

Parks, Buildings and Grounds Commission MEETING AGENDA



March 13, 2023 - 5:30 PM
Mayor's Conference Room
3805 S. Casper Dr.

Published 3/8/2023

AGENDA

1. **CALL TO ORDER**
2. **ROLL CALL; DECLARATION OF QUORUM; PUBLIC NOTICE**
3. **APPROVAL OF MINUTES**
4. **NEW BUSINESS**
 - A. Rejection of Bids for City Hall Window Project
 - B. Resolution 2023-7 Amending the 2023 Capital Projects Budget
 - C. Award of Safety Building Boiler Project
 - D. Award of Fire Station #1 Roof Project
 - E. Award of Safety Building Roof Project
 - F. Discussion and possible action to approve the request from FireWise BBQ and Mr. P's Grilled Cheese food trucks to sell at Malone Park on Friday May 19th through Sunday, May 21st for a New Berlin Pumas Youth Baseball Tournament that has been approved by the Recreation Department.
5. **UPDATES**
6. **ADJOURN**

Supplemental Information:

- The meeting agenda and agenda packet are available online at www.NewBerlin.org. The minutes are published online and are approved at the next regularly scheduled meeting.
- It is possible that action will be taken on any of the items on the agenda and that the agenda may be discussed in any order.
- You may provide comments to the City Clerk via email at CitizenComments@NewBerlin.org. Comments will be forwarded to the Mayor and members of the governing body. Emailed comments are not read during the meeting.
- The City of New Berlin strives to host inclusive, accessible meetings that enable all individuals to engage and participate fully. Any person who has a qualifying disability under the Americans with Disabilities Act that requires that the meeting be accessible, please contact City Clerk Rubina R. Medina at (262) 786-8610 or via email at CityClerk@NewBerlinWI.gov at least 48 hours before the scheduled meeting time. Efforts will be made to accommodate the needs of disabled individuals through appropriate aids and/or services.

- *It is also possible that members of and possibly a quorum of other governmental bodies of the municipality may be in attendance at the above-stated meeting to gather information; no action will be taken by any governmental body at the above-stated meeting other than the governmental body specifically referred to in the above notice.*

New Berlin City Hall Window Replacement
Quest CDN – 8382898
3805 S. Casper Dr., New Berlin, WI 53151

BID FORM

1. **GENERAL DIRECTIONS TO BIDDERS**

- A. All Bids must be submitted on these standard form sheets inclusive without modification. Fill out all blanks on the Bid Form by typing or writing in ink. Sign in ink. Erasures or other changes in Bid must be explained or noted over signature of Bidder. Enter Bid amount in both written words and printed figures in spaces provided on Bid Form. In case of conflict, amount given in written words will govern.
- B. Base Bid(s) must be for Work bid in strict accordance with the Drawings and Specifications. **INCLUDE BOND COSTS IN THE BASE BID(S)**. Bid all requested Alternates. If no change to the Base Bid applies, enter "No Change."
- C. Bid Forms containing qualifications, conditions, omissions, unexplained erasures, alterations or items not called for in Bid Form or other irregularities of any kind may be rejected at the discretion of the Owner.
- D. Bidders shall examine the provisions of the Project Manual thoroughly to ensure compliance with all bidding requirements.
- E. Bidders shall only submit the Bid Forms included in the Project Manual – DO NOT return the Project Manual.
- F. Bidders shall ensure that all items in the Bid Form such as Work Schedule, Bidders Official Title and Signature, and Proof of Responsibility are properly executed.
- G. A bid must be accompanied by a bid security made payable to Owner in an amount of 5% of bidder's maximum bid price (determined by adding the base bid and all alternates), and in the form of a certified check, bank money order or a bid bond issued by a surety acceptable to the City. The bid security will be retained by the City until the City awards the contract to such bidder and such bidder has executed the contract documents and met the other conditions of the Notice of Award, where upon the bid security will be released. If the successful bidder fails to execute and deliver the contract documents and furnish the requirements contract security within 15 days after the Notice of Award, the Owner may consider the bidder to be in default and annul the Notice of Award and the bid security of that bidder will be forfeited. Such forfeiture shall be the Owner's exclusive remedy if the bidder defaults.

- H. The Bidder shall be required to identify any subcontractor, suppliers, individuals or entities to be submitted to the Owner 14 days in advance of the City's acceptance of the agreement. The apparent successful bidder shall, within 5 days after the bid opening, submit to the Owner a list of all such subcontractors, suppliers, individuals or other entities that will be utilized in the completion of the work. An experience statement with pertinent information regarding similar projects and other evidence of qualification for the work that the subcontractor will be performing is required. If the Owner, after review of such information, determines, in its sole discretion, that such subcontractor, supplier, individual or entity is not satisfactory, the Owner, prior to the Notice of Award, shall give notice to the successful bidder requiring that an acceptable substitute be provided. In the event there is any adjustment to the cost as a result of said substitution, Owner may take that into consideration in making the contract award. In the event that the contractor fails to make the substitution requested, the Owner may award the contract to the next lowest responsive responsible bidder.
- I. Bids not conforming to the above directions may be declared irregular and are subject to disqualification at the discretion of the Owner.

THE BIDDER HEREBY AGREES THAT THIS BID IS INVALID WITHOUT BIDDER'S SIGNATURE APPEARING IN THE SIGNATURE BLOCK ON THE LAST PAGE OF THIS BID FORM.

2. BID SUBMITTAL PROCEDURE

In submitting a Bid, the Bidder represents that:

- He/She thoroughly reviewed and understood the Bidding and Contract Documents and the Bid is made in full accordance with these documents and amendments issued thereto.
- He/She has thoroughly reviewed and understands the Bidding and Contract Documents related to the Work of other portions of the Project, if any, being bid concurrently or presently under construction.
- He/She has thoroughly reviewed informational reports and documents available to him/her, visited the project site, become familiar with actual local conditions under which the Work is to be performed and has correlated his/her evaluations and personal observations with the requirements of the Bidding and Contract Documents.
- The contract for the work, if awarded, will be on the basis of materials and equipment specified or described in the bidding documents, and those or equal or substitute or materials and equipment subsequently approved by the Owner prior to the submittal of bids and identified by addendum. No item of material or equipment will be considered by Owner as an or equal or substitute unless written requests for approval has been submitted by the bidder and has been received by the Owner at least 10 days prior to the date of receipt of bids in the case of a proposed substitute. The burden of proof on the merit of the proposed item is upon the bidder. The Owner's decision of approval or disapproval of a proposed item will be final. If the Owner approves any such proposed items, such approval will be set forth as an addendum issued to all perspective bidders. Bidder shall not rely upon approvals made in any other manner. All prices

that Bidder sets forth in this bid shall be based on the presumption that the contractor will furnish the materials and equipment specified or described in the bidding documents as supplemented by any addenda.

- A. After Bid Forms are completed, place one (1) set of signed originals and the Bid Bond in a sealed envelope. Oral, telephonic, e-mailed, or faxed Bids are invalid and will not be considered.
- B. Address the envelope to:
City Clerks Department
New Berlin City Hall Window Replacement
Buildings and Grounds
3805 S Casper Dr
New Berlin, WI 53151
- C. Bidders shall affix their name and address to the front upper left-hand corner of the envelope with the words "Sealed Bid Enclosed" written on the outside. Identified in lower left corner should be: Bid number, project name and opening date.

3. BID CLOSING

- A. Bids must be received on or before 10:30 a.m. on March 1, 2023. The Bidder assumes full responsibility for timely delivery at the location designated for receipt of Bids. **Bids received after the time and date for receipt of Bids will be rejected and returned unopened.**

4. BID OPENING

- A. Bids will be publicly read at 10:30 a.m. on March 1, 2023 in the New Berlin City Hall – Common Council Chambers.

(a corporation)

(a partnership)

(an individual)

We B-D Contractors, Inc.

(Cross out inapplicable)

Of 17020 W. Rogers Dr. New Berlin, Waukesha, WI 53151
Street City County State Zip

hereby agree to execute the proposed Contract and to furnish a satisfactory Public Improvement Performance/Labor and Material Payment Bond, in the amount of one hundred percent (100%), and to provide all labor and material required for the construction of the designated Work, for the prices hereinafter set forth, in strict accordance with the Construction Documents released by: **City of New Berlin**, address: 3805 S. Casper Dr, New Berlin, WI dated January 11, 2023.

Including Amendment Nbr(s). 1-2 dated 2/10/23 - 2/17/23

5. BASE BID

Base Bid includes all work required to complete the Project, including Building Permits, General Conditions, overhead, profit, insurance, bonds, taxes, and all other expenses. Bid Guarantee ten percent (10%) Bid Bond Cost, Public Improvement Performance Bond and Labor and Materials Payment Bond Cost one hundred percent (100 %) for the sum of:

Four hundred forty thousand Dollars (\$ 440,000)

10. SCHEDULE OF VALUES

- A. Submit schedule of standard rates for all personnel, including personnel of subcontractors, involved with project.
- B. Include schedule of standard markups.

11. COMMENCEMENT, PROGRESS AND COMPLETION OF WORK

- A. If written Notice of Intent to Award Contract is issued not later than March 17, 2023 with a Project commencement of March 20, 2023, can you complete the Work in compliance with the requirements of the Contract Documents by September 29, 2023, in full cooperation and coordination with other Contractors, if any.
Yes ☒ No ☐.

If "No", state additional calendar days required _____.

- B. The undersigned understands that time is of the essence and agrees that the specified time period for completion stated above is a reasonable time for the completion of the Work. All time limits shall be binding.

12. BID ACCEPTANCE:

- A. All Bids as stated above are effective and open for acceptance by the Owner for a period of ninety (90) days after date set for opening of Bids.

FIRM NAME B+D Contractors, Inc.

BY SIGNATURE [Signature]

TITLE Vice President

DATED 3/1/2023

TELEPHONE (262) 784-9343

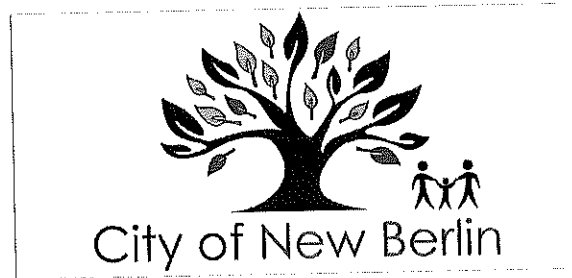
FAX NBR (262) 784-9093

EMAIL ADDRESS: jwelscher@b-dcontractors.com

If a corporation, answer the following:

Incorporated under laws of what state? WI

SEAL 111 (If Bid is by Corporation)



New Berlin City Hall Window Replacement

Project Manual

January 4, 2023

HGA

Hammel, Green and Abrahamson, Inc.
333 East Erie Street
Milwaukee, Wisconsin 53202-6005
414.278.8200 | HGA.COM

Project No. 4970-001-00
© 2023 HGA, Inc.

INVITATION TO BID

Project: City Hall Window Replacement
3805 S. Casper Dr.
New Berlin, WI 53151
Quest CDN – 8382898

1. Bids will be prepared in accordance with Contract Documents prepared by Hammel, Green, Abrahamson, Inc. 333 East Erie Street, Milwaukee, WI 53202-6005, Ph 414-278-8200 **and** dated January 4, 2023.
2. Notice is hereby given that sealed Bids are due in the New Berlin City Hall – City Clerk office, by 10:30 a.m. CST/CDT on March 1, 2023. (Reference Bid Form, Item 2)
3. Bids will be publicly read at 10:30 a.m. on March 1, 2023 in the New Berlin City Hall – Common Council Chambers.
4. Oral, faxed or e-mailed Bids will be rejected.
5. All blanks on the Bid Form shall be filled in by typewriter print or manually in ink. If the filled areas are illegible, the Bid shall be rejected. The Bidder shall make no additional stipulations on the Bid Form or qualify the Bid in any manner.
6. Where so indicated on the Bid Form, the values shall be expressed in both words and figures. In the event of discrepancy between the words and figures, the amount written in words shall govern.
7. Bids will be submitted using the Bid Forms provided herein. Bid security shall be by a qualified surety in the form of a bid bond, in the amount of ten percent (10%) of Bid amount, and shall be submitted with the Bid. Bidders shall agree to not withdraw the Bid for a period of ninety (90) days after due date of Bids.
8. Accepted Bidders will be required, as a condition precedent to award of Contract, to furnish in the amount of 100% of the contract prices, satisfactory Performance Bond, Labor and Material Payment Bond and Certificate of Insurance.
9. Bidding Documents will be available on or after February 8, 2023. Second advertisement on February 15, 2023. Bidders may obtain Bidding Documents only from the following site: Quest ebid doc #8382898 – Bid/RFP Listing. Documents will available for download. Documents will not be mailed. **It is the responsibility of prospective Bidders to check this website for any future amendments, questions, revisions, etc., prior to the opening date. All addenda must be**

acknowledged on the signature page in the area provided. Failure to do so may result in your response being rejected.

10. Mandatory Pre-bid meeting and walkthrough on February 20, 2023, at 10:00 AM. Meeting location is New Berlin City Hall, 3805 S. Casper Dr, New Berlin, WI 53151. Meeting will begin in the front lobby of City Hall. **Please be on time as no accommodations will be made for late arrivals. NOTE: This will be the only opportunity for a walk through with City Staff, therefore, be sure to bring all potential subcontractors. Vendors are also reminded to review all Bid Documents, etc. prior to arrival.**
12. The right to reject any or all Bids, either in whole or in part, or to waive any informalities or irregularities is reserved by City of New Berlin.

Published by Order of:
City of New Berlin
Buildings and Grounds
(262) 786-8610
3805 S Casper Dr
New Berlin, WI 53151

New Berlin City Hall Window Replacement
Quest CDN – 8382898
3805 S. Casper Dr., New Berlin, WI 53151

BID FORM

1. **GENERAL DIRECTIONS TO BIDDERS**

- A. All Bids must be submitted on these standard form sheets inclusive without modification. Fill out all blanks on the Bid Form by typing or writing in ink. Sign in ink. Erasures or other changes in Bid must be explained or noted over signature of Bidder. Enter Bid amount in both written words and printed figures in spaces provided on Bid Form. In case of conflict, amount given in written words will govern.
- B. Base Bid(s) must be for Work bid in strict accordance with the Drawings and Specifications. **INCLUDE BOND COSTS IN THE BASE BID(S)**. Bid all requested Alternates. If no change to the Base Bid applies, enter "No Change."
- C. Bid Forms containing qualifications, conditions, omissions, unexplained erasures, alterations or items not called for in Bid Form or other irregularities of any kind may be rejected at the discretion of the Owner.
- D. Bidders shall examine the provisions of the Project Manual thoroughly to ensure compliance with all bidding requirements.
- E. Bidders shall only submit the Bid Forms included in the Project Manual – DO NOT return the Project Manual.
- F. Bidders shall ensure that all items in the Bid Form such as Work Schedule, Bidders Official Title and Signature, and Proof of Responsibility are properly executed.
- G. A bid must be accompanied by a bid security made payable to Owner in an amount of 5% of bidder's maximum bid price (determined by adding the base bid and all alternates), and in the form of a certified check, bank money order or a bid bond issued by a surety acceptable to the City. The bid security will be retained by the City until the City awards the contract to such bidder and such bidder has executed the contract documents and met the other conditions of the Notice of Award, where upon the bid security will be released. If the successful bidder fails to execute and deliver the contract documents and furnish the requirements contract security within 15 days after the Notice of Award, the Owner may consider the bidder to be in default and annul the Notice of Award and the bid security of that bidder will be forfeited. Such forfeiture shall be the Owner's exclusive remedy if the bidder defaults.

- H. The Bidder shall be required to identify any subcontractor, suppliers, individuals or entities to be submitted to the Owner 14 days in advance of the City's acceptance of the agreement. The apparent successful bidder shall, within 5 days after the bid opening, submit to the Owner a list of all such subcontractors, suppliers, individuals or other entities that will be utilized in the completion of the work. An experience statement with pertinent information regarding similar projects and other evidence of qualification for the work that the subcontractor will be performing is required. If the Owner, after review of such information, determines, in its sole discretion, that such subcontractor, supplier, individual or entity is not satisfactory, the Owner, prior to the Notice of Award, shall give notice to the successful bidder requiring that an acceptable substitute be provided. In the event there is any adjustment to the cost as a result of said substitution, Owner may take that into consideration in making the contract award. In the event that the contractor fails to make the substitution requested, the Owner may award the contract to the next lowest responsive responsible bidder.
- I. Bids not conforming to the above directions may be declared irregular and are subject to disqualification at the discretion of the Owner.

THE BIDDER HEREBY AGREES THAT THIS BID IS INVALID WITHOUT BIDDER'S SIGNATURE APPEARING IN THE SIGNATURE BLOCK ON THE LAST PAGE OF THIS BID FORM.

2. BID SUBMITTAL PROCEDURE

In submitting a Bid, the Bidder represents that:

- He/She thoroughly reviewed and understood the Bidding and Contract Documents and the Bid is made in full accordance with these documents and amendments issued thereto.
- He/She has thoroughly reviewed and understands the Bidding and Contract Documents related to the Work of other portions of the Project, if any, being bid concurrently or presently under construction.
- He/She has thoroughly reviewed informational reports and documents available to him/her, visited the project site, become familiar with actual local conditions under which the Work is to be performed and has correlated his/her evaluations and personal observations with the requirements of the Bidding and Contract Documents.
- The contract for the work, if awarded, will be on the basis of materials and equipment specified or described in the bidding documents, and those or equal or substitute or materials and equipment subsequently approved by the Owner prior to the submittal of bids and identified by addendum. No item of material or equipment will be considered by Owner as an or equal or substitute unless written requests for approval has been submitted by the bidder and has been received by the Owner at least 10 days prior to the date of receipt of bids in the case of a proposed substitute. The burden of proof on the merit of the proposed item is upon the bidder. The Owner's decision of approval or disapproval of a proposed item will be final. If the Owner approves any such proposed items, such approval will be set forth as an addendum issued to all perspective bidders. Bidder shall not rely upon approvals made in any other manner. All prices

that Bidder sets forth in this bid shall be based on the presumption that the contractor will furnish the materials and equipment specified or described in the bidding documents as supplemented by any addenda.

- A. After Bid Forms are completed, place one (1) set of signed originals and the Bid Bond in a sealed envelope. Oral, telephonic, e-mailed, or faxed Bids are invalid and will not be considered.
- B. Address the envelope to:
City Clerks Department
New Berlin City Hall Window Replacement
Buildings and Grounds
3805 S Casper Dr
New Berlin, WI 53151
- C. Bidders shall affix their name and address to the front upper left-hand corner of the envelope with the words "Sealed Bid Enclosed" written on the outside. Identified in lower left corner should be: Bid number, project name and opening date.

3. BID CLOSING

- A. Bids must be received on or before 10:30 a.m. on March 1, 2023. The Bidder assumes full responsibility for timely delivery at the location designated for receipt of Bids. **Bids received after the time and date for receipt of Bids will be rejected and returned unopened.**

4. BID OPENING

- A. Bids will be publicly read at 10:30 a.m. on March 1, 2023 in the New Berlin City Hall – Common Council Chambers.

(a corporation)

(a partnership)

(an individual)

We _____ (Cross out inapplicable)

Of _____
Street City County State Zip

hereby agree to execute the proposed Contract and to furnish a satisfactory Public Improvement Performance/Labor and Material Payment Bond, in the amount of one hundred percent (100%), and to provide all labor and material required for the construction of the designated Work, for the prices hereinafter set forth, in strict accordance with the Construction Documents released by: **City of New Berlin**, address: 3805 S. Casper Dr, New Berlin, WI dated January 11, 2023.

Including Amendment Nbr(s). _____ dated _____.

5. BASE BID

Base Bid includes all work required to complete the Project, including Building Permits, General Conditions, overhead, profit, insurance, bonds, taxes, and all other expenses. Bid Guarantee ten percent (10%) Bid Bond Cost, Public Improvement Performance Bond and Labor and Materials Payment Bond Cost one hundred percent (100 %) for the sum of:

_____ Dollars (\$ _____)

10. SCHEDULE OF VALUES

- A. Submit schedule of standard rates for all personnel, including personnel of subcontractors, involved with project.
- B. Include schedule of standard markups.

11. COMMENCEMENT, PROGRESS AND COMPLETION OF WORK

- A. If written Notice of Intent to Award Contract is issued not later than March 17, 2023 with a Project commencement of March 20, 2023, can you complete the Work in compliance with the requirements of the Contract Documents by September 29, 2023, in full cooperation and coordination with other Contractors, if any.
Yes ___ No ___ .

If "No", state additional calendar days required _____.

- B. The undersigned understands that time is of the essence and agrees that the specified time period for completion stated above is a reasonable time for the completion of the Work. All time limits shall be binding.

12. BID ACCEPTANCE:

- A. All Bids as stated above are effective and open for acceptance by the Owner for a period of ninety (90) days after date set for opening of Bids.

FIRM NAME _____

BY SIGNATURE _____

TITLE _____

DATED _____

TELEPHONE _____

FAX NBR _____

EMAIL ADDRESS: _____

If a corporation, answer the following:

Incorporated under laws of what state?

SEAL _____ (If Bid is by Corporation)

SUPPLEMENTARY INSTRUCTIONS TO BIDDERS

GENERAL:

Carefully review Project Manual, including Bidding Requirements, General Requirements, Specifications, Alternates, and Amendments, all of which contain provisions applicable to all Bidders. Successful Bidder will be required to execute all Work belonging to their Contract which is stated in the Specifications, or reasonably implied as necessary to complete their Contract, including removal of existing work and preparing present work to receive new, if such be the requirements of actual job conditions.

Visit site to become acquainted with: Adjacent areas; means of approach to the site; present conditions of project site; and facilities for delivering, storing, placing and handling of materials and equipment. Compare Specifications with existing work in place, inspect demolition requirements and inform yourself of all conditions affecting execution of Work, including other new work, if any, being performed.

