the finished floor.

Z. Smoke- or Heat-Detector Spacing:

1. Comply with NFPA 72, "Smoke-Sensing Fire Detectors" Section in the "Initiating Devices" Chapter, for smoke-detector spacing.
2. Comply with NFPA 72, "Heat-Sensing Fire Detectors" Section in the "Initiating Devices" Chapter, for heat-detector spacing.
3. Smooth ceiling spacing shall not exceed 30 feet.
4. Spacing of detectors for irregular areas, for irregular ceiling construction, and for high ceiling areas shall be determined according to Appendix A or Appendix B in NFPA 72.
5. HVAC: Locate detectors not closer than 3 feet from air-supply diffuser or return-air opening.
6. Lighting Fixtures: Locate detectors not closer than 12 inches from any part of a lighting fixture.

AA. Duct Smoke Detectors: Comply with NFPA 72 and NFPA 90A. Install sampling tubes so they extend the full width of duct. Provide weatherproof enclosures for any duct smoke detector installed outdoors.

BB. Remote Status and Alarm Indicators: Install near each smoke detector and each sprinkler water-flow switch and valve-tamper switch that is not readily visible from normal viewing position.

CC. Annunciator: Install with top of panel not more than 46 inches above the finished floor.

3.2 CONNECTIONS

A. For fire-protection systems related to doors in fire-rated walls and partitions and to doors in smoke partitions, comply with requirements in Division 08 Section "Door Hardware." Connect hardware and devices to fire-alarm system.

1. Verify that hardware and devices are NRTL listed for use with fire-alarm system in this Section before making connections.

B. Make addressable connections with a supervised interface device to the following devices and systems. Install the interface device less than 3 feet from the device controlled. Make an addressable confirmation connection when such feedback is available at the device or system being controlled.

1. Alarm-initiating connection to smoke-control system (smoke management) at firefighter smoke-control system panel.
2. Smoke dampers in air ducts of designated air-conditioning duct systems.
3. Supervisory connections at valve supervisory switches.

3.3 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

B. Install framed instructions in a location visible from fire-alarm control unit.

3.4 POWER CONNECTIONS

A. Provide 120-volt, 20-amp circuit to all fire alarm panels, remote panels, terminal cabinets, etc (whether shown on drawings or not). Connect to spare 20-amp, 1 pole circuit breaker in nearest 120-volt panel. Re-label circuit breaker accordingly. Provide locking device on breaker and color breaker red.

3.5 GROUNDING

A. Ground fire-alarm control unit and associated circuits; comply with IEEE 1100. Install a ground wire from main service ground to fire-alarm control unit.

3.6 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Tests and Inspections:

1. Visual Inspection: Conduct visual inspection prior to testing.

a. Inspection shall be based on completed Record Drawings and system documentation that is required by NFPA 72 in its "Completion Documents, Preparation" Table in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter.
b. Comply with "Visual Inspection Frequencies" Table in the "Inspection" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72; retain the "Initial/Reacceptance" column and list only the installed components.

2. System Testing: Comply with "Test Methods" Table in the "Testing" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.
3. Factory-authorized service representative shall prepare the "Fire Alarm System Record of Completion" in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter in NFPA 72 and the "Inspection and Testing Form" in the "Records" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.

C. Reacceptance Testing: Perform reacceptance testing to verify the proper operation of added or replaced devices and appliances.

D. Fire-alarm system will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

3.7 WARRANTY

A. The Contractor shall warrant the completed fire alarm system wiring and equipment to be free from inherent mechanical and electrical defects for a period of two (2) years from the date of substantial completion of the project.

B. At the end of the project, the Contractor shall post the warranty period along with the company’s name and telephone number inside the fire alarm panel.

C. Any occupied facility shall not be without a UL and an NFPA approved and fully operational fire alarm system for a period longer than two (2) hours. Emergency response shall be provided within two (2) hours of the notification, to the contractor, of the failure of the system to perform operationally per UL and NFPA standards. Non-emergency service calls shall be responded to within twenty-four (24) hours of the notification to the contractor.

3.8 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain fire-alarm system.

B. Demonstration shall not take place until all systems are 100% operational as determined by the Owner. The purpose of training is to fully prepare the facility staff for complete operational responsibility of the fire alarm system.

C. The facility staff shall be fully trained and be given the capability by the product Vendor and installing Contractor to modify, to program, to fully repair, to service, and to maintain the system after (and if desired, during) the warranty period.

END OF SECTION 28 31 00

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JAMEY
TOMAN
A PROUD PARENT
OF MATT TOMAN

Owner: School District of Manawa
Project Name: 18-268
Cost Estimate Summary
June 25, 2019

Hoffman
Planning, Design & Construction, Inc.

	Referendum Estimate	Schematic Design Estimate	Design Development Estimate	Construct. Documents Estimate	Comments
Bid Package #1	**$2,516,075**	**$2,382,325**	**$1,511,195**	**$1,511,195**	MES site work, re-roof at both schools, and masonry restoration at HS (GREEN = CONTRACTED WORK)
MES - Renovation/Maintenance	**$741,554**	**$738,875**	**$766,678**	**$766,678**	
HS - Renovations/Maintenance	**$3,586,358**	**$3,421,552**	**$3,397,451**	**$3,438,967**	
HS - Additions	**$2,638,759**	**$2,948,000**	**$3,462,007**	**$3,426,037**	
Design Reimbursables	**$20,000**	**$20,000**	**$20,000**	**$20,000**	
Scheerer Construction Fee	**$0**	**$217,000**	**$80,000**	**$80,000**	
Cost of Work Consultants	**Inc. Above**	**Inc. Above**	**$57,375**	**$57,375**	Survey, Civil, Geotechnical, Commissioning
GC's and PR's	**$1,403,787**	**$1,403,787**	**$1,403,787**	**$1,403,787**	
Architectural Fee	**$556,952**	**$556,952**	**$556,952**	**$556,952**	
Construction Mgt Fee	**$376,683**	**$376,683**	**$376,683**	**$376,683**	
Total Construction Est. w/ fees	**$11,840,168**	**$12,065,174**	**$11,632,128**	**$11,637,673**	
Furnishings and Equipment	**$200,000**	**$300,000**	**$250,000**	**$250,000**	STEAM and FF&E Allowance-Including science tables (SD Added 50k in FF&E and Playground Equipment, DD Removed Playground Equipment)
Other Owner Costs	**$104,000**	**$105,350**	**$105,350**	**$110,776**	Moving and Abatement
Total Project Estimate	**$12,144,168**	**$12,470,524**	**$11,987,478**	**$11,998,449**	