WORKSITE AVAILABILITY:

A specific window of opportunity exists for completion of the Work, therefore Work shall commence on the date noted in the Bid Form. Construction activities may take place between **7:00 AM and 5:00 PM Monday through Friday, 8:00 AM – 5:00 PM. Work after hours must be coordinated with City of New Berlin Buildings and Grounds Department.**

DOCUMENTS:

Bidders shall be familiar with all Bidding Requirements and proposed Contract Documents. See General Conditions for definition of Contract Documents.

BID FORM:

Alterations of or amendments to Bid Form, attachments thereto, or inclusion of any correspondence, or other written or printed matter or details of any nature other than that specifically called for may disqualify Bid. No e-mailed alterations to the Bid will be accepted.

Only Bids which are made on regular Bid Form will be considered. No Bids for any arbitrary subdivision or sub classification of Work required by requested Bid(s) will be accepted.

Requirements of Signing: Include with each Bid full business address of Bidder. Bids by corporations shall be executed in the full legal name of the corporation, giving State of incorporation and be signed by an authorized officer or officers, who shall, in each case, type or print name and corporate title beneath the signature. Partnership Bids shall state the full name of all partners, e.g., "Smith and Jones, a partnership of John S. Smith and William B. Jones". Such Bids must also be signed by an authorized partner or other representative, typing or printing the name and title of the signer beneath the signature. Individuals operating as a business shall sign Bids, typing or printing the individuals name followed by

the words "Sole Proprietor" beneath the signature. When requested by Owner, furnish satisfactory evidence of agency or authority of any person signing on behalf of another.

Submission of Bids: Reference Bid Form, Section 2.

CONTRACT AND CONTRACT DOCUMENTS:

The Contract into which successful Bidder will be required to enter is based on City of New Berlin General Terms and Conditions of Service (as modified by Owner). Familiarize yourself with the provisions of this document.

ACCEPTANCE OF BID (AWARD):

It is the intent of the Owner to award a Contract or accept any Bid which will be in the best interests of the Owner, provided the Bid has been submitted in accordance with the requirements of the Bidding Documents and does not exceed the funds available. The Owner reserves the right to waive informalities or irregularities in a Bid received and to accept the Bid, which in the Owner's judgment, is in the Owner's best interests.

The Owner reserves the right to accept Alternates in any order or combination, unless otherwise specifically provided in the Bidding Documents, and to determine the lowest responsible Bidder on the basis of the Base Bid and Alternates accepted.

WITHDRAWAL OF BIDS:

Matters pertaining to the withdrawal of a Bid and to claims of error, omission or mistake in preparing or submitting a Bid shall be governed by Section 66.0901 of the Wisconsin Statutes.

All Bids shall be effective and open for acceptance for a period of ninety (90) days after date set for opening of Bids.

RESERVATION:

Owner reserves the right to: reject any or all Bids, reject a Bid not accompanied by a required bid security or by other data required by the Bidding Documents, reject a Bid which is in any way incomplete or irregular, waive any irregularities in any Bid, accept any Bid which will be in best interests of Owner.

INADEQUACIES AND OMISSIONS:

Failure to request timely clarification or interpretation of Bidding Documents shall not relieve Bidder/Contractor of responsibility to execute the Work in accordance with the intent of the Contract Documents. Signing of Contract means that the Contractor has thorough comprehension of full intent and scope of Contract Documents.

The Owner and his consultants are not responsible for oral instructions.

INTERPRETATIONS AND CORRECTIONS:

Carefully review and compare all parts of the Bidding Documents with each other, and with other work being bid concurrently or presently under construction to the extent that it relates to the Work for which the Bid is being submitted. Examine the site and local conditions, and immediately report to the Owner errors, inconsistencies or ambiguities discovered.

Bidders and Sub-bidders requiring clarification or interpretation of the Bidding Documents shall submit a written request to the Owner, received in Owner's office at least seven (7) days prior to the date set for receipt of Bids.

Interpretations and corrections of and changes to the Bidding Documents will be made in writing by Addendum only. Interpretations and corrections made in any other manner are not binding. Bidders shall not rely upon verbal instructions or information.

POWER OF ATTORNEY AND BOND REQUIREMENTS:

Submit with each Bid a bond executed by an attorney-in-fact, including a certified and effectively dated copy of his power of attorney. Where the certification is by facsimile, or otherwise does not bear an original signature, the bonding company must be qualified for recognition under facsimile execution.

AGREEMENT BETWEEN OWNER and CONTRACTOR FOR CITY HALL WINDOW REPLACEMENT PROJECT

ARTICLE I Work

Contractor shall complete all work as specified or indicated in the contract documents, which shall be inclusive of the bid instructions, bid forms, specifications, City of New Berlin insurance requirements, as well as this Agreement. The work is generally described as follows: replacement of City Hall Windows and Doors.

This work shall be considered the "Project".

ARTICLE II Contract Times

Time is of the essence with respect to all time limits, milestones (if any), as well as deadlines for substantial completion and completion of the work provided for in the specifications.

The work will be substantially completed on or before June 30, 2023, and completed and ready for final acceptance and payment in accordance with this Agreement on or before July 17, 2023, subject to conditions beyond the control of the Contractor, such as labor or material shortages, weather conditions, strikes, civil unrest or wars. The Owner shall make the final decision as to the adequacy of the justification for the delay. Contractor and Owner recognize that time is of the essence and that the Owner will suffer financial and other losses if the work is not completed and the milestones are not achieved within the time limits specified above. The parties also recognize that delays, expense and difficulties involved in proving, in a legal or arbitration proceedings, of the actual loss suffered by the Owner if not completed on time.

ARTICLE III Contract Price

The Owner shall pay Contractor for the completion of the work in accordance with the contract documents in the amounts that follow, subject to any applicable adjustments under this Agreement.

- (a) For all unit price work in an amount equal to the sum of the established unit prices for each separately identified item of unit price work times the actual quantity of that item.
 - 1) The estimated total of all unit price work for the base bid is \$_____.
 - 2) The estimated total of all unit price work for alternate bid number 1 (Provide GL-22) Insulating Vision Glass with UV Bird Collision Mitigation coating in lieu of GL-21) is \$_____.

- 3) The estimated total of all unit price work for alternate bid number 2 (Provide new hollow metal doors and frames) is \$_____.

These bid prices are based on estimated quantities. These quantities shall be adjusted based upon the actual work performed.

- (b) For all work at the prices stated in the Contractor's Bid attached hereto as Exhibit "A".

ARTICLE IV Payment Procedures

Contractors shall submit applications for payments in accordance with the terms of this Agreement upon final completion and acceptance of the work. Owner shall have thirty (30) days after receipt of such request to review the request for correctness and to obtain approval for such payment by its Common Council. The Owner may withhold payment for any portion of the work which is not completed in accordance with the specifications, and shall pay for the work related to any undisputed charges. Upon the successful completion of the work and the acceptance of that work as provided for hereunder, the Owner shall pay the remainder of the contract price.

Upon substantial completion of the work, the owner shall pay an amount sufficient to increase the total payments to the Contractor to one hundred (100%) percent of the work completed, but less such amount set off by Owner as provided for herein, less two hundred (200%) percent of the estimated value of the work to be completed or corrected in accordance with a punch list to be completed prior to final payment. Upon the successful completion of the work and the acceptance of that work as provided for hereunder, the Owner shall pay the remainder of the contract price.

ARTICLE V Contractor's Representations

In order to induce the Owner to enter into this contract, the Contractor makes the following representations;

- (a) The Contractor has examined and carefully studied the contract documents and any data and reference items included in the contract documents.
- (b) The Contractor has visited the site, conducted a thorough visual examination of the site and adjacent areas, and has become familiar with and is satisfied as to the general, local and site conditions that may affect cost, progress and performance of the work.

- (c) The Contractor is familiar with and is satisfied as to all laws and regulations that may affect cost, progress and performance of the work.
- (d) The Contractor has carefully studied all reports or explorations and tests related to the conditions in which the work will be performed. As well as reports and drawings related to the work and technical data in such reports and drawings.
- (e) The Contractor has considered the information known to the Contractor itself, including information commonly known to contractors doing business in the Milwaukee Metropolitan Area, as well as information and observations obtained from visits to the site, the contract documents and site related reports and drawings in the contract documents, with respect to the impact of such information, observations and documents on the cost, progress and performance of the work, the means, methods, techniques, sequences and procedures of construction and the contractor safety precautions and programs.

Based on the information and observation referred to in the preceding paragraph, the Contractor agrees that no further examinations, investigations, explorations, tests, studies or data are necessary for the performance of the work at the contract price, within the contract times, in accordance with the other terms and conditions of the contract.

The Contractor(s) have given the Owner written notice of all conflicts, errors, ambiguities or discrepancies, which the Contractor(s) have discovered in the contract documents and the Contractor(s) certify that the written resolution thereof by the Owners are acceptable to the Contractor.

The contract documents are sufficient to indicate and convey understanding of all terms and conditions for performance and the furnishing of the work.

The Contractor's entry into this contract constitutes an incontrovertible representation by the Contractor that without exception, all prices in in the Agreement are premised upon performing and furnishing the work required by the contract documents.

ARTICLE VI

Assignment of Contract

Unless expressly agreed to by the Owner, no assignment may be made of the rights and responsibilities of the Contractor under this Agreement.

ARTICLE VII

Successors and Assigns

The Owner and Contractor each binds themselves, their successors, agents, legal representatives and assigns with respect of all covenants, agreements and obligations contained in the contract documents.

ARTICLE VIII

Severability

Any provision or part of the contract documents held be void or unenforceable under any law or regulation, shall be deemed stricken and all remaining provisions shall continue to be valid and binding upon the Owner and Contractor which agree that the contract documents shall be reformed or replaced of such stricken revision or part thereof with a valid and enforceable provision that comes as close as possible to expressing the intention of the stricken provision.

ARTICLE IX

Relationship of the Parties

The Contractor agrees to perform the services as provided for hereunder as an independent contractor, not as an employee of the owner. The Contractor shall furnish all services and labors and materials and equipment necessary to conduct and complete the work. The work shall be performed in accordance with the specifications subject to the satisfaction of the Owner.

ARTICLE X

Delay

The Contractor shall not be liable for delays or failure to perform the services necessary to complete the work which are caused directly or indirectly by circumstances beyond the Contractor's control, including but limited to, acts of God, fire, flood, war, sabotage, accident, labor dispute, material shortage, governmental action, including regulatory requirements, change conditions, delays resulting from actions of the Owner or third parties not under control of the Contractor, site inaccessibility or inability of others to obtain materials, labor, equipment or transportation. Should any of the above occur, then the date for completion of the services shall be adjusted for such delay, provided that the Contractor reports delay to the Owner within a reasonable time of its discovery. The Owner shall determine whether or not the cause of delaying or not completing a duty or obligation under this Agreement is under the control of the Contractor.

The Contractor acknowledges that it must perform the work and services hereunder, pursuant to the terms and conditions of this Agreement and that such work shall conform to the recognized standards in the Milwaukee Metropolitan Area for the performance of this work as are prevalent in this field of endeavor and like services. Also, its work shall be performed in a good and workman- like manner.

ARTICLE XI

Taxes, Social Security and Governmental Reporting

Personal income tax payments, social security contributions, insurance and all other governmental reporting and contributions required as a consequence of the Contractor(s) receiving payment under this Agreement shall be the sole responsibility of the Contractor(s). The Contractor shall be solely responsible to meet the Owner's insurance needs, as specified below, during the terms of this Agreement or any extensions thereof:

General Liability

General Aggregate	\$2,000,000.00
Personal Advertising Injury	\$1,000,000.00
Each Occurrence	\$1,000,000.00
Fire Damage	\$ 50,000.00
Medical Expense (any one person)	\$ 5,000.00

Automobile Liability

CSL	\$1,000,000.00
(Excess Liability)	
Umbrella Form	\$1,000,000.00 (per occurrence)
	\$2,000,000.00 Aggregate Self-Insured Retention, Not Greater than \$10,000.00

Professional Liability

General Aggregate	\$2,000,000.00
Each Occurrence	\$1,000,000.00

A Certificate of Insurance shall be provided to the Owner as evidence thereof, naming the City as an additional insured on a primary and non-contributory basis, showing the Contractors covered by the above required types and amount of insurance and further providing for a thirty (30) day notice to the Owner prior to change, termination or cancellation of the Agreement, except in the event of cancellation or termination as a result of non-payment of premium, in which case the notice shall not be less than ten (10) days. Such notice provision shall be stated in the unconditional affirmative. Phrases such as, "shall endeavor to notify" are unacceptable and will be rejected. The Contractor shall provide evidence of the additional insured status through a policy endorsement form acceptable to the Owner.

ARTICLE XII

Indemnification

The Contractor shall indemnify and hold harmless the Owner and its agents, employees, elected officials, representatives and assigns, hereinafter referred to as the "Indemnified Parties", as and against any and all claims, demands, actions, causes of action, losses of expense, including but not limited to, actual attorney's fees arising out of or resulting from the performance of the work,

but only to the extent caused in whole or in part by a negligent acts or omissions of the Contractor, a sub-contractor or anyone directly or indirectly employed by them or anyone for whose acts they may be liable, regardless of whether or not such claims, damages loss or expenses is caused in part by the indemnified parties. Such obligation shall not be construed to negate, abridge or reduce other rights or obligations of indemnity which would otherwise exist as to a party or persons described in this paragraph. To the extent the Owner is separately entitled to coverage, defense or indemnification from a Contractor and/or its insurer for the same losses or expenses, this clause shall not apply, it being understood that the Contractor's obligation is primary. To the extent that the Contractor retains sub-contractors for the performance of the work, or any portion thereof, the Contractor and/or sub-contractor shall provide evidence of the insurance coverages noted above, as well as the terms of this indemnification provision shall be applicable to such Contractors or sub-contractors.

ARTICLE XIII

Regulations

The Contractor agrees to comply with all the requirements of applicable federal, state and local laws, as well as codes and specification requirements related to the performance of the work under this Agreement.

ARTICLE XIV

Termination of Contract for Cause

If, through any cause, the Contractor shall fail to fulfill, in a timely and proper manner, its obligations under this Agreement, or if the contractor shall violate any of the covenants, agreements or stipulations of the contract, the Owner shall thereupon have the right to terminate the Agreement by giving written notice to the Contractor of such termination. The Contractor will be paid for the work performed through the date of termination. However, notwithstanding that commitment the Contractor shall not be relieved of the liability to the Owner for damages sustained by the Owner and the Owner may withhold any payments to the Contractor for the performance of or set off until such time as the exact amount of damage is due the Owner from the Contractor are determined. If through no fault of the Contractor, the Owner shall fail to fulfill in a timely and proper manner its obligation under this contract, or if the Owner shall violate any of the covenants, agreements or obligations of the contract, the Contractor shall have the right to terminate this contract by giving written notice to the Owner of such termination specifying the effective date thereof, at least five (5) days prior to the effective date of such termination.

ARTICLE XV

Termination for Convenience of the Owner

The Owner may terminate this Agreement at any time for any reason by giving at least twenty (20) days' notice in writing from the Owner to the Contractor. The contract is terminated by the Owner as provided for herein. The Contractor shall be paid an amount which bears the same ratio to the total compensation as the services actually and satisfactorily performed compared to

the total services of the Contractor covered by this Agreement, less payments for such services as were previously made, plus all reimbursed expenses payable under the Agreement.

ARTICLE XVI **Governing Law**

This Agreement shall be governed and construed in accordance with the laws of the State of Wisconsin. The contract documents shall represent the complete understanding of the parties with respect to the subject matter set forth herein and may only be amended in a subsequent agreement executed by all parties.

Dated this _____ day of _____ 2023.

Contractor:

City of New Berlin

By: _____

By: _____

ADDENDUM TO CITY OF NEW BERLIN CONTRACTS

This Addendum is made and entered into and shall be considered an attachment to all contracts entered into by the City of New Berlin for so long as the City of New Berlin is subject to the U.S. Department of Treasury Restrictions, as well as other federal regulations related to the City's receipt of American Rescue Plan Act Funds. The following Terms and Conditions shall be included in each such agreement and are incorporated as though fully set forth in the original contract.

1. The contractor agrees to comply with the applicable requirements of Section 603 of the American Rescue Plan Act (hereinafter referred to as the "Act") regulations adopted by the US Department of Treasury (hereinafter referred to as the "Treasury") pursuant to Section 603(f) of the Act and the guidance issued by the Treasury regarding the foregoing. The contractor also agrees to comply with all other applicable federal statutes, regulations and executive orders and shall provide for such compliance by other parties, including subcontractors in any agreements it enters into with other parties related to this award.
2. Statutes and regulations prohibiting discrimination and applicable to this contract include, but are not limited to the following:
 - a. Title VI of the Civil Rights Act of 1964 (42 USC, §2000 D, et. seq.) and Treasury's implementing regulations at 31 CFR, Part 22, which prohibit discrimination on the basis of race, color or national origin under programs or activities receiving federal financial assistance.
 - b. Fair Housing Act. Title VIII of the Civil Rights Act of 1968 (42 USC, §3601, et. seq.) which prohibits discrimination in housing on the basis of race, color, religion, national origin, sex, familial status or disability.
 - c. Section 504 of the Rehabilitation Act of 1973, as amended, (29 USC, §794), which prohibits discrimination on the basis of disability under any program or activity receiving federal financial assistance.
 - d. The Age Discrimination Act of 1975, as amended (42 USC, §6101, et. seq.) and Treasury's implementing regulations at 31 CFR, Part 23, which prohibit discrimination on the basis of age and programs or activities receiving federal financial assistance; and
 - e. Title II of the Americans with Disabilities Act of 1990, as amended (42 USC, §12, 12101 et. seq.), which prohibits discrimination on the basis of disability under programs, activities and services provided or made available by state and local governments or instrumentalities or agencies thereto.
3. Equal Employment Opportunity. During the performance of the contract, the contractor will be required to comply with Equal Opportunity Employment Statutes as outlined in 47 CFR, §90.168.
4. Copeland Anti-Kickback Act. The contractor shall comply with 18 USC, § 874, 40 USC, §3145 and the requirements of 29 CFR, Part 3, as may be applicable, which are incorporated by reference into this contract.

5. Contract Work Hours of the Safety Standards Act.

- a. Overtime Requirements. No contract or subcontract contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any work week in which he/she is employed on such work to work in excess of 40 hours in such work week unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of 40 hours in such work week.
 - b. Violation. Liability for unpaid wages; liquidated damages: In the event a violation of the clause set forth in (a) above, the contractor or any subcontractor responsible therefore shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards employed in violation of this section.
 - c. Withholding fund paid wages and liquidated damages: The City of New Berlin shall, upon its own action or upon written request of an authorized representative of the US Department of Labor, withhold or cause to be withheld from any monies payable on account of work performed by the contractor or subcontractor under any such contract or any other federal contract with the same contractor or any other federally assisted contract subject to the contract work hours and Safety Standards Act, which is held by the same contractor such sums as may be determined to be necessary to satisfy any liabilities of such contractors or subcontractors or unpaid wages and liquidated damages as provided in the clause set forth in this section.
 - d. Subcontract. The contractors or subcontractors shall insert in any contract the clauses set forth in Paragraph B, 1-4 of 29 CFR §5.5 and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in Paragraphs B, 1-4 of 21 CFR, §5.5.
6. Clean Air Act and Federal Water Pollution Control Act. Contractor needs to comply with all applicable standards, orders or regulations issued pursuant to the Clean Air Act, as amended, 42 USC, §7401, et. seq.
7. Debarment and Suspension. This award is a covered transaction for purposes of 2 CFR, Part 180 and 2 CFR, Part 3000. As such, the contractor is required to verify that none of the contractors principals (defined in 2 CFR, §180.995) or its affiliate (defined in 2 CFR, §180.1.905) are excluded (defined in 2 CFR, §180.940) or disqualified (defined in 2 CFR, §180.935). Selected contractors must comply with 2 CFR, Part 180, Subpart C and 2 CFR, Part 3000, Subpart C, and must include a requirement to comply with these regulations in any lower tier covered transaction it enters into. This certification is a material representation of fact relied upon by the City of New Berlin. If it is later determined that the contractor did not comply with 2 CFR, Part 180, Subpart C and 2 CFR, Part 3000, Subpart C, in addition to remedies available to the City of New Berlin, the federal government may pursue available remedies including, but not limited to, suspension and/or

disbarment. The contractor and the bidder or proposer agree to comply with the requirements of 2 CFR, Part 180, Subpart C and 2 CFR, Part 3000, Subpart C, while this offer is valid and throughout the period of any contract that may arise from this offer. This contractor and the bidder or proposer further agrees to provide a provision requiring such compliance in its lower tier covered transactions.

8. Byrd Anti-Lobbying Amendment. The contractor shall file the required certification. The contractor and all subcontractors certify that they will not and have not used federal appropriated funds to pay any person or organization for influencing or attempting to influence an officer or employee of any agency, a member of Congress, officer or employee of Congress or an employee of a member of Congress, or employees of the City of New Berlin in connection with obtaining any federal contract, grant or any award covered by 31 USC, §1352. Each tier, including the contractor and all subcontractors, shall also disclose any lobbying with non-federal funds that takes place in connection with obtaining any federal award. Such disclosures are forwarded from tier to tier up to the recipient, who in turn will forward the certifications to the awarding agency. If the agreement exceeds \$100,000.00, the contractor must certify compliance with the Byrd Anti-Lobbying Amendment.
9. Procurement of Recovered Materials. Contractor shall comply with 2 CFR, §200.323 as applicable.
10. Prohibition on Certain Telecommunications and Video Surveillance Services or Equipment. Contractor shall comply with 2 CFR, §200.216, as applicable.
11. Domestic Preferences for Procurements. Contractor shall comply with 2 CFR, §200.322.
12. This Exhibit A is intended to incorporate those federal laws and regulations that apply to this contract. If the contractor believes that any law or regulation described herein is not applicable in this contract per the terms of the federal law or regulation, the contractor shall present their position in that regard to the City of New Berlin with a written change order request. The laws cited herein shall be followed by the contractor and all subcontractors unless the municipality agrees that the cited federal law or regulation does not apply, and the change order is approved by the City of New Berlin Common Council.

ADDENDUM TO CITY OF NEW BERLIN CONTRACTS

This Addendum is made and entered into and shall be considered an attachment as Exhibit B to all contracts entered into by the City of New Berlin for so long as the City of New Berlin is subject to the U.S. Department of Treasury Restrictions, as well as other federal restrictions related to the City's receipt of Federal Funds. The following Terms and Conditions shall be included in each such agreement and are incorporated as though fully set forth in the original contract.

1. No City contractor or employee shall operate any machinery or vehicle while utilizing a smart phone, including, but not limited to, the use of any cellular phone or texting.
2. All City employees and contractors, while engaged in the performance of City business or acting consistent with the performance of services under a contract with the City shall utilize seatbelts and any other safety devices related to the operation of a motor vehicle.
3. City employees or contractors whose duties and responsibilities are funded through the Coronavirus State and Local Fiscal Recovery Funds agree that they will not engage in any lobbying activities while in the course of providing services on behalf of the City of New Berlin, as restricted under the Hatch Act, 5 USC Sec. 1501-1508. No funds appropriated under the Coronavirus State and Local Fiscal Recovery Act shall be utilized for lobbying, and no political payments shall be made through the use of said funds.
4. All City employees and contractors, while in the performance of duties on behalf of the City shall abide by all local, state and federal regulations concerning the ingestion of controlled substances and shall not violate such Statutes or Ordinances. The City shall enforce drug free workplace standards and provide awareness programs for Staff. The City shall further agree to take action regarding individuals using drugs in the workplace according to law.
5. All City employees and contractors, in the course of performing of their duties on behalf of the City, shall, to the extent applicable, comply with the provisions in Wisconsin Statute §19.59 regarding conflicts of interest, as well as City of New Berlin Municipal Code Chapter 28 regarding ethics. Specifically, no City employee or contractor shall accept or solicit money or tangible personal property or otherwise receive consideration in exchange for the agreement to enter into a contract with a third party.
6. City employees shall avoid the acquisition of unnecessary items or property on behalf of the City.
7. City employees shall, to the extent applicable, engage in value engineering as part of any construction work performed on behalf of the City.
8. Contracts shall only be awarded to responsible contractors with experience in performing the services being contracted for.

9. City contracts shall avoid compensating for contractor work performed on a time and material basis and, to the extent practicable, shall have fixed-price contracts.
10. The selection of a contractor by the City should be done in an atmosphere of open and honest competition.
11. In the course of public bidding involving the purchase of equipment, the City shall not specify only a brand name for the purpose of limiting potential contracting parties. The City may include a clause, however, that any equipment being supplied under a City contract must interface well and be compatible with existing equipment utilized by the City of New Berlin, which is identified as the following: _____.
12. The City shall verify that any entity with which it is contracting has not been excluded for contracting pursuant to 2 CFR §180.
13. City contractors do hereby certify that they are not designated by the federal government as being precluded from engaging in federal contracts.
14. The City of New Berlin, its employees, officers, agents, contractors and assigns may not discharge, demote or otherwise discriminate against an employee in reprisal for disclosing information that the employee reasonably believes is evidence of gross mismanagement of a Federal, State or City contract or grant; a gross waste of Federal, State or City funds; an abuse of authority relating to Federal, State or Local Contractor Grant; a substantial and specific danger to public health, safety or welfare; or a violation of law, rule or regulation related to a Federal, State or City contract (including, but not limited to, the competition for or negotiation of a contract) or Grant. The entities to which disclosure of such information includes, but is not limited to the following entities:
 - a. A member of Congress or a representative of a committee of Congress;
 - b. An Inspector General;
 - c. The Government Accountability Office;
 - d. A Treasury employee responsible for contract grant oversight or management;
 - e. An authorized official of the Department of Justice or other law enforcement agency;
 - f. A Court or Grand Jury;
 - g. A management official or other employee of the City;
 - h. A contractor of the City;
 - i. A subcontractor of the City, which has the responsibility to investigate, discover or address misconduct;
 - j. An official of the State of Wisconsin, or other employee, agent or contractor of the State who has the responsibility to investigate, discover or address misconduct.
15. This Policy shall be disclosed to all City officers, agents, contractors or assigns and shall be included as part of the City's Addendum for City contract.
16. The City shall engage in a cost and price evaluation analysis to include independent estimates of the cost of the equipment or service before placing the matter out for bid.

17. When the City is engaged in negotiating purchase of goods and services, the profit in the contract shall be negotiated independently from the materials and labor. In any contract entered into by the City of New Berlin for the acquisitions of goods and services shall require remedies in the event of a breach of the agreement and shall include provisions for termination as to cause.

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SECTION 010000 GENERAL REQUIREMENTS

1.1 SUMMARY

- A. Owner: City of New Berlin
- B. Project Location: 3805 S Casper Dr, New Berlin, WI 53151
- C. General Scope: Project consists of the replacement of all exterior windows and doors as described within the scope of the Contract Documents.
 - 1. Work Included: Provide labor, materials, articles, equipment, incidentals, items, tools, services, supplies, methods, operations, skills in such quantities as may be necessary to complete Project within intent of Contract Documents.
 - 2. Singular notations shall be considered plural where plural application is reasonably inferable. Mention or indication of extent of work under work division or specification section is done only for convenience of Contractor and shall not be construed as describing all work required under that Division or Section.
- D. Construction Contract: Construction will be accomplished under a single Prime Contract administered by the City of New Berlin.
- E. Existing Conditions:
 - 1. Verify location of utilities and existing conditions.
 - 2. Verify dimensions on Drawings with dimensions at the Project.
 - 3. Notify Architect of conditions differing from those indicated on the Drawings.
- F. Specification and Drawing Conventions: Drawings and specifications are intended to provide the basis for the proper completion of the Project suitable for the intended use of the Owner. Items not expressly set forth but which are reasonably implied or necessary for the proper performance of this work shall be included.

1.2 WORK RESTRICTIONS

- A. It is essential that full Owner's services and functions are maintained throughout construction period, with minimum disturbance and disruption to operations.
 - 1. Contractor, subcontractors and workers shall be aware of these requirements and objectives.
 - 2. Conduct work and develop detailed schedule to meet these requirements and objectives.
 - 3. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and approval of authorities having jurisdiction.
 - 4. Notify the Owner not less than 72 hours in advance of activities that will affect Owner's operations.
- B. Keep Owner advised of intended operations and schedule and be guided by other constraints or timing of work that may develop during construction, as instructed by Owner.
 - 1. It shall be recognized that unanticipated difficulties may arise, unanticipated conflicts in timing may occur or that Contractor will be able to develop alternatives which will benefit Project, timing of Work or Owner. In such event, propose or develop with Owner, alternatives for acceptance by Owner in advance, which will improve Project and its progress.
- C. Condition of Existing Building: Maintain portions of existing building affected by construction operations in a weathertight condition throughout construction period. Repair damage caused by construction operations.
- D. Exercise care to prevent interruption of existing services. Utilities or other services which are shown, or not shown but encountered or otherwise found, shall be protected from any damage from work and operations of this Contract, unless or until they are abandoned.
 - 1. Verify location of utilities and existing conditions. Notify Architect of conditions differing from those indicated on the Drawings.
 - 2. If the utilities or services are not abandoned, or to be abandoned, immediately restore any damage from work or operations to place the utilities and service in an equal or better condition to that which existed.

3. Where utilities or services are shown to be abandoned or moved, they shall remain in service, and be protected by the Contractor, until new utilities and services have been provided, tested and are ready for use.
- E. Work Over Finished Floors: Where work is performed over finished floors or where the area is used as a passage, provide hardboard or plywood cover to protect against damage or stains. Covering to be provided by Contractor.
- F. Working Hours: Work done outside of normal work hours, **7:00 am to 7:00 pm** shall be authorized by the Owner.
 1. Coordinate with Owner for scheduling of work to allow for continuous access for building tenants and their customers.
 2. Schedule especially loud and potentially disruptive work to be done outside of normal work hours.
- G. Site Storage: Cooperate and coordinate use of available areas effectively and within sequence of Work. Owner will establish and govern use of the available space, with consideration to the needs of the subcontractors to work effectively on the site.

1.3 ALTERNATES

- A. Alternate: Amount proposed by bidders and stated on Bid Form for certain work defined in bidding requirements that may be added to or deducted from Base Bid amount if Owner decides to accept corresponding change either in amount of construction to be completed or in products, materials, equipment, systems, or installation methods described in Contract Documents.
 1. Cost or credit for each alternate is net addition to or deduction from Contract Sum to incorporate alternate into Work. No other adjustments are made to Contract Sum.
- B. Schedule of Alternates:
 1. Alternate No. 1: Provide (GL-22) Insulating Vision Glass with UV Bird Collision Mitigation coating in lieu of GL-21 as specified in Section 088000 and indicated on the Drawings.
 2. Alternate No. 2: Provide new hollow metal doors and frames as specified in Section 081113 at identified openings on the Drawings.

1.4 SUBMITTAL PROCEDURES

- A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order and coordinated with Construction Schedule, List of Subcontracts, Schedule of Values, and with performance of construction activities.
 1. Review and Processing Time: Allow at least 10 working days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required.
- B. Submittal Procedures, General:
 1. The Contractor shall perform no portion of the Work for which the Contract Documents require submittal and review of Shop Drawings, Product Data, Samples or similar submittals until the respective submittal has been approved by the Architect.
 2. Submittal Coordination: Submit Shop Drawings, Product Data, Samples, and Informational Submittals as individual packages, each with its own transmittal. Send all required submittals of a single specification Section concurrently, but as separate packages under separate transmittals.
- C. Transmittal Form: Include completed transmittal form attached to the end of this Section or other form acceptable to Architect. Submittals sent without completed Submittal Transmittal Form will be considered incomplete, marked NOT ACCEPTED, and returned without review.
- D. Electronic Submittals: Prepare submittals as PDF package, incorporating complete information into each PDF file. Name PDF file with submittal number.
- E. Contractor's Review: Prior to submitting to Architect, review each submittal for clarity, coordination with other Work and compliance with the Contract Documents; note corrections, clarifications and field dimensions and insert Contractor's approval stamp.
- F. Architect's Review: Architect will review each submittal, annotate to indicate required corrections or revisions, insert action stamp and mark stamp appropriately to indicate action.

1. Architect will advise Contractor when a submittal being processed must be delayed for coordination. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- G. Final Submittals: Distribute final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for coordination and performance of construction activities. Provide copies to Owner if Owner requests copies during construction.

1.5 QUALITY ASSURANCE

- A. Comply with applicable codes, regulations, ordinances and requirements of authorities having jurisdiction, including accessibility guidelines where applicable. Submit copies of inspection reports, notices and similar documents to Architect.
- B. Should the specifications, Architect's instruction, laws, ordinances or any public authority require any work to be inspected or approved, give timely notice of its readiness for inspection and a reasonable date fixed for such inspection. If any work requiring inspection should be covered up without approval or consent of the approving agency, it must be uncovered for examination at Contractor's expense.
- C. Engage and pay for testing agencies as required. Refer to individual sections for additional requirements.
 1. Unless otherwise provided in the specifications, provide all materials, samples, mock-ups or assemblies for all tests specified in various sections of specifications, or as directed by the Architect, and pay shipping costs of such samples to laboratory or other testing location and facility.
 2. Unless specified otherwise, all tests shall be made by an approved independent testing laboratory and reports provided to Architect.

1.6 QUALITY CONTROL

- A. Qualifications of Testing Agency: An independent testing agency acceptable to the Owner and the Architect and possessing the professional qualifications and equipment to perform the specified tests and to evaluate and report the results.
- B. Payment for Tests: Contract with and pay one or more independent testing agencies to perform testing, inspection of construction materials, conditions, and procedures for conformance with the Contract Documents and related actions, including reports.
 1. Unless otherwise indicated, the cost of tests shall be paid by the Contractor.
 2. Owner will not pay for tests to determine if a proposed material will initially meet the specified requirements, which will include but not be limited to, analysis of paving aggregate, paving mix designs, and similar tests.
- C. Retesting Responsibility: Where results of required inspections, tests or similar prove unsatisfactory and do not indicate compliance of related work with requirements of the contract documents, then retests are responsibility of Contractor, regardless of whether original test was Contractor's responsibility.
 1. Where required tests were performed on original Work, retesting of revised or replaced Work by Contractor is Contractor's responsibility,
- D. Inspections: Should the specifications, Architect's instruction, laws, ordinances or any public authority require any work to be inspected or approved, give timely notice of its readiness for inspection and a reasonable date fixed for such inspection. If any work requiring inspection should be covered up without approval or consent of the approving agency, it must be uncovered for examination at Contractor's expense.
- E. Certificates: Except for test reports provided and signed by approved independent testing laboratories, all certificates required by the specification shall be signed by an authorized official of the firm providing the certificate, with the signature notarized, when such certificates by the producer are acceptable to the Architect.

1.7 TEMPORARY FACILITIES AND CONTROLS

- A. Parking. Owner will designate parking area for contractor on site. Parking for construction personnel shall be coordinated with Owner.

- B. Waste Disposal. Provide suitable waste disposal units and empty regularly. The Owner will identify location of dumpster on site. Coordinate with Owner waste removal route through facility and disposal.
- C. Site Storage: Cooperate and coordinate use of available areas effectively and within sequence of Work. Owner will establish and govern use of the available space, with consideration to the needs of the subcontractors to work effectively on the site.
- D. Temporary Barriers and Enclosures:
 - 1. Exterior Openings: Temporary closures at exterior openings shall provide protection from weather and from the transfer of dust.
 - a. When any closure will be exposed to weather (or cold temperatures) from November to April it shall be insulated with 3 inch minimum blanket insulation, and have minimum of 1/2 inch plywood exterior face, and gypsum board inner face at temporarily occupied spaces.
 - b. Closures shall be well maintained to protect against weather, dust and to provide security.
 - 2. It is the Contractors responsibility to determine when a dustproof enclosure is required to protect any adjoining area. The Contractor is responsible, however, for providing a dustproof enclosure whenever requested by the Owner for this project.

1.8 PRODUCT REQUIREMENTS AND SUBSTITUTION PROCEDURES

- A. Submit requests for substitution in writing to Architect at least ten days prior to bid date and hour. Requests received after this time will not be considered. Substitution Request Form provided upon request.
 - 1. Refer to Section 016211 - Substitution Request Form.
- B. Basis of Design Products: Reference to "Basis of Design" and a named specific product or manufacturer is intended to establish criteria for use of that product and manufacturer based on that products published information whether or not those criteria are explicitly stated in Specifications.
- C. Architect and Owner reserve the right to accept or reject proposed products. Should a proposed product be unable to meet requirements to satisfaction of Architect, product shall not be used.

1.9 EXECUTION

- A. Installation:
 - 1. Inspect substrates and report unsatisfactory conditions in writing.
 - 2. Do not proceed until unsatisfactory conditions have been corrected.
 - 3. Take field measurements prior to fabrication where practical. Form to required shapes and sizes with true edges, lines and angles. Provide inserts and templates as needed for work of other trades.
 - 4. Install materials in exact accordance with manufacturer's instructions and approved submittals.
 - 5. Install materials in proper relation with adjacent construction and with proper appearance.

1.10 CUTTING AND PATCHING

- A. Perform cutting, demolition, removal work, patching and restoration of work as necessary to accomplish and complete all work under the Contract, including any relocation or reuse of existing materials, equipment, systems, or other work, as well as the disposition of salvaged materials or debris.
 - 1. Temporary Protection: Provide protective coverings and enclosures necessary to prevent damage to existing spaces and materials to remain.
 - 2. Remove unsalvable materials in a manner that will avoid damage to materials or equipment which will remain. Completely remove and legally dispose away from the site.
 - 3. Salvable materials and items designated for reuse, relocation, or to be stored by Owner; such as brick, millwork, or equipment; shall be removed by the applicable trades and relocated to the new location or stored and protected from damage until incorporated into the new work.
- B. Patching and Remodeling: Patch or otherwise restore disturbed existing construction as indicated on the drawings and schedules, or as otherwise required to restore the work and surfaces. Patching or restoration shall be carried to natural breaks (i.e., corners) wherever possible. Where existing construction is removed, cut or otherwise disturbed by Work of the Project, patch defective and incomplete surfaces. Repair any damage to existing construction which is to remain.

- C. Cleaning: Perform periodic and final cleaning.
 - 1. Clean Owner-occupied areas daily.
 - 2. Clean spillage, overspray, and heavy collection of dust in Owner- occupied areas immediately.
 - 3. At completion of work of each trade, clean area and make surfaces ready for work of successive trades.
 - 4. At completion of alteration work in each area, provide final cleaning and return space to a condition suitable for use by Owner.

1.11 CLOSEOUT PROCEDURES

- A. Closeout: Plan an efficient, orderly and coordinated completion process including organizing, scheduling and coordinating the Work of contractor's own forces and Work of subcontractors. Establish firm commitments for on-time completion.
 - 1. Prepare punchlist for remaining work for review by the Architect.
 - 2. Complete punchlist items promptly at no additional expense to the Owner.
 - 3. Submit operating manuals, maintenance manuals, and warranty information.
 - 4. Obtain and submit copy of occupancy permits.
 - 5. Provide final cleaning and touch-up.
 - 6. Restore portions of building, site improvements, and other items damaged by construction operations to the satisfaction of the Architect at no additional expense to the Owner.
- B. After Substantial Completion expedite completion of remaining work in an organized, efficient manner that maintains quality standards. Scheduled work in advance with Owner.
 - 1. Perform Work in occupied spaces when space is not in use, such as after hours in administrative areas, unless otherwise approved by Owner.
 - 2. Perform Work in occupied areas in a manner and at such time as will not significantly interfere with, hamper or inconvenience Owner's program or functions.
- C. Closeout Submittals: Provide operating instruction data and maintenance manuals to the Owner, including Manufacturer's cleaning and maintenance instructions, and copies of warranties.

END OF SECTION

**SECTION 013310
SUBMITTAL TRANSMITTAL FORM**

To: Hammel Green and Abrahamson, Inc.
Attn: Submittals Coordinator
333 East Erie Street
Milwaukee, WI 53202
Submittals.glo@hga.com

From: _____

Contact: _____
Email: _____
Phone: _____

Owner: City of New Berlin
Project: New Berlin City Hall Window Replacement

Submittal Date: _____
Previous Date: _____

HGA No.: 4970-001-00

PRODUCT DATA

☐ Partial ☐ Complete ☐ Preliminary ☐ Final

Specification Section, Article, Paragraph: _____

Description: _____

Product/Model: _____

Manufacturer: _____

Supplier: _____

Subcontract: _____

SHOP DRAWINGS

☐ Partial ☐ Complete ☐ Preliminary ☐ Final

Specification Section, Article, Paragraph: _____

Description: _____

Product/Model: _____

Manufacturer: _____

Supplier: _____

Subcontract: _____

SAMPLES

☐ Partial ☐ Complete ☐ Preliminary ☐ Final

Specification Section, Article, Paragraph: _____

Description: _____

Product/Model: _____

Manufacturer: _____

Supplier: _____

Subcontract: _____

SUBMITTED BY

Name: _____ **Company:** _____

Signature: _____ **Date:** _____

**SECTION 016211
SUBSTITUTION REQUEST FORM**

To: Hammel Green and Abrahamson, Inc.
Attn: Submittals Coordinator
333 East Erie Street
Milwaukee, WI 53202
Submittals.glo@hga.com

From: _____

Contact: _____
Email: _____
Phone: _____

Owner: City of New Berlin **Submittal Date:** _____
Project: New Berlin City Hall Window Replacement **Previous Date:** _____

HGA No.: 4970-001-00

PROPOSED SUBSTITUTION

Specification Section, Article, Paragraph: _____
Applicable Drawing & Details: _____
Proposed Substitution: _____
Manufacturer: _____
Product/Model: _____

REASON FOR SUBSTITUTION REQUEST

- ☐ Pre-Bid Substitution (Prior Approval) Date: _____
☐ Specified product is not available. Explain: _____
☐ Cost savings to Owner. Provide comparative cost analysis.
☐ Other: _____

EFFECTS OF PROPOSED SUBSTITUTION

Does substitution affect dimensions indicated on Drawings?
☐ NO ☐ YES Explain: _____
Does substitution affect Work of other Sections?
☐ NO ☐ YES Explain: _____
Does substitution require modifications to design, changes to Drawings, or revisions to specifications to be incorporated into the Project?
☐ NO ☐ YES Explain: _____

CONTRACTOR'S / BIDDER'S REPRESENTATION

Undersigned accepts responsibility for coordination of proposed substitution and accepts all additional costs resulting from the incorporation of proposed substitution into the Project per Section 010000.

Subcontractor

Signature: _____
Date: _____

Contractor

Signature: _____
Date: _____

ARCHITECT'S REVIEW

☐ Accepted
☐ Not Accepted
☐ No Action Required
☐ Incomplete Submission
☐ Late Submission
Reviewer: _____
Review Date: _____

SECTION 079200 JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Exterior and interior sealants (SLNT).

1.2 ACTION SUBMITTALS

- A. Product Data: For each joint-sealant product.
- B. Color Samples:
 - 1. Samples for Initial Selection: Manufacturer's color charts consisting of actual strips of cured sealants showing the full range of colors available for each product exposed to view.
 - 2. Samples for Verification: For each kind and color of joint sealant selected, provide Samples with joint sealants in 1/2-inch-wide joints formed between two 6-inch- long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

1.3 INFORMATIONAL SUBMITTALS

- A. Quality Control Submittals:
 - 1. Product Test Reports: For each kind of joint sealant.
 - 2. Statement of compliance for compatibility of sealant with adjacent materials and coatings.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Engage experienced Installer who has completed joint sealant applications similar in material, design, and extent to that indicated for Project that have resulted in construction with record of successful in-service performance.
- B. Provide materials for exterior envelope from a single manufacturer.
- C. Compatibility: Verify compatibility of silicone sealant with materials in contact with sealant. Provide list of stone materials and verify that silicone sealant will not stain or damage stone work.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to project site in original unopened containers or bundles with labels informing about manufacturer, product name and designation, color, expiration period for use, pot life, curing time and mixing instructions for multi component materials.
- B. Store and handle materials to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

1.6 PROJECT CONDITIONS

- A. Weather Conditions: Do not proceed with installation of sealant under adverse weather conditions, or when temperatures are below or above manufacturer's recommended limitations for installation.
 - 1. Proceed with work only when forecasted weather conditions are favorable for proper cure and development of high early bond strength.
 - 2. Wherever joint width is affected by ambient temperature variation, apply elastomeric sealant only when temperatures are in lower third of manufacturer's recommended installation temperature range, so that sealant will not be subjected to excessive elongation and bond stress at subsequent low temperatures.
- B. Joint Width Conditions: Do not proceed with installation of joint sealers when joint widths are less than allowed by joint sealer manufacturer for application indicated.
- C. Joint Substrate Conditions: Do not proceed with installation of joint sealers until contaminants capable of interfering with their adhesion are removed from joint substrates.

- D. Compatibility and Adhesion Testing: Ascertain sealant compatibility and adhesion with adjacent materials using laboratory testing procedures.

PART 2 - PRODUCTS

2.1 SEALANT, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.
- B. Sealant Colors: In accordance with approved sealant color schedule.
1. Colors as selected by Architect from manufacturer's standard colors. Acceptance of sealant will depend on range of standard colors available for selection.
 2. Custom Color:

2.2 SILICONE SEALANT

- A. (SLNT-3) Low-Modulus Silicone Rubber Sealant: Silicone rubber based, one part neutral cure elastomeric sealant with plus 50 percent to minus 50 percent movement complying with FS-TT-S-001543, Class A, and recommended by manufacturer for joints.
1. Manufacturers and Products:
 - a. General Electric: Silpruf SCS 2000.
 - b. Dow Corning Corporation: 795 Building Sealant.
 - c. BASF Building Systems: Sonolastic Omniseal or OmniPlus.
 - d. Pecora Corporation: 864 Silicone.
 - e. Tremco Construction Division: Spectrem 3.
 2. Applications: Exterior Vertical Surfaces.

2.3 BUTYL SEALANT

- A. (SLNT-10) Concealed Sealant; Butyl Sealant: Non-skinning, non-drying, flexible synthetic butyl sealant.
1. Manufacturers and Products:
 - a. Tremco Construction Division; TremPro JS-773.
 - b. Pecora Corporation; BA-98.
 2. Location/Use: concealment locations, such as flashing backpane joints, setting aluminum storefront windows, window sills, etc. and where called for in other assemblies.

2.4 JOINT SEALANT BACKING

- A. Joint Sealant Backer Rod Manufacturers:
1. Denver Foam, Backer Rod Manufacturing, Inc.
 2. Construction Foam Products, Nomaco Inc..
- B. General: Provide sealant backings of material that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- C. Sealant Backing Material: Nonstaining, sealants, primers, and other joint fillers; compatible with joint substrates; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- D. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
- E. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.5 PREPARATORY MATERIALS

- A. Joint Primer: Non-staining type recommended by sealant manufacturer to suit application.
- B. Joint Cleaner: Non-corrosive type recommended by sealant manufacturer; compatible with joint forming materials.
- C. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- D. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joint surfaces, backing, and anchorage of units forming sealant rabbet, and conditions under which sealant work is to be performed. Do not proceed with sealant work until unsatisfactory conditions have been corrected.

3.2 JOINT SURFACE PREPARATION

- A. Preparation: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions.
 - 1. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
 - 2. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.
- B. Clean joint surfaces immediately before installation of sealant. Remove dirt, insecure coatings, moisture and other substances which would interfere with bond of sealant.
- C. Etch concrete and masonry joint surfaces to remove excess alkalinity, unless sealant manufacturer's printed instructions indicate that alkalinity does not interfere with sealant bond and performance. Etch with 5 percent solution of muriatic acid; neutralize with dilute ammonia solution, rinse thoroughly with water and allow to dry before sealant application.
- D. Roughen joint surfaces on vitreous coated and similar non-porous materials, wherever sealant manufacturer's data indicates lower bond strength than for porous surfaces. Rub with fine abrasive cloth or steel wool to produce dull sheen.
- E. Ensure that joint forming materials are compatible with sealant.
- F. Examine joint dimensions and size materials to achieve required width/depth ratios. Use joint filler to achieve required joint depths, to allow sealants to perform properly.

3.3 SEALANT APPLICATION

- A. Installation:
 - 1. Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
 - 2. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
 - 3. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

4. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
 5. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
- B. Apply sealant in accordance with manufacturer's printed instructions. Perform work in accordance with ASTM C804.
 - C. Prime or seal joint surfaces. Do not allow primer/sealer to spill or migrate onto adjoining surfaces.
 - D. Install sealant backer rod for liquid elastomeric sealant, except where recommended to be omitted by sealant manufacturer for application shown.
 - E. Install bond breaker tape wherever required by manufacturer's recommendations to ensure that elastomeric sealant will perform properly.
 - F. Employ only proven installation techniques, which will ensure that sealant will be deposited in uniform, continuous ribbons without gaps or air pockets, with complete "wetting" of joint bond surfaces equally on opposite sides.
 1. Except as otherwise indicated, fill sealant rabbet to slightly concave surface, slightly below adjoining surfaces. Where horizontal joints are between horizontal surface and vertical surface, fill joint to form slight cove, so that joint will not trap moisture and dirt.
 - G. Install sealant as recommended by sealant manufacturer but within following general limitations, measured at center (thin) section of bead:
 1. For normal moving joints sealed with elastomeric sealant, but not subject to traffic, fill joint to depth equal to 50 percent of joint width, but not more than 1/2 inch deep nor less than 1/4 inch deep.
 - H. Do not allow sealant or compounds to overflow or flow onto adjoining surfaces, or to migrate into voids of adjoining surfaces including rough texture surfaces. Use masking tape or other precautionary devices to prevent staining of adjoining surfaces, by either primer/sealer or sealant.
 - I. Remove excess and spillage of sealant promptly as work progresses. Clean adjoining surfaces by whatever means may be necessary to eliminate evidence of spillage, without damage to adjoining surfaces or finishes.

3.4 PROTECTION AND CLEANING

- A. Protect joint sealers during and after curing period from contact with contaminating operations or other causes so that they are without deterioration or damage at time of Substantial Completion.
 1. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealers immediately and reseal joints with new materials to produce joint sealer installations with repaired areas indistinguishable from original work.
- B. Clean off excess sealant or sealant smears adjacent to joints as work progresses by methods and with cleaning materials approved by manufacturers of joint sealers and of products in which joints occur.

END OF SECTION

SECTION 081113 HOLLOW METAL DOORS & FRAMES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Pressed steel hollow metal doors and frames.
 - 2. Factory prime paint finish.

1.2 COORDINATION

- A. Preparation for Hardware: Reinforced and machine hollow metal work for hardware specified in Sections 087100.
 - 1. Obtain templates, shop drawings, jigs, or materials, and a copy of the accepted Hardware Schedule from the hardware distributor.
 - 2. Templates: Door hardware supplier is to furnish templates, template reference number and/or physical hardware to the steel door and frame supplier in order to prepare the doors and frames to receive the finish hardware items.
 - 3. Reinforcing: Reinforce the work of this Section to meet requirements for anchoring hardware using concealed fasteners.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include construction details, material descriptions, core descriptions, fire-resistance ratings, temperature-rise ratings, and finishes.
- B. Shop Drawings: Include the following:
 - 1. Elevations of each door type.
 - 2. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
 - 3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
 - 4. Locations of reinforcement and preparations for hardware.
 - 5. Details of each different wall opening condition.
 - 6. Details of anchorages, joints, field splices, and connections.
 - 7. Details of accessories.
 - 8. Details of conduit and preparations for power, signal, and control systems.
- C. Schedule: Provide a schedule, in electronic PDF format, of hollow-metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final Door Hardware Schedule.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow-metal work palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Store hollow-metal work vertically under cover at Project site with head up. Place on minimum 4-inch- high wood blocking. Provide minimum 1/4-inch space between each stacked door to permit air circulation.
- D. Handle hollow metal with care to prevent damage to hollow metal and to factory-applied primer and galvanized coatings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Thermally Rated Door Assemblies: Provide door assemblies with U-factor of not more than 0.38 deg Btu/F x h x sq. ft when tested in accordance with ASTM C1363 or ASTM E1423.

2.2 MANUFACTURERS

- A. Source Limitations: Obtain hollow-metal work from single source from single manufacturer.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Ceco Door Products; an ASSA ABLOY Group company.
 - 2. Curries Company; an ASSA ABLOY Group company.
 - 3. Republic Doors and Frames.
 - 4. Steelcraft; an Ingersoll-Rand company.

2.3 EXTERIOR STANDARD STEEL DOORS AND FRAMES

- A. Construct hollow-metal doors and frames to comply with standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
- B. Maximum-Duty Doors and Frames: ANSI/SDI A250.8, Level 4; ANSI/SDI A250.4, Level A.
 - 1. Doors:
 - a. Type: As indicated in the Door and Frame Schedule.
 - b. Thickness: 1-3/4 inches.
 - c. Face: Metallic-coated steel sheet, minimum thickness of 0.067 inch, with minimum A60 coating.
 - d. Edge Construction: Model 2, Seamless.
 - e. Edge Bevel: Provide manufacturer's standard beveled or square edges.
 - f. Top Edge Closures: Close top edges of doors with flush closures of same material as face sheets. Seal joints against water penetration.
 - g. Bottom Edges: Close bottom edges of doors where required for attachment of weather stripping with end closures or channels of same material as face sheets. Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape.
 - h. Core: Polyurethane.
 - 2. Frames:
 - a. Materials: Metallic-coated steel sheet, minimum thickness of 0.067 inch, with minimum A60 coating.
 - b. Construction: Thermally Broken.
 - 3. Exposed Finish: Prime.

2.4 FRAME ANCHORS

- A. Jamb Anchors:
 - 1. Type: Anchors of minimum size and type required by applicable door and frame standard, and suitable for performance level indicated.
 - 2. Quantity: Minimum of three anchors per jamb, with one additional anchor for frames with no floor anchor. Provide one additional anchor for each 24 inches of frame height above 7 feet.
 - 3. Postinstalled Expansion Anchor: Minimum 3/8-inch-diameter bolts with expansion shields or inserts, with manufacturer's standard pipe spacer.
- B. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor.
- C. Material: ASTM A879, Commercial Steel (CS), 04Z coating designation; mill phosphatized.
 - 1. For anchors built into exterior walls, steel sheet complying with ASTM A1008 or ASTM A1011; hot-dip galvanized in accordance with ASTM A153, Class B.

2.5 MATERIALS AND COMPONENTS

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Steel Sheets:

1. Cold-Rolled Steel Sheet: ASTM A1008, Commercial Steel (CS), Type B; suitable for exposed applications.
2. Hot-Rolled Steel Sheet: ASTM A1011, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
3. Galvanized Steel Sheet: ASTM A653, Commercial Steel (CS), Type B; with minimum G60 or A60 metallic coating.
 - a. Provide galvanized steel sheets for exterior hollow metal doors, door and window frames, frame anchors and reinforcements, and louvers.

C. Fastenings: Provide fastenings, anchors and clips as required to secure hollow metal work in place. Provide Jackson head screws, or flatter. Dimple metal work to receive screw heads. Set stops and other non-structural fastenings with #8 FHSMS.

D. Steel Reinforcing: ASTM A36.

E. Glazing: Comply with requirements in Section 088000 "Glazing."

2.6 FABRICATION

- A. Hollow-Metal Frames:** Fabricate in one piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections, provide alignment plates or angles at each joint, fabricated of metal of same or greater thickness as frames.
1. Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by welding.
 2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
 3. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.
 - a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
 - b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.
- B. Hardware Preparation:** Factory prepare hollow-metal doors and frames to receive templated mortised hardware, and electrical wiring; include cutouts, reinforcement, mortising, drilling, and tapping in accordance with ANSI/SDI A250.6, the Door Hardware Schedule, and templates.
1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
 2. Comply with BHMA A156.115 for preparing hollow-metal doors and frames for hardware.
- C. Glazed Lites:** Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints.
1. Provide fixed frame moldings on outside of exterior frames. Provide loose stops and moldings on inside of hollow-metal frames.
 2. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.
 3. Provide stops for installation with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner.

2.7 FINISHES

- A. Shop Primer:** Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI/SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine supporting structure and conditions under which hollow metal is to be installed. Do not proceed with installation until unsatisfactory conditions have been corrected.**

3.2 INSTALLATION

- A. Install hollow metal in accordance with reviewed shop drawings and manufacturer's printed instructions. Securely fasten and anchor work in place without twists, warps, bulges or other unsatisfactory or defacing workmanship. Set hollow metal plumb, level, square to proper elevations, true to line and eye. Set clips and other anchors with Ramset "shot" anchors or drill in anchors as approved. Units and trim shall be fastened tightly together, with neat, uniform and tight joints.
- B. Placing Frames: Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces and spreaders leaving surfaces smooth and undamaged.
 - 1. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with post-installed expansion anchors.
 - 2. Installation Tolerances: Adjust hollow metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
 - a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
 - c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.
- C. Door Installation: Fit hollow metal doors accurately in their respective frames, within following clearances: Jambs and head 3/32 inch, meeting edges pair of doors 1/8 inch, sill where no threshold or carpet 1/4 inch above finished floor, sill at threshold 3/4 inch maximum above finished floor, sill at carpet 1/4 inch above carpet.
 - 1. Provide undercut no greater than 3/8-inch at doors equipped with automatic sound seal door bottoms.

3.3 INSTALLED WORK

- A. Remove grout and other bonding material from hollow-metal work immediately after installation.
- B. Touchup: Sand and clean rusted or abraded surfaces and apply compatible touchup finish:
 - 1. Primer: Apply air-drying, rust-inhibitive primer.
 - 2. Metallic-Coated Surface: Repair with galvanizing repair paint according to manufacturer's written instructions.
 - 3. Painting: As specified in Section 099000 - Painting.
- C. Protection Removal: Immediately before final inspection, remove protective wrappings from doors and frames.
- D. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow-metal work that is warped, bowed, or otherwise unacceptable.

END OF SECTION

SECTION 084110 ALUMINUM STOREFRONTS & ENTRANCES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Thermally-broken aluminum-framed storefront glazing systems and entrances.
 2. Thermally-broken fully-glazed aluminum stile and rail doors
 3. Non-thermally-broken interior aluminum storefront framing systems and entrances.
 4. Non-thermally-broken interior aluminum stile and rail doors.
 5. Installation accessories.
 6. Field-testing for leakage.

1.2 ACTION SUBMITTALS

- A. Product Data: Include construction details, material descriptions, glazing and fabrication methods, dimensions of individual components and profiles, hardware, and finishes for aluminum windows.
- B. Shop Drawings: Include plans, elevations, sections, hardware, accessories, insect screens, operational clearances, and details of installation, including anchor, flashing, and sealant installation.
- C. Samples: For each exposed product and for each color specified, 2 by 4 inches in size.
- D. Delegated Design Submittal and Shop Drawings: Where professional design services or certifications by a qualified Professional Engineer are specifically required of the Contractor by the Contract Documents, submit in accordance with the delegated design submittal requirements in Section 013300 - Submittal Procedures.
1. Calculations: Upon request from the Architect/Engineer only, submit calculations in accordance with Section 013300 - Submittal Procedures.

1.3 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For weather stripping, operable panels, and operating hardware to include in maintenance manuals.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An installer acceptable to aluminum window manufacturer for installation of units required for this Project, and has completed installations of aluminum storefront and entrances similar in design and extent to those required for the project, and whose work has resulted in construction with record of successful in-service performance.
1. Installer's responsibilities include providing professional engineering services needed to assume engineering responsibility.

1.5 PROJECT CONDITIONS

- A. Field Measurements: Verify aluminum storefront, window and door openings by field measurements before fabrication and indicate measurements on Shop Drawings.

1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace aluminum windows and doors that fail in materials or workmanship within specified warranty period.
1. Failures include, but are not limited to, the following:
 - a. Failure to meet performance requirements.
 - b. Structural failures including excessive deflection, water leakage, air infiltration, or condensation.
 - c. Faulty operation of movable sash and hardware.
 - d. Deterioration of metals, other materials, and metal finishes beyond normal weathering.
 - e. Failure of insulating glass.

2. Warranty Period: Three years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 STRUCTURAL DESIGN CRITERIA

- A. Engineering Responsibility: Engage a qualified Professional Engineer to provide delegated design services.
- B. Structural Loads: Design and construct storefront system, including anchorages, to withstand dead loads of storefront system and wind loads caused by pressure and suction of wind acting normal to plane of wall as calculated in accordance with requirements of authorities having jurisdiction or ANSI/ASCE 7-10, whichever are more stringent.
 1. Wind Load Provisions of ANSI/ASCE 7-10.
 2. Deflection of Framing Members: At design wind pressure, as follows:
 - a. Deflection Normal to Wall Plane: When subjected to design wind loads or concentrated maintenance loads shall be limited to following:
 - 1) Spans up to 13 feet-6 inches: limit deflection to $L/175$.
 - 2) Spans greater than 13 feet-6 inches: limit deflection to $L/240$ plus 1/4 inch.
 - 3) Cantilevered members: limit deflection to lesser of $2L/175$ or 3/4 inch.
 - 4) No permanent deformation in excess of 0.2 percent of its span.
 - 5) The deflection of any member (such as vertical jambs) shall not impair the function of system or damage any joint seals as warranted by the manufacturer.
 - b. Deflection Parallel to Glazing Plane: Shall not exceed an amount which will reduce the glass bite below 75 percent of design dimension, and member shall have a minimum 1/8 inch clearance between itself and edge of fixed panel, glass or fixed part immediately below.
 - 1) Structural Support Movement: System to accommodate anticipated interstory differential live load vertical movement of 5/16 inch (downward) in addition to anticipated thermal movement.
 - 2) Sidesway Movement: System to accommodate anticipated interstory differential drift of $H/400$ in any horizontal direction.

2.2 PERFORMANCE REQUIREMENTS

- A. General Performance: Comply with performance requirements specified, as determined by testing of aluminum-framed entrances and storefronts representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.
 1. Aluminum-framed entrances and storefronts shall withstand movements of supporting structure including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
 2. Failure also includes the following:
 - a. Thermal stresses transferring to building structure.
 - b. Glass breakage.
 - c. Noise or vibration created by wind and thermal and structural movements.
 - d. Loosening or weakening of fasteners, attachments, and other components.
 - e. Failure of operating units.
- B. Storefront: Provide exterior storefront assemblies designed and fabricated to comply with requirements for system performance characteristics listed below as demonstrated by testing manufacturer's corresponding stock systems according to test methods designated.
 1. Thermal Movement: Allow for expansion and contraction resulting from ambient temperature range of 120 degrees F.
 2. Wind Loading: Provide capacity to withstand wind loading shown on Structural Drawings.
 3. Air Infiltration: Air infiltration of not more than 0.06 CFM per square foot of fixed area per ASTM E283 and applicable AAMA methods.
 - a. Limit air infiltration to 0.10 cu. ft/min/lineal foot of sash crack for operating sash.
 4. Water Leakage: No uncontrolled water penetration per ASTM E331 and AAMA 503 at pressure differential of 10.00 psf.
 5. Thermal Resistance of Wall System: U-value of 0.32 BTU/sq ft. per AAMA 1503.1.
 6. Condensation: Achieve not less than 68 CRF per AAMA 1503.

- C. Entrances: Provide entrance doors with jamb and head frames which comply with requirements indicated below for transmission characteristics and test methods.
1. Air Leakage: Air infiltration per linear foot of perimeter crack of not more than 0.50 CFM for single doors and 1.0 CFM for pairs of doors per ASTM E283 at pressure differential of 1.567 psf.
 2. Thermal Transmittance: U-value of not more than 0.52 Btu per AAMA 1503.
 3. Condensation Resistance: Not less than 49 CRF per AAMA 1503.

2.3 PRODUCTS AND MANUFACTURERS

- A. Source Limitations: Obtain all components of aluminum-framed entrance and storefront system, including framing, doors, and accessories, from single manufacturer.
- B. Subject to requirements, provide Basis of Design or equivalent as approved by Architect, by one of the following Manufacturers:
1. EFCO Corporation
 2. Kawneer Company
 3. Tubelite Incorporated,
 4. Oldcastle/VistaWall.
 5. YKK AP America Inc..

2.4 GLAZED ALUMINUM FRAMING SYSTEMS

- A. (AFS-1) Storefront Framing Systems: Low-rise, thermally-broken, extruded aluminum storefront framing; internally reinforced as required to resist wind loading; glazing mechanically-retained with glazing gaskets and mullion caps.
1. Basis of Design: Kawneer; Trifab VersaGlaze 451UT.
 2. Mullion Profile: 2 inches by 4-1/2 inches.
 3. Glazing Set: Center.
- B. (AFS-2) Interior Storefront Framing Systems: Non-thermally-broken storefront framing.
1. Basis of Design: Kawneer; Trifab VersaGlaze 451.
 2. Mullion Profile: 2 inches by 4-1/2 inches.

2.5 ENTRANCE DOORS

- A. (AL DR-1) Entrance Doors: Framing system manufacturer's thermally-broken and non-thermally-broken extruded aluminum tubular stile and rail doors fully-glazed for swing operation; with square profile, snap-on, extruded-aluminum stops and preformed glazing gaskets; Mechanically-fastened corners with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods.
1. Exterior, Thermally-Broken Basis of Design: Kawneer; Insulpour 250T Thermal Entrances.
 - a. Door Thickness: 2-1/4 inches.
 - b. Stile and Top Rail Width: 2-1/2 inches.
 - c. Bottom Rail Height: 10 inches unless otherwise indicated on Drawings.
 - d. Tube Wall Thickness: 1/8 inch, minimum.
 2. Interior, Non-Thermally-Broken Basis of Design: Kawneer; 250 Standard Entrances.
 - a. Door Thickness: 1-3/4 inches.
 - b. Stile and Top Rail Width: 2-1/2 inches.
 - c. Bottom Rail Height: 10 inches unless otherwise indicated on Drawings.
 - d. Tube Wall Thickness: 0.125 inch, minimum.
- B. Door Hardware: In accordance with Section 087100 - Door Hardware.

2.6 COMPONENTS & MATERIALS

- A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
1. Sheet and Plate: ASTM B 209.
 2. Extruded Bars, Rods, Shapes, and Tubes: ASTM B 221.
 3. Extruded Structural Pipe and Tubes: ASTM B 429.
 4. Structural Profiles: ASTM B 308.

- B. Steel Reinforcement: With manufacturer's standard corrosion-resistant primer complying with SSPC-PS Guide No. 12.00 applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.
1. Structural Shapes, Plates, and Bars: ASTM A 36.
 2. Cold-Rolled Sheet and Strip: ASTM A 611.
 3. Hot-Rolled Sheet and Strip: ASTM A 570.
- C. Fasteners:
1. Fasteners Exposed to Weather: 300 Series stainless steel, type and size recommended by curtain wall manufacturer with exposed portions matching finish curtain wall system.
 2. Concealed Fasteners: ASTM A449, SAE Grade 5 carbon steel with cadmium and yellow chromate finish, type and size recommended by curtain wall manufacturer.
- D. Accessories
1. Setting Blocks: Black EPDM 85±5 durometer, Shore-A per ASTM D 2000.
 2. Gaskets: Glazing gaskets shall be extruded EPDM rubber.
 3. Perimeter Anchors: Aluminum. When steel anchors are used, provide insulation between steel material and aluminum material to prevent galvanic action.
 4. Flashing: Aluminum same finish as for storefront section where exposed; secured with concealed fastening method.
- E. Sealants: Refer to Section 079200 – Joint Sealants.
- F. Glass and Glazing: Refer to Section 088000 – Glazing.

2.7 FABRICATION

- A. Fabrication, General:
1. Conceal fasteners wherever possible.
 2. Reinforce work as necessary for performance requirements, and for support to structure.
 3. Separate dissimilar metals and aluminum in contact with concrete utilizing protective coating or preformed separators, which will prevent contact and corrosion.
 4. Comply with Section 088000 for glazing requirements.
 5. Welding: Comply with recommendations of the American Welding Society.
 - a. Use recommended electrodes and methods to avoid distortion and discoloration.
 - b. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.
 - c. Grind exposed welds smooth and flush with adjacent surfaces; restore mechanical finish.
- B. Prefabrication: To greatest extent possible, complete fabrication, assembly, finishing and other work before shipment to project site. Disassemble components only as necessary for shipment and installation.
1. Do not drill and tap for surface-mounted hardware items until time of installation at project site.
 2. Perform fabrication operations, including cutting, fitting, forming, drilling and grinding of metal work in manner which prevents damage to exposed finish surfaces.
 - a. For hardware, perform these operations prior to application of finishes.
- C. Coordination of Fabrication:
1. Check actual frame or door openings required in construction work by accurate field measurements before fabrication.
 2. Fabricate units to withstand loads that will be applied when system is in place.
- D. Framing:
1. Thermal-Break Construction: Fabricate exterior aluminum storefront framing system with integrally concealed, low conductance thermal barrier, located between exterior materials and exposed interior members, in manner which eliminates direct metal-to-metal contact.
 2. Sealant Back Stop Containment: At perimeter, provide not less than 1-1/2 inch continuous flush metal to permit sealant back-stop containment.
 3. Provide inside-outside matched resilient flush-glazed system with provisions for glass replacement.

4. Provide members of size, shape and profile indicated.
5. Fabricate frame assemblies with joints straight and tight fitting.
6. Reinforce internally with structural members as necessary to support design loads.
7. Maintain accurate relation of planes and angles, with hairline fit of contacting members.
8. Seal horizontals and direct moisture accumulation to exterior.
9. Provide flashings and other materials used internally or externally that are corrosive resistant, non-staining, non-bleeding and compatible with adjoining materials.
10. Provide manufacturer's extrusions and accessories to accommodate expansion and contraction due to temperature changes without detrimental to appearance or performance.

E. Entrances:

1. Door Frames: Fabricate tubular and channel frame assemblies, as indicated, with either welded or mechanical joints in accordance with manufacturer's standards, reinforced as necessary to support required loads Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.
 - a. At exterior doors, provide compression weather stripping at fixed stops.
 - b. At interior doors, provide silencers at stops to prevent metal-to-metal contact. Install three silencers on strike jamb of single-door frames and two silencers on head of frames for pairs of doors.
2. Stile-and-Rail Doors: Provide tubular frame members, fabricated with mechanical joints using heavy inserted reinforcing plates and concealed tie-rods or j-bolts, or fabricate with structurally welded joints, at manufacturer's option. Reinforce doors as required for installing entrance door hardware.
 - a. At pairs of exterior doors, provide sliding-type weather stripping retained in adjustable strip and mortised into door edge.
 - b. At exterior doors, provide weather sweeps applied to door bottoms.
3. Glazing: Fabricate doors to facilitate replacement of glass or panels, without disassembly of door stiles and rails. Provide snap-on extruded aluminum glazing stops, with exterior stops anchored for non-removal.
4. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.

- F. Flashings: Form from sheet aluminum with same finish as extruded sections. Apply finish after fabrication. Material thickness as required to suit condition without deflection or "oil-canning".

2.8 FINISHES

- A. General: Comply with NAAMM's "Metal Finishes Manual" for recommendations for applying and designating finishes.
 1. Form or extrude aluminum shapes before finishing.
 2. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Color-Anodized Finish: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or thicker.
 1. Color: Dark bronze.
- C. Other Finishes:
 1. Concealed Steel Items: Galvanized in accordance with ANSI/ASTM A653 to 2.0 oz/sq ft primed with iron oxide paint.
 2. Apply one coat of bituminous paint to concealed aluminum and steel surfaces in contact with cementitious or dissimilar materials.
 3. Primer: FS TT-P-31; for shop application and field touch-up.
 4. Touch-Up Primer for Galvanized Surfaces: FS TT-P-641; TT-P-645.

PART 3 - EXECUTION

3.1 EXAMINATION AND PREPARATION

- A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work. Verify rough opening dimensions, levelness of sill plate, and operational clearances. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure a coordinated, weathertight installation.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.
- B. Field Measurement: Wherever possible, take field measurements prior to preparation of shop drawings and fabrication, to ensure proper fitting of work.

3.2 INSTALLATION

- A. Comply with manufacturer's instructions and recommendations for installation of aluminum entrances and storefronts, windows, doors, hardware, accessories, and other components.
- B. Set units plumb, level, and true to line, without warp or rack of framing members, doors, or panels.
 - 1. Anchor securely in place, separating aluminum and other corrodible metal surfaces from sources of corrosion of electrolytic action at points of contact with other materials.
- C. Construction Tolerances: Install aluminum entrance and storefront to comply with following tolerances:
 - 1. Variation from Plane: Do not exceed 1/8 inch in 12 feet of length or 1/4 inch in any total length.
 - 2. Offset from Alignment: Maximum offset from true alignment between two identical members abutting end to end in line shall not exceed 1/16 inch.
 - 3. Diagonal Measurements: Maximum difference in diagonal measurements shall not exceed 1/8 inch.
 - 4. Offset at Corners: Maximum out-of-plane offset of framing at corners shall not exceed 1/32 inch.
- D. Drill and tap frames and doors and apply surface-mounted hardware items, complying with hardware manufacturer's instructions and template requirements.
 - 1. Use concealed fasteners wherever possible.
- E. Set sill members and other members in bed of sealant as indicated, or with joint fillers or gaskets as indicated to provide weather tight construction.
 - 1. Comply with requirements of Section 079200 - Joint Protection for sealants, fillers, and gaskets.
- F. Install perimeter sealant and backing in accordance with Section 079200 - Joint Sealants.
- G. Entrance Doors: Install doors to produce smooth operation and tight fit at contact points.
 - 1. Exterior Doors: Install to produce weathertight enclosure and tight fit at weather stripping.

3.3 INSTALLED WORK

- A. Adjust doors, operating sashes and ventilators, screens, hardware, and accessories for a tight fit at contact points and weather stripping for smooth operation and weathertight closure. Lubricate hardware and moving parts.
- B. Clean aluminum surfaces immediately after installing windows and doors. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.
- C. Clean factory-glazed glass immediately after installing windows and doors. Comply with manufacturer's written recommendations for final cleaning and maintenance. Remove nonpermanent labels, and clean surfaces.
- D. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.

- E. Protect window and door surfaces from contact with contaminating substances resulting from construction operations. In addition, monitor 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 and door surfaces, remove contaminants immediately according to manufacturer's written recommendations.

END OF SECTION

SECTION 085110 ALUMINUM WINDOWS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Extruded aluminum windows.
 - 2. Glass and Glazing

1.2 ACTION SUBMITTALS

- A. Product Data: Include construction details, material descriptions, glazing and fabrication methods, dimensions of individual components and profiles, hardware, and finishes for aluminum windows.
- B. Shop Drawings: Include plans, elevations, sections, accessories, and details of installation, including anchor, flashing, and sealant installation.
- C. Samples: For each exposed product and for each color specified, 2 by 4 inches in size.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: Engage experienced Installer who has completed installation of aluminum windows similar in material, design, and extent to those required for this project and with record of successful in-service performance.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Deliver and handle window units to prevent damage to finished surfaces.
- B. Store and protect window units in accordance with manufacturer's recommendations.
- C. Provide wrapping to protect prefinished aluminum surfaces.

1.5 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace aluminum windows that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Failure to meet performance requirements.
 - b. Structural failures including excessive deflection, water leakage, condensation, and air infiltration.
 - c. Deterioration of materials and finishes beyond normal weathering.
 - d. Failure of insulating glass.
 - 2. Warranty Period:
 - a. Window: 10 years from date of Substantial Completion.
 - b. Glazing Units: 10 years from date of Substantial Completion.
 - c. Aluminum Finish: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Product Standard: Comply with AAMA/WDMA/CSA 101/I.S.2/A440 for definitions and minimum standards of performance, materials, components, accessories, and fabrication unless more stringent requirements are indicated.
 - 1. Minimum Performance Class: AW
 - 2. Minimum Performance Grade: PG100
- B. Thermal Transmittance: NFRC 100 maximum whole-window U-factor of 0.58 Btu/sq. ft. x h x deg F

- C. Design Loads: Design and size members to withstand dead loads and live loads caused by pressure and suction of wind as calculated in accordance with design wind loads applicable to Project from basic wind speed indicated in miles per hour at 33 feet above grade, according to ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 6.4.2, "Analytic Procedure," based on mean roof heights above grade indicated on Drawings.
 - 1. Limit mullion deflection to 1/175 of its span with full recovery of glazing materials.
- D. Water Resistance in accordance with ASTM E 331/ASTM E 547:
 - 1. No uncontrolled water leakage at a static air pressure difference of 12.0 psf.
 - 2. Drain water entering joints, condensation occurring in glazing channels, or migrating moisture occurring within system, to exterior.
- E. Condensation-Resistance Factor (CRF):
 - 1. Provide aluminum windows tested for thermal performance according to AAMA 1503.1 as follows:
 - a. Horizontal Sliding Windows showing a Frame CRF of 54.
 - b. Casement Projecting Windows showing a Frame CRF of 67
- F. Limit air infiltration through assembly to .10 cfm/SF (.50 l/s·m²) of unit, measured at reference differential pressure across assembly of 6.24 psf, as measured in accordance with ANSI/ASTM E283
- G. Thermal Movements: Provide window units that allow thermal movement resulting from following maximum change (range) in ambient temperature when engineering, fabricating, and installing aluminum windows to prevent buckling, opening of joints, and overstressing of components, connections, and other detrimental effects. Base engineering calculation on actual surface temperatures of materials due to solar heat gain and nighttime sky heat loss.
 - 1. Temperature Change (Range): 120 degrees F, ambient; 180 degrees F, material surfaces.

2.2 PRODUCTS AND MANUFACTURERS

- A. Source Limitations: Obtain aluminum windows from single source from single manufacturer.
- B. Products and Manufacturers: Subject to specified requirements, provide Basis of Design or equivalent by one of the following:
 - 1. EFCO Corporation
 - 2. Kawneer Company
 - 3. Wausau Window and Wall Systems,
 - 4. Tubelite Incorporated,
 - 5. Oldcastle/VistaWall.
 - 6. YKK AP America Inc.

2.3 ALUMINUM WINDOWS

- A. (AW-1) Fixed Aluminum Window Units:
 - 1. Basis of Design: Series 8225TL by the Kawneer Company.
- B. Frames and Sashes:
 - 1. Thermally Isolated Construction: Fabricate frames, with an integral, concealed, low-conductance thermal barrier located between exterior materials and window members exposed on interior side in a manner that eliminates direct metal-to-metal contact.
 - 2. Aluminum extrusions complying with AAMA/WDMA/CSA 101/I.S.2/A440.
- C. Glass and Glazing: Manufacturer-furnished and factory-installed.
 - 1. Refer to Section 088000 - Glazing for glass types.
- D. Thermal Barrier:
 - 1. Exterior aluminum separated from interior aluminum by rigid, structural thermal barrier:
 - a. A system that shall transfer shear during bending and promote composite action between the exterior and interior extrusions
 - b. Nonstructural thermal barrier is unacceptable.
 - 2. Sills thermally broken with thermal struts:
 - a. Glass reinforced polyamide nylon, mechanically crimped in raceways extruded in the exterior and interior extrusions.

3. Other thermally broken members:
 - a. Latest technology in two-part, high-density polyurethane
- E. Mullions: Provide mullions and cover plates, matching window units, complete with anchors for support to structure and installation of window units. Allow for erection tolerances and provide for movement of window units due to thermal expansion and building deflections, as indicated. Provide mullions and cover plates capable of withstanding design wind loads of window units.
- F. Subsills: Provide thermally-broken, extruded-aluminum subsills in sizes and configurations to match existing.
- G. Receptor System: Two-piece, snap-together, thermally broken, extruded-aluminum receptor system that anchors windows in place.
- H. Interior Trim: Provide extruded-aluminum profiles in sizes and configurations to match existing.
- I. Exterior Panning Trim: Provide extruded-aluminum panning trim profiles (2 profiles) in sizes and configurations to match existing if indicated.
- J. Fasteners: Noncorrosive and compatible with window members, trim, hardware, anchors, and other components.
 1. Exposed Fasteners: Do not use exposed fasteners to the greatest extent possible. For application of hardware, use fasteners that match finish hardware being fastened.

2.4 FINISHES

- A. Color Anodic Finish: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or thicker.
 1. Color: Dark bronze.
- B. Concealed Finishes:
 1. Concealed Steel Items: Galvanized in accordance with ANSI/ASTM A386 to 2.0 oz/sq. ft. (Primed with iron oxide paint.)
 2. Apply one coat of bituminous paint to concealed aluminum and steel surfaces in contact with cementitious or dissimilar materials.

2.5 FABRICATION

- A. Fabrication, General:
 1. Fabricate aluminum windows in sizes indicated. Include a complete system for assembling components and anchoring windows.
 2. Conceal fasteners wherever possible.
 3. Reinforce work as necessary for performance requirements, and for support to structure.
 4. Separate dissimilar metals and aluminum in contact with concrete utilizing protective coating or preformed separators, which will prevent contact and corrosion.
 5. Glaze aluminum windows in the factory. Comply with Section 088000 for glazing requirements.
- B. Prefabrication: To greatest extent possible, complete fabrication, assembly, finishing and other work before shipment to project site. Disassemble components only as necessary for shipment and installation.
 1. Do not drill and tap for surface-mounted hardware items until time of installation at project site.
 2. Perform fabrication operations, including cutting, fitting, forming, drilling and grinding of metal work in manner which prevents damage to exposed finish surfaces.
- C. Coordination of Fabrication:
 1. Check actual frame or door openings required in construction work by accurate field measurements before fabrication.
 2. Fabricate units to withstand loads that will be applied when system is in place.
- D. Aluminum Window Fabrication:
 1. Thermal-Break Construction: Fabricate exterior aluminum storefront framing system with integrally concealed, low conductance thermal barrier, located between exterior materials and exposed interior members, in manner which eliminates direct metal-to-metal contact.
 2. All aluminum frame and vent extrusions shall have a minimum wall thickness of .125" (3 mm).

3. Frame components shall be mechanically fastened. Each corner shall be mitered, reinforced with an extruded corner key, hydraulically crimped, and "cold welded" with epoxy adhesive.
4. Shop-fabricate and pre-assemble frame components
5. Reinforce internally with structural members as necessary to support design loads.
6. Develop drainage holes with moisture pattern to exterior.
7. Sills: Extruded aluminum; sloped for positive wash; one piece full width of opening.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

3.2 EXAMINATION

- A. Examine openings, substrates, structural supports, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances; rough opening dimensions; levelness of sill plate; coordination with wall flashings, vapor retarders, moisture barrier, and other built-in components; and other conditions affecting performance of work.
 1. Masonry Surfaces: Visibly dry and free of excess mortar, sand, and other construction debris.
 2. Metal Surfaces: Dry; clean; free of grease, oil, dirt, rust, corrosion, and welding slag; without sharp edges or offsets at joints.
 3. Verify rough opening dimensions and levelness of sill plate.
 4. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure weathertight window installation.
 5. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 INSTALLATION

- A. Comply with manufacturer's written instructions for installing windows, hardware, accessories, and other components. For installation procedures and requirements not addressed in manufacturer's written instructions, comply with installation requirements in ASTM E 2112.
- B. Install windows level, plumb, square, true to line, without distortion or impeding thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction to produce weathertight construction.
- C. Install windows and components to drain condensation, water penetrating joints, and moisture migrating within windows to the exterior.
- D. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials.

3.4 INSTALLED WORK

- A. Clean exposed surfaces immediately after installing windows. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.
 1. Keep protective films and coverings in place until final cleaning.
- 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. If contaminating substances do contact window surfaces, remove contaminants immediately according to manufacturer's written instructions.

END OF SECTION

SECTION 087100 DOOR HARDWARE

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. Commercial door hardware for the following:
 - a. Swinging doors.
 - 2. Cylinders for doors and locking devices specified in other Sections.
 - 3. Electrified door hardware.
- B. Related Sections:
 - 1. Section 081113 – Hollow Metal Doors and Frames.
 - 2. Section 084113 – Aluminum-Framed Entrances and Storefronts

1.3 GENERAL REQUIREMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.4 COORDINATION

- A. Installation Templates: Distribute for doors, frames, and other work specified to be factory prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.
- B. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.
- C. Electrical System Roughing-In: Coordinate layout and installation of electrified door hardware with connections to power supplies and building safety and security systems.
- D. Existing Conditions: Where hardware components are reused or where modifications to existing hardware is required, field verify existing conditions and coordinate installation resulting in proper door operation and ensure fire-rating recertification if required.
- E. Coordination Meeting: When requested by Architect and/or Owner, the Contractor will schedule a meeting prior to the installation of electrified hardware to review and coordinate functions and connections. Participants to include representatives and-suppliers of all applicable electrified hardware components. Advise Architect/Owner of scheduled date, time, place, and attendees.

1.5 PREINSTALLATION MEETINGS

- A. Pre-Installation Conference: Prior to the installation of hardware, manufacturers' representatives must arrange and conduct a jobsite meeting to instruct Installers on the proper installation. A letter of compliance must be sent to the Architect and Owner.
- B. Refer to Keying article for keying conference requirements.

1.6 ACTION SUBMITTALS

- A. Hardware Schedule: Submit hardware schedule per Section 013300 in vertical format as illustrated by the Sequence of Format for the Hardware Schedule as published by the Door and Hardware Institute. Schedules, which do not comply, will be returned for correction before review. Hardware schedule shall clearly indicate architect's hardware group and manufacturer of each item proposed. The schedule shall be reviewed prior to submission by a certified Architectural Hardware Consultant, who shall affix his or her seal attesting to the completeness and correctness of the schedule.
1. Provide illustrations from manufacturers' catalogs and data in brochure form.
 2. Check specified hardware for suitability and adaptability to details and surrounding conditions. Indicate unsuitable or incompatible items and proposed substitutions in the hardware schedule submittal.
 3. When requested, provide listing of manufacturers' template numbers for each item of hardware in the hardware schedule submittal.
 4. Furnish associated Contractors and Subcontractors with copies of final approved hardware schedule. Submit necessary templates and schedules as soon as possible to hollow metal, wood, aluminum, and other door & frame fabricators in accordance with schedule they require for fabrication.
 5. Samples; if requested by Architect, provide for each exposed product in each finish specified, in manufacturer's standard size
 - a. Tag Samples with full product description to coordinate Samples with door hardware schedule.
 6. List of related door devices specified in other Sections for each door and frame.
- B. Closer Mounting: Indicate mounting description for each closer included in the submittal's hardware groups.
- C. Existing Hardware Conditions: Refer to Part 1 - Coordination.
1. Advise Hardware Supplier and Architect of any existing conditions which would prevent utilization of specified hardware.
- D. Provide keying schedule, prepared by or under the supervision of Installer's Architectural Hardware Consultant, detailing Owner's final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations that are coordinated with the Contract Documents. Keying schedule to be coordinated with and approved by Owner.
- E. Electrified Hardware Coordination:
1. List all hardware specified in groups and identify items not in your scope as -inchesby Others-inches or other means of identification.
 2. Provide operational descriptions for each electrified hardware group including operation for exit, entry, and fire alarm conditions.
 - a. Refer to operational descriptions in electrified hardware groups. Part 3 - Hardware Groups.
 3. Wiring Diagrams: When requested after final approval of the hardware schedule submittal, provide wiring diagrams for each opening that requires electrified hardware.
 - a. Exception: groups where only magnetic hold-opens or door position switches are specified.
 - b. Approved diagrams to be sent with hardware delivery to the jobsite.
- F. Installation Instructions: Provide manufacturer's written installation and adjustment instructions for finish hardware. Send installation instructions to site with hardware.

1.7 INFORMATIONAL SUBMITTALS

- A. Contract Closeout Submittals: Comply with Section 017800 including specific requirements indicated.
1. Operating and maintenance manuals containing the following:
 - a. Complete information in care, maintenance, and adjustment, and data on repair and replacement parts, and information on preservation of finishes.
 - b. Catalog pages for each product.
 - c. Name, address, and phone number of local representative for each manufacturer.
 - d. Parts list for each product.
 2. Copy of final approved hardware schedule, edited to reflect As installed.

3. Copy of final keying schedule.
4. As installed Wiring Diagrams for each opening connected to power, both low voltage and 110 volts.
5. One complete set of special tools required for maintenance and adjustment of hardware, including changing of cylinders.

1.8 QUALITY ASSURANCE

- A. Manufacturer: Obtain each type of hardware, i.e. latch and locksets, hinges, closers from single manufacturer, although several may be indicated as offering products complying with requirements.
- B. Supplier: Recognized architectural finish hardware supplier, with warehousing facilities, who has been providing hardware for period of not less than 3 years. The supplier shall be, or employ, a certified Architectural Hardware Consultant AHC, who is registered in the continuing education program as administered by the Door and Hardware Institute. The hardware schedule shall be prepared and signed by a certified AHC.
- C. Installer: Firm with three years experience in installation of similar hardware to that required for this project, including specific requirements indicated.
- D. Regulatory Label Requirements: Provide nationally recognized testing agency label or stamp on hardware for labeled openings. Where UL requirements conflict with drawings or specifications, hardware conforming to UL requirements shall be provided. Conflicts and proposed substitutions shall be clearly indicated in hardware schedule.
- E. Pre-Installation Conference: Prior to the installation of hardware, manufacturers' representatives for locksets, closers, and exit devices shall arrange and conduct a jobsite meeting to instruct the installing contractor's personnel on the proper installation of their respective products. A letter of compliance, indicating when this meeting is held and who is in attendance, shall be sent to the Architect and Owner. Refer to Keying article for keying conference requirements.

1.9 DELIVERY, STORAGE AND HANDLING

- A. Deliver hardware to jobsite in manufacturer's original packaging, marked to correspond with the approved hardware schedule. Do not deliver hardware until suitable locked storage space is available. Check hardware against reviewed hardware schedule. Store hardware to protect against loss, theft, or damage.
- B. Deliver hardware required to be installed during fabrication of hollow metal, aluminum, wood, or stainless-steel doors prepaid to the respective manufacturer.

1.10 WARRANTY

- A. Guarantee workmanship and material provided against defective manufacture. Repair or replace defective workmanship and material appearing within period of one year after Substantial Completion.
- B. Provide a minimum ten-year factory warranty on door closer body against defects in material and workmanship from date of occupancy of Project.
- C. Replace shortages and incorrect items with correct material at no additional cost to Owner.
- D. At completion of project, qualified factory representative shall inspect closer installations. After this inspection, letter shall be sent to Architect reporting on conditions, verifying that closers have been properly installed and adjusted.

1.11 ATTIC STOCK

- A. Coordinate with Owner for products and quantities desired for attic stock.

PART 2 PRODUCTS

2.1 GENERAL

- A. Confirm acceptable manufacturers and models of all hardware products with Owner. Specified products are listed only to establish function and a level of quality.
- B. Specified manufacturers and models are based on the best information available at the time of this printing to establish function and level of quality but are subject to change as additional information becomes available. Changes will be advised in future documentation.
- C. Acceptable manufacturers and models of particular products will be determined by hardware distributor/supplier who has been contracted and directed by the Owner. Specified products are listed only to establish function and a level of quality.

2.2 BUTTS AND HINGES

- A. Acceptable Manufacturers:
 - 1. Bommer
 - 2. Hager listed below for design intent only
 - 3. Ives
 - 4. McKinney
 - 5. PBB
 - 6. Stanley
- B. Types per Application:
 - 1. Exterior Out-Swinging doors: BB1199 x NRP
 - 2. Exterior in-swinging doors and vestibule doors: BB1168
 - 3. Provide NRP, non-removable pins, at out-swinging doors that are lockable or locked and at other doors when specifically indicated.
- C. Size:
 - 1. 1-3/4 inch Doors 4-1/2 inch by 4-1/2 inch
- D. Quantity:
 - 1. 2 – hinges per leaf for openings through 60 inches in height.
 - 2. 1 – additional hinge per leaf for each additional 30 inches in height or fraction thereof.
 - 3. 1 – additional hinge per leaf for openings 40 inches wide and wider.
 - a. For mineral core doors Refer to Part 2 - Continuous Stainless-Steel Hinges
- E. Drill 5/32 inch hole and use No. 12, 1-1/4 inch steel threaded to the head wood screws for hinges on wood doors.

2.3 ELECTRIC POWER TRANSFERS

- A. Acceptable Manufacturers:
 - 1. Adams Rite 4612
 - 2. Securitron EPT/EPTL
 - 3. Von Duprin EPT-2/EPT-10
- B. Provide electric power transfer devices as specified in hardware groups or as required by electrified hardware voltage requirements.
- C. When specifically indicated, provide surface-mounted armored power transfer loops with length to accommodate door opening conditions.

2.4 CONTINUOUS GEARED HINGES

- A. Acceptable Manufacturers:
 - 1. ABH A110HD, A240HD
 - 2. Hager/Roton: 780-112HD, 780-224HD
 - 3. McKinney: MCK-12HD, MCK-25HD
 - 4. Pemko: FM_SLFHD, FM_HD
 - 5. Select: SL-11HD, SL-24HD

6. Stanley: 661HD, 662HD
- B. Provide model of continuous hinges as appropriate for the type, inset, and thickness of door where specified. Coordinate hinge types with the door supplier.
- C. Specialty hinges for special mounting conditions, example: swing-clear, wide-throw, etc. are indicated in assigned hardware groups for particular openings.

2.5 BOLT LOCKS

- A. Acceptable Manufacturers:
 1. Burns
 2. Door Controls International
 3. Hager
 1. Ives listed below for design intent only
 2. Rockwood
 3. Trimco
- B. Automatic Flushbolt: FP31/FP41 Series
- C. Semi-automatic, constant-latching Flushbolt: FP51/FP61 Series
- D. Provide flush bolts meeting the requirements of ANSI A156.3, Grade 1, Type 25, conforms to positive pressure standards of UL10C and UBC 7-2 -1997, and is UL listed at fire rated openings.
- E. Provide flush bolts for inactive door of pairs as indicated in the hardware groups, as required for metal or wood doors, and per the following conditions, unless indicated otherwise:
 1. At all exterior openings and locking interior openings, provide top and bottom bolt configuration for inactive door of pair, unless indicated otherwise.
 2. At non-locking interior openings, provide top bolt only.
 3. At fire-rated openings utilizing top bolt only configurations, provide appropriate auxiliary fire latch, as required by the door manufacturer to attain the specified fire-rating/label.
 - a. Include appropriate strike to receive bolt/pin when projected.
 4. Where bottom bolts are utilized, provide dustproof strike, as required for sill conditions.
 5. Locate centerline of top bolt not more than 78 inches above finished floor – provide rod extensions as necessary.
 6. Only provide manual flushbolts or surface bolts when specifically indicated in the assigned hardware group.

2.6 LOCKSETS – MORTISE

- A. Acceptable Manufacturer and Series:
 1. Best 40H-15H
 2. SARGENT 8200 x LNL
 3. Schlage L9000 x 06A
- B. Provide mortise locks, unless indicated otherwise, with functions specified in Hardware Groups and with following provisions:
 1. Cylinders: Provide cylinders, as required, to accomplish specified lock function. Refer to Part 2 – KEYING.
 2. Locksets shall meet the requirements of ANSI/BHMA A156.13-1994, Operational Grade 1, and Security Grade 1.
 3. Backsets: 2-3/4 inches.
 4. Strikes: Provide wrought boxes and strikes with proper lip length to protect trim but not to project more than 1/8 inch beyond trim, frame or inactive leaf. Where required, provide open back strike and protected to allow practical and secure operation.
 5. ANSI functions – mortise locks.
 - a. Passage – F01
 - b. Privacy – F22
 - c. Office – F04
 - d. Classroom – F05
 - e. Storeroom – F07

6. Where electrified locksets are specified, provide wiring harness and connections from electric lock to electric power transfer.
7. Provide escutcheons to match existing conditions, where applicable.

2.7 EXIT DEVICES

- A. Provide Heavy-Duty Manufacturers and Models as listed below. Sargent & Von Duprin are included in the hardware groups as a basis of design and function. Provide ONLY manufacturers and models as listed below.
 1. Precision Apex 2000 Series
 2. SARGENT 80 Series
 3. Von Duprin 35A/98 Series
- B. All exit devices shall be UL listed for panic. Exit devices for labeled doors shall be UL listed as Fire Exit Hardware.
- C. Where lever trim is specified, provide lever design to match locksets specified in previous articles.
- D. Provide cylinder dogging feature for non-rated heavy-duty exit devices with pull or locked lever outside trim.
- E. Cylinders: Provide cylinders as required for specified locking function and cylinder dogging. Refer to Part 2 – KEYING.
- F. Provide keyed removable mullions, including keyed cylinders, as specified in the Hardware Groups.
- G. Door supplier to coordinate exit device mounting location to be mounted below half-height glazing to keep exit device from obstructing vision panel.

2.8 ELECTRIC STRIKES

- A. Acceptable Manufacturers and Series:
 1. HES 1600 Series; 9500/9600 Series
 2. Folger-Adam 310 Series
 3. Von Duprin 6000 Series
- B. Provide electric strikes designed for use with latch/lock type shown at each specified opening.
- C. Electric Strikes shall be UL Listed as Burglary-Resistant Electric Door Strikes and, where required, shall be UL Listed as Electric Strikes for Fire Doors and Frames. Provide fail-secure type electric strikes, unless specified otherwise.
- D. Provide power supply, transformer, and rectifier for each strike as required, unless indicated otherwise. Verify voltage with electrical contractor.
- E. Provide spacer plates and accessories as required for installation to suit details.

2.9 IN-LINE POWER CONTROLLERS

- A. Acceptable Manufacturers and Series:
 1. Best; 8WTCM
 2. Command Access; CRU-3
 3. HES; 2005ME Smart Pac III
- B. Provide in-line power controllers for electrified locks, electrified lever trim, and electric strikes where indicated in the hardware group or by modifiers to reduce overheating due to continuous power required to maintain specified lock/unlock function for extended periods of time.

2.10 KEYING

- A. Keying to be provided by owner's Security Vendor. Security Vendor to coordinate products and installation with GC.
- B. Integrate keying of new locks/cylinders with existing key system as directed by Owner. Confirm existing key system manufacturer and keyway. Factory key all cylinders with manufacturer retaining permanent keying records. If requested, provide Owner with copy of bitting list via Owner acceptable delivery method.

- C. Contractor shall provide construction masterkeying and keys for the construction period.
- D. Authorized local distribution/service shall be available for purchase of additional keys & cylinders to allow for system revisions, expansion, and service, as required.
- E. Keying Conference: Conduct conference.
 - 1. Conference participants shall include Installer's Architectural Hardware Supplier/Consultant, Architect and Owner's security consultant.
 - 2. Incorporate conference decisions into keying schedule after reviewing door hardware keying system including, but not limited to, the following:
 - a. Flow of traffic and degree of security required.
 - b. Preliminary key system schematic diagram.
 - c. Requirements for key control system.
 - d. Requirements for access control.
 - e. Address for delivery of keys.
- F. If requested, submit proposed keying schedule to Architect and meet with Owner and Architect to review schedule.
- G. Provide construction masterkeying. Permanent cylinders/cores shall be installed/activated upon completion of the project.
- H. Provide 6 masterkeys for each masterkey set. Provide 3 change keys for each lock. Stamp keys Do Not Duplicate. When interchangeable core cylinders are specified, provide 2 control keys for core removal.
- I. All keys shall be delivered to the designated Owner's representative via method determined and agreed upon by the Owner at the keying meeting.

2.11 DOOR TRIM

- A. Acceptable Manufacturers and Types:
 - 1. Burns
 - 2. Hiawatha listed below for design intent only
 - 3. Rockwood
 - 4. Trimco.
- B. 1-inch Diameter, 10-inch CTC, offset pull
 - 1. Burns 39C
 - 2. Hiawatha 658A
 - 3. Rockwood BF157A
 - 4. Trimco 1191-3
- C. Non-Mortise edge guard bottom rod and latch guard
 - 1. Burns 301/302
 - 2. Hiawatha DES-1A/DES-2A
 - 3. Rockwood 304/305
 - 4. Trimco KE31-1/KE32-1 PG8002
- D. Push Bars:
 - 1. Length:
 - a. Stile and rail doors: center of stile to center of stile.
 - b. Flush doors: 3 inches less than door width.
 - 2. Use concealed mounting and mount back-to-back with pulls.
- E. Pulls:
 - 1. Length: 10-inches CTC
 - a. 8-inches CTC when used with pull plate.
 - 2. Use concealed mounting and mount back-to-back with push bars.
- F. Door Protection Plates and Edge Guards: Minimum of 0.050 inch thick, stainless-steel, beveled 4 edges.
 - 1. Kick Plates:
 - a. At single doors provide width 1-1/2 inches less than door width on push side.

- b. At pairs of doors provide width 1 inch less than door width on both doors.
 - c. Height: 10 inches unless otherwise detailed in Architectural drawings or indicated in hardware groups.
- 2. Armor Plates:
 - a. Push side Single door: 1-1/2 inches less than door width.
 - b. Pull side Single door: 1 inch less than door width.
 - c. Pairs of doors: 1 inch less than door width on both doors.
 - d. Height: 34 inches, unless otherwise detailed in Architectural drawings or indicated in hardware groups.
- 3. Edge Guards:
 - a. Height: 34 inches, unless otherwise detailed in Architectural drawings or indicated in hardware groups.
 - b. When edge guards are specified in conjunction with protection plates, coordinate widths of to result in a continuous smooth surface with no more than 1/8-inches between the edge of the edge guard and the edge of the protection plate. Do not overlap.
 - c. Coordinate sizing of edge guards with door & frame supplier/manufacturer to ensure that opening clearances prevent binding and/or rubbing of the swinging door.
- 4. Do not provide protection plates, or edge guards for impact-resistant doors. Refer to Door Panel type in Opening Schedule or MAT-ID list.

2.12 COORDINATORS

- A. Acceptable Manufacturers:
 - 1. Door Controls International
 - 2. Hager
 - 3. Ives
 - 4. Trimco, listed below for design intent only
- B. Provide stop-mounted coordinator for labeled pairs of doors equipped with automatic flush bolts and those with vertical rod/mortise lock fire exit device combinations with astragals, unless indicated otherwise.
 - 1. Trimco 3094 series, or approved equivalent
- C. Provide filler bars for total opening width, closer mounting brackets, carry bars, and special preparation for top latches where applicable.

2.13 DOOR CLOSERS

- A. Acceptable Manufacturers and Types of Exposed Closers:
 - 1. Heavy-Duty - cast aluminum bodies:
 - 2. Heavy-Duty - cast iron bodies:
 - a. LCN 4040/4040XP
 - b. Norton 9500
 - c. SARGENT 281/281 P-10
- B. Provide heavy-duty non-sized closers with heavy-duty closer arms, unless indicated otherwise in Hardware Groups, adjustable to meet maximum opening force requirements of ADA.
- C. Provide heavy-duty drop plates, brackets, or adapters for arms as required to suit details.
- D. Mount closers on room side of corridor doors, inside of exterior doors, and stair side of stairway doors, unless indicated otherwise.
- E. Provide back-check for closers.
- F. Provide heavy-duty mechanical holder arms where holder function is indicated.
- G. Provide closers for doors as noted in Hardware Groups and, in addition, provide closers for labeled doors whether or not specifically noted in group.
- H. Provide closers meeting the requirements of UBC 7-2 and UL 10C positive pressure tests.
- I. No through bolting of closers will be accepted.

2.14 AUTOMATIC OPERATORS

- A. Acceptable low-energy standard-duty manufacturers/models:
 - 1. Besam: SW100
 - 2. LCN Senior-Swing
 - 3. Horton: 4000LE Series
 - 4. Stanley: Magic-Force-LE
 - 5. Best/Stanley: D-4990. Provide low energy automatic swing door operators complying with ANSI A156.19 and as indicated in the hardware groups. Provide complete with drop plates, brackets, or adapters for arms as required to suit details. Must function as compliant manual closer if power fails.
- C. Provide a terminal strip in an enclosed box near or above door that indicates connections for security and fire alarm equipment and for electrified hardware items associated with proper door operation, as indicated by hardware group operational description.
- D. Provide wall-mounted actuator switches by the same manufacturer as the operator. Actuators shall be weather-resistant type at exterior applications.
- E. Where indicated, provide square switch adapter cuff.
 - 1. Wikk No. BP4X4 ADT RFBLK, or equivalent
- F. Provide connections and integration with other specified electronic hardware to achieve the operational description, as specified.
- G. Provide fire-alarm connection, or smoke detectors, as required by local codes, to de-activate operator to close door during fire-alarm event.
- H. Install automatic operators in compliance with manufacturer's installation procedures. Adjust automatic operators for smooth & quiet operation.

2.15 OVERHEAD STOPS

- A. Acceptable Manufacturers and Types: BHMA A156.8.
 - 1. ABH listed below for design intent only
 - 2. Glynn-Johnson
 - 3. Rixson
 - 4. Sargent
- B. Heavy duty, surface:
 - 1. ABH 9000
 - 2. Glynn-Johnson 90
 - 3. Rixson 9
 - 4. Sargent 590
- C. Heavy duty, concealed:
 - 1. ABH 1000
 - 2. Glynn-Johnson 100
 - 3. Rixson 1
 - 4. Sargent 690
- D. Provide concealed or surface mounted overhead stops unless indicated otherwise.
- E. Provide overhead stops for the following opening conditions.
 - 1. At doors that swing more than 140 degrees before striking a wall.
 - a. Provide a closer stop arm at interior doors with parallel arm closer mountings.
 - 2. At doors that open against objects, materials, casework, equipment, or other conditions that make wall stops inappropriate.
 - 3. At doors located 1'-6-inches or more from the wall, unless specifically indicated otherwise.
- F. Where overhead stops are required per opening conditions defined above, provide the following.
 - 1. Provide surface-mounted overhead stops for fire-rated wood doors, exterior hollow metal doors, or where specifically indicated.

2. Provide heavy-duty overhead stops for doors that are over 39 inches wide and for exterior doors.
 - a. A heavy-duty closer compression stop arm is an acceptable option for overhead stops at exterior doors with parallel arm closer mountings.
3. Provide hold-open function where indicated at non-label doors.
4. Provide sex bolt attachments for mineral core wood door applications.

2.16 STOPS AND HOLDERS

- A. Acceptable Manufacturers:
 1. Burns
 2. Hager
 3. Ives listed below for design intent only
 4. Trimco
- B. Wall Bumper: WS406/407CVX; WS406/407CCV
- C. Wall Mounted Stops: WS11/WS11X
- D. Provide wall bumper for each door leaf except where wall mounted stops are specified in the Hardware Groups, or where opening conditions require the use of an overhead stop. Refer to Part 2 – Overhead Stops
 1. Provide an overhead stop for doors in which the door face or operating trim on the leading/latch edge does not open against wall or opens against equipment or furniture.
- E. Floor or base stops must be used only where specified or absolutely unavoidable.

2.17 THRESHOLDS

- A. Acceptable Manufacturers:
 1. Hager
 2. National Guard Products
 3. Pemko listed below for design intent only
 4. Reese Enterprises
 5. Zero
- B. Exterior Thermally Broken: 252X3_FG.
 1. Provide 171A where detailed otherwise, or where thermally broken is not feasible.
- C. Interior: 271A, unless detailed otherwise or specifically indicated by Hardware Group Modifier.
- D. Refer to drawings for special details.
- E. Provide accessories, shims and fasteners as recommended by Manufacturer.
 1. Provide self-tapping fasteners for products being applied to hollow metal doors and frames.
 2. Where thresholds occur at openings with one or more mullions, they must be cut for the mullions and extended continuously for the entire opening.

2.18 WEATHER-STRIPPING

- A. Acceptable Manufacturers:
 1. Hager
 2. National Guard Products
 3. Pemko listed below for design intent only
 4. Reese Enterprises
 5. Zero
- B. Refer to drawings for special details. Provide accessories, shims and fasteners.
 1. Provide self-tapping fasteners for products being applied to hollow metal doors and frames. Cutting or notching of gasket for stop-mounted hardware on frame shall not be permitted.
 2. Provide special brackets, as required by actual frame conditions, for specified stop-mounted hardware.

3. Cutting or notching of gasket for stop-mounted hardware on frame shall not be permitted. Provide special brackets, as required by actual frame conditions, for specified stop-mounted hardware.
- C. Where weather-strip and thresholds are assigned by hardware group modifier "W", provide the following:
 1. Thresholds: Refer to Part 2 - Thresholds
 2. Door Bottom/Sweep: 315_N, unless detailed otherwise, both doors of pairs.
 3. Weatherstrip: 2891_PK frame-applied, unless detailed otherwise.
 4. Rain Drip: 346 by full frame width, unless detailed otherwise.
 5. Astragal: 18041_P split type, for each door of pairs with both doors active, or S88D gasket. Applied to fixed astragal by door supplier for active/inactive pairs, unless detailed otherwise.

2.19 DOOR POSITION SWITCHES

- A. Acceptable Manufacturers and Types:
 1. Ademco ADI 800-233-6261: 944SP-WH 3/4-in recessed white
 2. Detex: MS-2049F
 3. SARGENT: 3287
 4. Sentrol: 1078
- B. Provide model to accommodate door and frame materials and mounting conditions.
- C. Coordinate door and frame preparations with door and frame suppliers.
- D. Switches shall be installed in frame head approximately 4-inches from latching edge of door, unless detailed otherwise.

2.20 FASTENERS

- A. Including, but not limited to; wood or machine screws, special screws, bolts, special bolts, nuts, expansion shields, anchors, and other accessory items of proper type, material, and finish required for complete operational installation of hardware.
- B. Use phillips head for exposed screws. Do not use aluminum screws to attach hardware.
- C. Provide self-tapping, TEC, screws for attachment of sweeps and stop-applied weatherstripping.

2.21 TYPICAL FINISHES AND MATERIALS

- A. Finishes, unless otherwise specified: @ **HOLLOW METAL DOORS IN ALT BID**
 1. Butts, Out-swinging Exterior Doors: US32D/BHMA 630 on Stainless Steel.
 2. Flush Bolts: US26D/BHMA 626 on Brass or Bronze.
 3. Exit Devices: US32D/BHMA 630 on Stainless Steel.
 4. Locks and Latches: US26D/BHMA 626 on Brass or Bronze.
 5. Coordinators: USP/BHMA 600 on Steel.
 6. Kick Plates, Armor Plates, and Edge Guards: US32D/BHMA 630 on Stainless Steel.
 7. Overhead Stops and Holders: US26D/BHMA 626 on Brass or Bronze.
 8. Closers - Surface mounted. Sprayed Lacquer or Powder Coat to Match.
 9. Miscellaneous Hardware: US26D/BHMA 626 on Brass or Bronze.
- B. Finishes, unless otherwise specified: Dark Bronze @ **ALUMINUM DOORS IN BASE BID**
 1. Continuous Hinges: Dark Anodized Bronze.
 2. Exit Devices: 313AN/710 Dark Bronze.
 3. Door Trim: Dark Bronze
 4. Overhead Stops and Holders: Dark Bronze
 5. Closers - Surface mounted, Sprayed Lacquer or Powder Coat to Match. Dark Bronze
 6. Thresholds and Weatherstripping: Clear mill finish aluminum thresholds, unless indicated otherwise; Dark Bronze Anodized weatherstrip housing.
 7. Miscellaneous Hardware: Dark Bronze

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine doors, frames, and related items for conditions that would prevent the proper application of finish hardware. Do not proceed until defects are corrected.

3.2 INSTALLATION

- A. Install finish hardware in accordance with reviewed hardware schedule and manufacturer's printed instructions. Prefit hardware before finish is applied, remove and reinstall after finish is completed. Install hardware so that parts operate smoothly, close tightly and do not rattle.
- B. Installation of hardware shall comply with NFPA 80 and NFPA 101 requirements.
- C. Set units level, plumb and true to line and location. Adjust and reinforce attachment to substrate as necessary for proper installation and operation.
- D. Screws for hinges and lock fronts in wood doors shall have pilot holes pre-drilled to avoid splitting doors. Do not over-drill pilot holes or over-torque installation of screws.
- E. Drill and countersink units which are not factory-prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.
- F. For doors with door pulls and push plates, install door pulls with through bolted fasteners countersunk and flush with door face. Then install push plates over countersunk through bolts so they are concealed by push plate.
- G. Ensure latches and dead latches are installed per manufacturers installation instructions, and adjustments are to be made to ensure that they are in alignment with strikes.
- H. Set thresholds for exterior doors in full bed of butyl-rubber or polyisobutylene mastic sealant, forming tight seal between threshold and surface to which set. Securely and permanently anchor thresholds, using countersunk non-ferrous screws to match color of thresholds; stainless steel screws at aluminum thresholds.

3.3 FIELD QUALITY CONTROL

- A. After installation has been completed, provide services of qualified hardware consultant to check Project to determine proper application of finish hardware according to schedule. Also check operation and adjustment of hardware items.
- B. Adjust door control devices to compensate for final operation of heating and ventilating equipment.

3.4 ADJUSTING AND CLEANING

- A. At final completion, hardware shall be left clean and free from disfigurement. Make final adjustment to door closers and other items of hardware. Where hardware is found defective repair or replace or otherwise correct as directed.
- B. Adjust door closers to meet opening force requirements of Uniform Federal Accessibility Standards.
 - 1. Force Requirements:
 - a. Interior hinged doors and gates: 5 pounds maximum.
 - b. Sliding or folding doors: 5 pounds maximum.
- C. Final Adjustment: Wherever hardware installation is made more than one month prior to acceptance or occupancy of space or area, return to work during week prior to acceptance or occupancy, and make final check and adjustment of hardware items in such space or area. Clean operating items as necessary to restore proper function and finish of hardware and doors.
- D. Instruct Owner's personnel in proper adjustment and maintenance of door hardware and hardware finishes.
- E. Clean adjacent surfaces soiled by hardware installation.

3.5 PROTECTION

- A. Provide for proper protection of hardware items until the Owner accepts Project as complete.

3.6 HARDWARE GROUP MODIFIERS

- A. Hardware Group modifiers added to numeric hardware group assignments on the schedule of openings indicate a variation to the group as defined below.

"C" – Add concealed overhead stop, or door closer stop arm. At exterior doors provide both stop arm and concealed overhead stop.

"P" – Add door position switch/contact for doors being monitored/alarmed, both leaves of pairs. Refer to Part 2 - Door Position Switches. Connection by Electrical.

"W" – Add weatherstrip, sweeps and rain drip, where applicable. Refer to Part 2 – Weatherstrip & Thresholds.
Provide thermally broken threshold that coordinates with Architectural details.
At aluminum assemblies, add rain drips, where applicable and not part of aluminum frame assembly – match door & frame finish, add thermally broken thresholds and sweeps, integral weatherstrip is provided by door manufacturer.

3.7 HARDWARE GROUPS

- A. Provide all required door hardware for each specified opening to comply with requirements of this section in its entirety. Included are desired/intended functions, acceptable manufacturers and models, systems coordination, etc. for a complete installed opening.
- B. Refer to the openings schedule for hardware group and modifiers assigned to each door opening. Ignore hardware groups and modifiers not assigned on the openings schedule.

GROUP 44.43M – Storeroom lock with closers (plus holders), active/inactive pair (non-rated) with semi-automatic (constant-latching) flushbolts & coordinator (storage and/or equipment rooms)

Hinges

1 set Flushbolts (semi-automatic / constant-latching)

1 each Lockset Storeroom Function (mortise lock)

Function: Latchbolt is retracted by lever inside only. Outside lever is always LOCKED. Key outside retracts latchbolt. Deadlocking latchbolt.

1 each EPT-10 power transfer – active leaf

1 each Coordinator

2 each Closers (cush stop and mechanical holder function)

2 each Armor Plates (push-side): 34-inches tall x 1-1/2-inches less-than-door width)

4 each Edge Guards (L-type; to wrap edge of door and push-side face of door. Coordinate size of edge guards with protection plates resulting in a smooth surface on the push-side of each door with not more than 1/8 of an inch between edge guard and protection plate.

1 Each overlapping metal astragal, provided by Door Manufacturer/Supplier, primed flat steel at hollow metal doors.

Prep for future card reader. Provide conduit from EPT location to head of frame

GROUP 34.01 – Storeroom (mortise) with closer

Hinges

1 each Mortise Lockset Storeroom Function

Function: Latchbolt is retracted by inside lever only. Outside lever is always LOCKED. Key outside retracts latchbolt. Deadlocking latchbolt.

1 each Closer

1 each Armor Plate

1 each Stop, as required by opening conditions

Prep for future card reader. Provide conduit from strike location to head of frame

GROUP 50 – Single exit only with closer

Hinges

1 each exit device: 8810 or 12-8810 / 99EO or 99EO-F

Function: latchbolt is retracted by inside push rail. No outside operation.

1 each closer

1 each kickplate

1 each stop, as required by opening conditions

COORDINATION NOTE: provide signage stating: "exit only. There is no provision for re-entry." Signage provided by owner's signage consultant, g.c. to coordinate prior to building occupancy certification.

GROUP 254.11 – Single exit with pull & cylinder x electric latch retraction ("quiet" dogging) & access control (card reader and/or building control system)

Hinges

1 each Electric Hinge (or power transfer, as required by exit device)

1 each Electric Exit Device QEL99-NL

Function: Latchbolt is retracted electronically, by inside pushrail, and by outside key. Outside access by pull when latchbolt is retracted – mechanically or electronically.

1 each Closer

1 each Kickplate

1 each Stop

1 each Power Supply, for exit device

Access controls, request-to-exit device, and alarm (if utilized) by Security Contractor.

Connection by Electrical.

OPERATIONAL DESCRIPTION: Door is normally closed. Manual exit by depressing pushrail is possible at all times. Access control (card reader and/or building control system) retracts exit device latchbolt electronically to control entry. Latchbolt can be held retracted electronically for extended periods of time enabling push/pull operation. Fire-rated assemblies require fire alarm connection to release latchbolt upon activation of fire alarm.

GROUP 551.01 – Aluminum narrow-stile exit/panic with pull & cylinder plus electric latch retraction via electronic access control system

1 each Continuous Geared Hinge, match door and frame finish

1 each Electric Power Transfer Device, as required by exit/panic device

1 each Electrified Exit Device: RX-QEL35A-NL-OP x 8190

Function: Latchbolt is retracted electronically, by outside/pull-side key, and by inside pushrail. Outside access by pull when device latchbolt is electronically or mechanically retracted/dogged.

1 each Closer

1 each Heavy-Duty Stop

1 each Power Supply, as required for exit/panic device

1 each Door Position Switch/Contact, concealed

Electronic access control system/devices, request-to-exits, and monitoring/alarms are provided with Security System. Contractor to coordinate the provision and installation of products. Refer to documents with Security information for locations and types of controls. Connection by Electrical.

OPERATIONAL DESCRIPTION: Door is normally closed. Manual exit by depressing exit/panic pushrail is possible at all times. Electronic access control system/devices retracts, unlocks and extends, locks exit device latchbolt to control entry. When extended, locked, presenting authorization temporarily retracts latchbolt to allow entry by outside pull. Interruption of power, or fire alarm event at fire-rated openings releases/extends latchbolt to positively latch door, resulting in door being locked on the pull side and requiring key for entry.

NOTE: Opening door by outside key when secured electronically will send monitor alert to monitoring station, if utilized.

GROUP 580.11 – Aluminum pair with keyed removable mullion, narrow-stile exits/panics with pulls and cylinder x electric latch retraction via electronic access control system, with closers

2 each Continuous Hinges, match finish of aluminum door and frame assembly

1 each Electric Power Transfers

1 each Electrified Exit Device: 56-8510 x 862 / QEL-35A-EO x 8190

Function: Latchbolt is retracted electronically and by inside pushrail. Outside access by pull when latchbolt is retracted.

1 each Exit Device: 56-8504 x 862 / 35A-NL-OP x 8190

Function: Latchbolt is retracted electronically, by outside outside key, and by inside pushrail. Outside access by pull when device is electronically or mechanically dogged.
1 each Keyed Removable Aluminum Mullion, include keyed cylinder, match aluminum door and frame finish

2 each Closers

2 each Heavy-Duty Concealed Overhead Stops

1 each Power Supply, for exit devices

2 each Door Position Switches/Contacts

Electronic access control system/devices, request-to-exit devices, and monitoring/alarms are provided by Security Contractor. Refer to security documents for locations and types of controls. Connection by Electrical.

OPERATIONAL DESCRIPTION: Doors are normally closed. Manual exit is always possible through either door by depressing push rail on exit device of either leaf.

Entry is controlled by electronic access control system/devices which extends and retracts latchbolts on both leaves. When secured, presenting authorization temporarily retracts latchbolt allowing travel through either leaf. Interruption of power extends latchbolts to prohibit entry, requiring key for entry.

GROUP 700.01 – Single Aluminum, push-bar and pull with automatic operator

1 each Continuous Hinge

1 each Push Bar / Offset pull combo – 9190 IVES

1 each Automatic Operator: LCN 4640 Series– or reuse existing – GC to verify

2 each Actuators: 8310-853 LCN– or reuse existing – GC to verify

1 each Stop, heavy-duty concealed overhead

Connection by Electrical.

OPERATIONAL DESCRIPTION: Door is normally close, no latching. Manual passage is always possible both directions of travel. Depressing either actuator switch opens door automatically.

GROUP 720.22 – Aluminum narrow-stile exit/panic with pull & cylinder, controlled entry via electronic access control system & electric strike (fail-secure entry) with automatic operator

1 each Continuous Hinge

1 each Exit/Panic Device 33A-NL-OP x 8190

Function: Latchbolt is retracted by outside key and inside pushrail. Outside access by pull when latchbolt is retracted or device is dogged.

1 each Electric Strike (fail-secure entry)

1 each Automatic Operator LCN 4640 Series– or reuse existing – GC to verify

2 each Actuators 8310-853 LCN– or reuse existing – GC to verify

1 each Heavy-Duty Concealed Overhead Stop

Connection by Electrical.

OPERATIONAL DESCRIPTION: Door is normally closed. Manual exit is allowed at all times by depressing exit/panic pushrail. Automatic exit is allowed (except during power interruption) by depressing inside wall actuator switch which temporarily releases electric strike and then opens door.

Entry is normally secured mechanically and electronically. Outside actuator operable during business hours. Outside key retracts latchbolt to allow manual entry. Presenting authorization temporarily releases electric strike and allows manual or automatic entry.

END OF SECTION

SECTION 088000 GLAZING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Monolithic glass.
 - 2. Insulating vision glass.
 - 3. Insulating spandrel glass.

1.2 DEFINITIONS

- A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.
- B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.
- C. Interspace: Space between lites of an insulating-glass unit that contains dehydrated air or a specified gas.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each type of product; 12 inches square.
- C. Calculations: Structural design shall be performed by a Professional Engineer, licensed in the state where Project is located. Signed engineering calculations shall be submitted to Architect/Engineer.
 - 1. Structural design calculations are required per IBC Section 2403, for glass not supported on 4 sides, including glass supports and framing, indicating structural integrity of glass size, glass support members, anchors, fasteners and connections to building, in accordance with specified criteria.
 - 2. Engineering Responsibility: Calculations shall be reviewed for stated design assumptions, general compliance to specified requirements, and forces imposed on glass structure. The accuracy of the design calculations shall be the sole responsibility of the Contractor's Professional Engineer.

1.4 INFORMATIONAL SUBMITTALS

- A. Insulating Glass Certification: Submit data verifying compliance with IGCC, Class A level.
- B. Compatibility Certification: After testing and review, certify compatibility of materials in contact and in close proximity to glazing sealant materials.
- C. Wind Pressure and Thermal Stress Analysis: Submit thermal stress analysis of glass where thermal stress may occur.
- D. Product Certificates: For glass and glazing products, from manufacturer.
- E. Preconstruction adhesion and compatibility test report.
- F. Sample Warranties: For special warranties.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed glazing similar in material, design, and extent to that indicated for this Project; whose work has resulted in glass installations with a record of successful in-service performance; and who employs glass installers for this Project who are certified under the National Glass Association Glazier Certification Program as Level 2 (Senior Glaziers) or Level 3 (Master Glaziers).
- B. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of the inspecting and testing agency, Insulating Glass Certification Council.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

1.7 FIELD CONDITIONS

- A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.

1.8 GLASS WARRANTY

- A. Warranty for Insulating Units: Warranty sealed insulating glass units for minimum period of ten (10) years, with manufacturer's replacement guarantee, covering as minimum: Defective or failure of seal; material vision obstruction as result of dust collection or film formation between panels or other similar failure and the following specific conditions:
 - 1. Reflective glass whose reflective coating cracks, peels or discolors shall be replaced at no charge (material only) for minimum ten (10) year period beginning on date of Substantial Completion.
 - 2. In addition to replacement of insulated units, provide removal and reinstallation of new units without cost to Owner during first five (5) years of guarantee.
- B. Spandrel Glass Warranty: Spandrel glass whose opacifier delaminates, cracks, peels, wrinkles, discolors, or stains shall be replaced at no charge (material only) for minimum five (5) year period beginning on date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General: Provide glazing systems capable of withstanding normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.
- B. Glass Design: Glass thicknesses indicated are minimums and are for detailing only. Confirm glass thicknesses by analyzing Project loads and in-service conditions. Provide glass lites for various size openings in nominal thicknesses indicated, but not less than thicknesses complying with ASTM E 1300 and in strengths (annealed or heat treated) required to meet or exceed the following criteria:
 - 1. Specified Design Wind Loads: Determine design wind loads applicable to Project from basic wind speed indicated in miles per hour at 33 feet above grade, according to ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 6.4.2, "Analytic Procedure," based on mean roof heights above grade indicated on Drawings.
 - 2. Probability of Breakage for Vertical Glazing: 8 lites per 1000 for lites set vertically or not more than 15 degrees off vertical and under wind action.
 - a. Load Duration: 60 seconds or less.
 - 3. Maximum Lateral Deflection: For the following types of glass supported on all four edges, provide thickness required that limits center deflection at design wind pressure to 1/50 times the short side length or 1 inch, whichever is less.
 - a. For monolithic-glass lites heat treated to resist wind loads.
 - b. For insulating glass.
 - 4. Minimum Glass Thickness for Exterior Lites: Not less than 6 mm.
 - 5. Thickness of Tinted and Heat-Absorbing Glass: Provide the same thickness for each tint color indicated throughout Project.
- C. Thermal Movements: Provide glazing that allows for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures acting on glass framing members and glazing components. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change (Range): 120 deg F , ambient; 180 deg F, material surfaces.

- D. Thermal and Optical Performance Properties: Provide glass with performance properties specified based on manufacturer's published test data, as determined according to procedures indicated below:
1. For monolithic-glass lites, properties are based on units with lites 6 mm thick.
 2. For insulating-glass units, properties are based on units with lites 6 mm thick and a nominal 1/2"- wide interspace.
 3. Center-of-Glass U-Values: NFRC 100 methodology using LBL-35298 WINDOW 4.1 computer program, expressed as Btu/ sq. ft. x h x deg F .
 4. Center-of-Glass Solar Heat Gain Coefficient: NFRC 200 methodology using LBL-35298 WINDOW 4.1 computer program.
 5. Solar Optical Properties: NFRC 300
- E. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.
1. Safety Glazing Labeling: Where safety glazing is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.

2.2 MANUFACTURERS

- A. Single Source Responsibility: Provide materials obtained from one source for each type of insulating glass and glazing product indicated.
- B. Manufacturers of Flat Glass Substrate:
1. AGC Glass Company
 2. AFG Industries, Inc..
 3. ACH.
 4. Guardian Industries Corp..
 5. Pilkington North America, Inc..
 6. Vitro Architectural Glass (formerly PPG).
 7. Saint-Gobain.
 8. Schott North America, Inc..

2.3 GLASS PRODUCTS

- A. Glass Thicknesses: Specified glass thickness and thickness of individual glass plies of laminated glass descriptions are minimum. Provide glass of greater thickness as required for size and conditions indicated.
- B. Heat-Strengthened Float Glass: ASTM C1048, Kind HS (heat strengthened). Provide heat-strengthened as required for wind pressure or thermal stress.
- C. Fully-Tempered Float Glass: ASTM C1048, Kind FT (fully tempered). Provide as required to comply with safety code requirements and as indicated with "T" in the Material Identification Abbreviation. Provide safety glazing labeling, as applicable.
- D. Clear Float Glass: ASTM C1036, Type I (transparent glass, flat), Class 1 (clear), Quality Q3 (glazing select).
- E. Tinted Annealed Float Glass: ASTM C1036, Type I, Class 2 (tinted), Quality-Q3.
1. Basis of Design: Vitro Solarbronze.
- F. Ceramic-Coated Spandrel Glass: ASTM C1048, Type I, Condition B, Quality-Q3.
- G. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190, and complying with other requirements specified.
1. Dual Seal: Manufacturer's standard silicone dual sealing system, color as indicated in Glazing Schedule.
 2. Spacer: Manufacturer's standard warm edge spacer.
 3. Desiccant: Molecular sieve or silica gel, or blend of both.
- H. High-performance Low-Emissivity (Low E) Coating:

1. Basis of Design: Vitro Solarban 70.

2.4 GLAZING SCHEDULE

- A. Glazing type locations as indicated on Drawings. Provide tempered glass where safety glass is required by code.
- B. (GL-1) Clear Float Glass: 1/4-inch (6 mm) minimum thickness.
- C. (GL-1T) Clear Float Glass, Fully-Tempered: 1/4-inch (6 mm) minimum thickness.
- D. (GL-21) Insulating Vision Glass:
 1. Configuration: 1-inch thick unit as follows:
 - a. Outboard Lite: 1/4 inch, tinted; heat-treated, Low E coating applied to No. 2 surface.
 - 1) Basis of Design: Vitro Solarban 70XL.
 - b. Airspace: 1/2 inch, argon-filled.
 - c. Inboard Lite: 1/4 inch, clear; heat-treated.
 2. Performance:

a. Visible Transmittance:	39 percent.
b. Ultraviolet Transmission:	7 percent.
c. Nighttime Winter U-value:	0.24
d. Solar Heat Gain Coefficient:	0.20
- E. (GL-21T) Insulating Vision Glass, Fully-Tempered: Same as GL-21 except all glass fully-tempered.
- F. (GL-22) Insulating Vision Glass with UV Bird Collision Mitigation coating:
 1. Configuration: 1-inch thick unit as follows:
 - a. Outboard Lite: 1/4 inch, tinted; heat-treated, Low E coating applied to No. 2 surface and UV bird deterrent coating on No. 1 surface.
 - 1) UV Coating Basis of Design: "AviProtek T" by Pilkington
 - b. Airspace: 1/2 inch, argon-filled, with manufacturer's standard warm edge spacer.
 - c. Inboard Lite: 1/4 inch, clear; heat-treated glass.
- G. (GL-22T) Insulating Glazing Glass with UV Bird Collision Mitigation coating, Fully-Tempered: Same as GL-22 except all glass fully-tempered.
- H. (GL-41) Insulating Spandrel Glass.
 1. Configuration: 1-inch thick unit as follows:
 - a. Outboard Lite: 1/4-inch thick, tinted glass, heat-strengthened with Low E coating on No. 2 surface
 - b. Airspace: 1/2-inch, argon-filled space.
 - c. Inboard Lite: 1/4-inch thick, clear glass, heat-strengthened, with opaque ceramic coating on No. 4 surface.
 - 1) Ceramic Frit:
 - (a) Pattern: Solid, Opaque.
 - (b) Color: as selected by Architect from Manufacturer's standards
 2. Performance:

a. Nighttime Winter U-value:	0.24
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2.5 GLAZING ACCESSORIES

- A. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
 1. Structural Sealant: Capable of withstanding tensile and shear stresses imposed by structural-sealant-glazed curtain walls without failing adhesively or cohesively. When tested for preconstruction adhesion and compatibility, cohesive failure of sealant shall occur before adhesive failure.
 - a. Adhesive failure occurs when sealant pulls away from substrate cleanly, leaving no sealant material behind.
 - b. Cohesive failure occurs when sealant breaks or tears within itself but does not separate from each substrate because sealant-to-substrate bond strength exceeds sealant's internal strength.

- B. Adhesion Testing: Prior to application of sealants, test each application condition to ensure sealant satisfactorily adheres to substrate.
1. Conduct test in field or by submission of representative substrate sample to manufacturer for factory test.
 2. Apply sealant to sample substrate and perform hand-pull tab test in accordance with ASTM C1193, Method A.
 3. Determine if primer is required. If so, re-test using primer.
 4. Structural-Sealant Adhesion: Test structural sealant according to recommendations in ASTM C 1401, Destructive Test Method A, "Hand Pull Tab (Destructive)," Appendix X2.
- C. Compatibility: Compatible with one another and with other materials they contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
1. Compatibility Testing: Prior to application of sealants, test gaskets, spacers, setting blocks, and other glazing accessories being provided for project to determine compatibility with structural silicone sealants.
 - a. Submit representative samples of accessories to manufacturer for factory testing.
 - b. Perform testing in accordance with ASTM C1087.
 - c. Incompatible accessories shall be replaced with ones recommended by and tested by manufacturer as acceptable.
- D. Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 50, for Use NT, G, A, and O; SWRI validation.
1. Basis of Design: Dow Corning Corporation, 795 Silicone Building Sealant
- E. Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 50, for Use NT, G, and A; SWRI validation.
1. Basis of Design: Dow Corning Corporation, 995 Silicone Structural Sealant
- F. Single-Component, Nonsag, Acid-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Use NT, G, and A.
1. Basis of Design: Dow Corning Corporation, 999-A Silicone Building & Glazing Sealant.
- G. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C 1281 and AAMA 800 for products indicated below:
1. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
 2. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.
- H. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:
1. AAMA 810.1, Type 1, for glazing applications in which tape acts as the primary sealant.
 2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.
- I. High-Bond Structural Glazing Tape: Pressure-sensitive, conformable acrylic closed-cell foam tape with high-performance acrylic adhesive on both faces, 2.3 mm thick, black color.
1. Basis of Design for Product Type and Performance: B23F VHB Tape by 3M.
 2. Provide Basis of Design product or other product as recommended by tape Manufacturer for intended use.
- J. Setting Blocks: Neoprene, 80 to 90 shore "A" durometer hardness, chemically compatible with glazing sealant or compound, length as recommended by glass manufacturer.
- K. Spacers and Shims: Neoprene, 40 to 50 shore "A" durometer hardness, chemically compatible with glazing sealant or compound, length as recommended by glass manufacturer.

2.6 FABRICATION

- A. Heat-Treated Float Glass: ASTM C 1048. Fabricate using horizontal roller heating process only. Roll wave distortion parallel to bottom edge of glass as installed. Deviation from flatness at any peak (peak to valley deviation): shall not exceed 0.003 inches in the center of a lite and shall not exceed 0.008 inches within 10.5 inches of the leading or trailing edge.
- B. Insulating Glass Units:
 - 1. Fabricate using both primary and secondary seals and as otherwise required to comply with the IGCC CBA classification.
 - 2. Fabricate using glass from the same manufacturer throughout the Project.
 - 3. Seal Construction: Dual seal design with primary seal of PIB and Silicone Secondary Seal, unless specifically indicated otherwise.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. 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 glazing channels are free of burrs, irregularities, and debris.
 - 2. Verify glass is free of edge damage or face imperfections.
 - 3. Inspect door and frames to determine that frames, sash, and stops are set true and straight. Sash rabbets and stops shall be clean and dry at time of glazing.
 - 4. Do not proceed until unsatisfactory conditions have been corrected.
- B. Beginning of installation means acceptance of substrate.

3.2 PREPARATION

- A. Provide glass manufacturer's recommended edge clearances when sizing glass.
- B. Remove protective coatings from surfaces to be glazed.
- C. Clean glass and glazing surfaces to remove dust, oil, and contaminants, and wipe dry.
- D. Verify measurements of sash and openings at Project.
- E. Coordinate with and check Shop Drawings furnished by other suppliers of Work affecting this Section to avoid field installation problems.

3.3 INSTALLATION

- A. Comply with glass fabricators recommendations.
- B. Except where storefront, window, entrance or glass manufacturer recommends otherwise, comply with Flat Glass Marketing Association (FGMA) Sealant Manual and FGMA Glazing Manual.
- C. Glaze insulated units as recommended by glass and frame manufacturers.
- D. Do not apply glazing materials at temperatures below manufacturer's recommendations or to damp or frosted surfaces. Apply glazing material according to the manufacturer's instructions using proper primers as required.
- E. Set glass using neoprene setting blocks and spacers to insure proper edge clearance and uniform beads of compound. Clearances shall conform to FGMA Glazing Manual requirements. Center glass in glazing rabbets.
- F. Check openings to confirm proper clearance at perimeters and between glass and stops.
 - 1. Clean surfaces of rabbet (including stops) and surface of glass which will come into contact with sealant. Use solvents and methods which insure clean, dry surfaces without film or foreign material when sealant is placed.
- G. Remove and replace glazing beads carefully to avoid marking or defacing any portion of frame, sash, or fastenings.

1. Set glass in full bed of glazing tape or sealant. Clean glazing material after stops are installed. Clean excess compound, etc. from glass after setting in conformance with glass manufacturer's recommendations.
 2. If recommended prime surfaces prior to glazing.
- H. Set glass with reams (waves) running horizontally. Set glass with factory attached labels in place.
- I. Setting Blocks: Place setting blocks at locations recommended by glass manufacturer, generally between 1/4 points and 6 inches from corner, except at glazed doors.
1. At glazed doors, provide one block at sill, located 3 inches up from edge of glass at hinge side; one block at hinge side jamb, located 3 inches up from lower edge of glass; one block at head, located 3 inches from edge of glass at latch side of door; and, one block at jamb at lock side of door, located 3 inches down from edge of glass at top corner.
 2. Use blocks of length required to properly support glass. Offset approximately 1 inch from shims.
- J. Glass Installation in Steel (Hollow Metal) Frames:
1. Glaze frames using pre-shimmed tape on both sides. Firmly glaze in place with joints sealed, free of rattles.
 2. Set glass on setting blocks with a full bed of sealant or glazing tape.
- K. Glass Installation in Aluminum Frames:
1. Glaze aluminum frames using preformed EPDM elastomeric glazing extrusion separately or in combination with sealant and pre-shimmed glazing tape in compliance with aluminum frame supplier's recommendations.
 2. Set glass on setting blocks as recommended by manufacturer.
 3. Apply tape and/or sealant to produce uniform sight line even with frame.
 4. Set glass in gaskets with corners sealed.
- L. Glazing Sealant: Along entire bottom edge of light, and up at least 6 inches at each jamb, gun in continuous full bed of sealant to fill voids.
1. Fill entire space, full width of pane, full depth of glass, with sufficient sealant to form heel along inside face and edge of glass.
 2. At other edges (top and sides) gun in continuous heel bead of sealant along edges of glass perimeter to set stop against and into, acting as fill between glass and stop.
 3. Immediately after setting glass, at entire perimeter of glass, gun in sealant between stop and glass so space above spacer is completely filled, without voids.
 4. Place sealant flush with daylight edge of stops, with slight watershed at exterior. Provide straight, smooth surface meeting at opening corners with sharp intersection.
 5. Leave no sealant on exposed surfaces of stops and glass.

3.4 CLEANING

- A. Remove surplus materials.
- B. Final cleaning of glass by Contractor.

END OF SECTION

City Hall Window Replacement

Company	Base Bid	Alternative 1	Alternative 2	Bid Bond	Addendum 1	Addendum 2
B&D Contractors	\$440,000.00	\$85,000.00	\$83,000.00	X	X	X

Alternative 1 - Provide GL-22 glass with UV Bird Collision Mitigation Coating

Alternative 2 - Provide new hollow metal doors and frames



REQUESTED ACTION STATEMENT

DATE: March 7, 2023

TO: Mayor
Common Council
Parks, Buildings and Grounds Commission

FROM: Josh Radomski – Director of Public Works

ISSUE: City Hall Window Project

REQUESTED:

Recommend Council to reject the bid by B&D Contractors, Inc for \$440,000 and recommend that the remaining project funding be moved to the Safety Building Boiler Project. Also recommend that the City Hall Window project be budgeted for in future years and re-bid at that time.

FISCAL IMPACT:

The remaining funding from this account 04251300-61510-C2022 in the amount of \$275,000 will be transferred to the Safety Building Boiler Project (Account #04251300-61507-C2021) in Resolution #2023-7.

RATIONALE:

The low bidder, B&D Contractors, Inc was the sole bidder and was significantly over the budget for this project which was \$300,000. This in combination with the Safety Building Boiler Project, Safety Building Roof Project and Fire Station #1 Project all being over budget, the funds are needed to cover these other projects. The Buildings and Grounds Department will request funding for this project in future years and re-bid the project when funding is available.



REQUESTED ACTION STATEMENT

DATE: March 7, 2023

TO: Mayor
Common Council
Parks, Buildings and Grounds Commission

FROM: Josh Radomski – Director of Public Works

ISSUE:

Resolution Number 2023-7: A Resolution Amending the 2023 Capital Projects Budget

REQUESTED:

Recommend Council to approve Resolution Number 2023-7: A Resolution Amending the Capital Projects Budget in the following ways:

EXPENDITURES - Increase

04251300-61312-C2023	ROOF REPLACEMENT-FIRE ST #1	\$ 55,000
04251300-61414-C2023	ROOF REPLACEMENT-SAFETY BLDG	\$ 60,000
04251300-61478-C2023	BOILER-SAFETY BLDG	\$ 500,000

EXPENDITURES - Decrease

04251300-61510-C2022	WINDOW REPLACEMENT CITY HALL	\$ 275,000
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REVENUES - Increase

04011800-49505-C2023	BOND PROCEEDS	\$ 340,000
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FISCAL IMPACT:

The roof replacement projects for Safety Building and Fire Station #1 came in slightly over the budgeted amount. To account for the overage as well as a small amount of contingency, we needed to increase the budgets for these projects by the amounts listed above. The Safety Building Boiler project came in significantly over budget due to a combination of inflationary costs and some necessary design changes. By removing the funds from the City Hall Window project, we will no longer be able to complete this

project in 2023. Approval of this resolution will increase the City's overall borrowing for the 2023 CIP by \$340,000.

RATIONALE:

The roofs at both the Safety Building and Fire Station #1 have reached the end of their useful life and have had a significant number of leaks in the past few years. By completing the roofing projects, we will eliminate the leaks from the roof.

The Safety Building Boilers are in need of replacement as they have reached the end of their useful life. The existing 3 boiler system has been reduced to 2 functioning boilers as the third boiler is no longer operational. Repairs on the 2 functioning boilers are becoming more difficult as supplies are limited for these 23 year old boilers.

Delaying the City Hall window project will not impact the potential safety or ability to occupy the building which may be the case for the other three projects. Therefore it was deemed necessary to delay this project and use the funds elsewhere this year. We also will need additional borrowing to cover the costs related to the roofing and boiler projects.

RESOLUTION NUMBER 2023-7

A RESOLUTION AMENDING THE 2023 CAPITAL PROJECTS BUDGET

WHEREAS, the bids for roofing projects came in y over estimate, the safety building boiler project also came in significantly over the engineering estimate. It was determined that these projects are critical to get done this year. To partially fund the overage the window replacement project that was budgeted for last year will be put off a year and capital borrowing increased to pay for these.

WHEREAS, It was determined that the Capital Projects Budget had to be amended to accomplish these goals.

NOW THEREFORE BE IT RESOLVED, by the Common Council of the City of New Berlin that the Capital Projects Fund Budget be reallocated as follows:

EXPENDITURES - Increase

04251300-61312-C2023	ROOF REPLACEMENT-FIRE ST #1	\$ 55,000
04251300-61414-C2023	ROOF REPLACEMENT-SAFETY BLDG	\$ 60,000
04251300-61478-C2023	BOILER-SAFETY BLDG	\$ 500,000

EXPENDITURES - Decrease

04251300-61510-C2022	WINDOW REPLACEMENT CITY HALL	\$ 275,000
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REVENUES - Increase

04011800-49505-C2023	BOND PROCEEDS	\$ 340,000
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BE IT FURTHER RESOLVED that the City Clerk is hereby directed to publish this resolution in the Waukesha County NOW within 10 days of adoption by the Common Council.

RESOLUTION ADOPTED by the New Berlin Common Council this 14th day of March 2023.

David Ament, Mayor

Countersigned:

Rubina M Medina, City Clerk

PROJECT MANUAL

**City of New Berlin
Safety Building
Boiler Replacement**

16300 W National Ave
New Berlin, Wisconsin 53151

Harwood Engineering Consultants, Ltd.
Quest CDN - 8356382
HEC Project No. 19-1011.18
December 23, 2022

New Berlin Safety Building – Boiler Replacement
Quest CDN – 8356382
16300 W. National Ave, New Berlin, WI 53151

BID FORM

1. **GENERAL DIRECTIONS TO BIDDERS**

- A. All Bids must be submitted on these standard form sheets inclusive without modification. Fill out all blanks on the Bid Form by typing or writing in ink. Sign in ink. Erasures or other changes in Bid must be explained or noted over signature of Bidder. Enter Bid amount in both written words and printed figures in spaces provided on Bid Form. In case of conflict, amount given in written words will govern.
- B. Base Bid(s) must be for Work bid in strict accordance with the Drawings and Specifications. **INCLUDE BOND COSTS IN THE BASE BID(S).** Bid all requested Alternates. If no change to the Base Bid applies, enter “No Change.”
- C. Bid Forms containing qualifications, conditions, omissions, unexplained erasures, alterations or items not called for in Bid Form or other irregularities of any kind may be rejected at the discretion of the Owner.
- D. Bidders shall examine the provisions of the Project Manual thoroughly to ensure compliance with all bidding requirements.
- E. Bidders shall only submit the Bid Forms included in the Project Manual – DO NOT return the Project Manual.
- F. Bidders shall ensure that all items in the Bid Form such as Work Schedule, Bidders Official Title and Signature, and Proof of Responsibility are properly executed.
- G. A bid must be accompanied by a bid security made payable to Owner in an amount of 5% of bidder’s maximum bid price (determined by adding the base bid and all alternates), and in the form of a certified check, bank money order or a bid bond issued by a surety acceptable to the City. The bid security will be retained by the City until the City awards the contract to such bidder and such bidder has executed the contract documents and met the other conditions of the Notice of Award, where upon the bid security will be released. If the successful bidder fails to execute and deliver the contract documents and furnish the requirements contract security within 15 days after the Notice of Award, the Owner may consider the bidder to be in default and annul the Notice of Award and the bid security of that bidder will be forfeited. Such forfeiture shall be the Owner’s exclusive remedy if the bidder defaults.

- H. The Bidder shall be required to identify any subcontractor, suppliers, individuals or entities to be submitted to the Owner 14 days in advance of the City's acceptance of the agreement. The apparent successful bidder shall, within 5 days after the bid opening, submit to the Owner a list of all such subcontractors, suppliers, individuals or other entities that will be utilized in the completion of the work. An experience statement with pertinent information regarding similar projects and other evidence of qualification for the work that the subcontractor will be performing is required. If the Owner, after review of such information, determines, in its sole discretion, that such subcontractor, supplier, individual or entity is not satisfactory, the Owner, prior to the Notice of Award, shall give notice to the successful bidder requiring that an acceptable substitute be provided. In the event there is any adjustment to the cost as a result of said substitution, Owner may take that into consideration in making the contract award. In the event that the contractor fails to make the substitution requested, the Owner may award the contract to the next lowest responsive responsible bidder.
- I. Bids not conforming to the above directions may be declared irregular and are subject to disqualification at the discretion of the Owner.

THE BIDDER HEREBY AGREES THAT THIS BID IS INVALID WITHOUT BIDDER'S SIGNATURE APPEARING IN THE SIGNATURE BLOCK ON THE LAST PAGE OF THIS BID FORM.

2. BID SUBMITTAL PROCEDURE

In submitting a Bid, the Bidder represents that:

- He/She thoroughly reviewed and understood the Bidding and Contract Documents and the Bid is made in full accordance with these documents and amendments issued thereto.
- He/She has thoroughly reviewed and understands the Bidding and Contract Documents related to the Work of other portions of the Project, if any, being bid concurrently or presently under construction.
- He/She has thoroughly reviewed informational reports and documents available to him/her, visited the project site, become familiar with actual local conditions under which the Work is to be performed and has correlated his/her evaluations and personal observations with the requirements of the Bidding and Contract Documents.
- The contract for the work, if awarded, will be on the basis of materials and equipment specified or described in the bidding documents, and those or equal or substitute or materials and equipment subsequently approved by the Owner prior to the submittal of bids and identified by addendum. No item of material or equipment will be considered by Owner as an or equal or substitute unless written requests for approval has been submitted by the bidder and has been received by the Owner at least 10 days prior to the date of receipt of bids in the case of a proposed substitute. The burden of proof on the merit of the proposed item is upon the bidder. The Owner's decision of approval or disapproval of a proposed item will be final. If the Owner approves any such proposed items, such approval will be set forth as an addendum issued to all perspective bidders. Bidder shall not rely upon approvals made in any other manner. All prices

that Bidder sets forth in this bid shall be based on the presumption that the contractor will furnish the materials and equipment specified or described in the bidding documents as supplemented by any addenda.

- A. After Bid Forms are completed, place one (1) set of signed originals and the Bid Bond in a sealed envelope. Oral, telephonic, e-mailed, or faxed Bids are invalid and will not be considered.
- B. Address the envelope to:
New Berlin Safety Boiler HVAC Replacement
Buildings and Grounds
3805 S Casper Dr
New Berlin, WI 53151
- C. Bidders shall affix their name and address to the front upper left-hand corner of the envelope with the words "Sealed Bid Enclosed" written on the outside. Identified in lower left corner should be: Bid number, project name and opening date.

3. BID CLOSING

- A. Bids must be received on or before 9:00 a.m. on February 1, 2023. The Bidder assumes full responsibility for timely delivery at the location designated for receipt of Bids. **Bids received after the time and date for receipt of Bids will be rejected and returned unopened.**

4. BID OPENING

- A. Bids will be publicly read at 9:00 a.m. on February 1, 2023 in the New Berlin City Hall – Common Council Chambers.

(a corporation)

We _____ (a partnership)
_____ (an individual)
(Cross out inapplicable)

Of _____
Street City County State Zip

hereby agree to execute the proposed Contract and to furnish a satisfactory Public Improvement Performance/Labor and Material Payment Bond, in the amount of one hundred percent (100%), and to provide all labor and material required for the construction of the designated Work, for the prices hereinafter set forth, in strict accordance with the Construction Documents released by: **City of New Berlin**, address: 3805 S. Casper Dr, New Berlin, WI dated January 11, 2023.

Including Amendment Nbr(s)._____ **dated**_____.

5. BASE BID

Base Bid includes all work required to complete the Project, including Building Permits, General Conditions, overhead, profit, insurance, bonds, taxes, and all other expenses. Bid Guarantee ten percent (10%) Bid Bond Cost, Public Improvement Performance Bond and Labor and Materials Payment Bond Cost one hundred percent (100 %) for the sum of:

_____ Dollars (\$ _____)

6. ALTERNATE BID "1"

Alternate Bid "1" includes all expenses to remove the abandoned fan coils and condensing units as described.

Add to Base Bid the

_____ Dollars (\$ _____)

7. ALTERNATE BID "2"

Alternate Bid "2" includes the expenses to replace an existing VAV control valve as described.

Add to Base Bid

_____ Dollars (\$ _____)

8. ALTERNATE BID "3"

Alternate Bid "3" includes the expenses to replace/ install insulation as described.

Add to Base Bid

_____ Dollars (\$ _____)

9. ALTERNATE BID "4"

Alternate Bid "4" includes the expenses provide 20-year extended warranty on all mechanically grooved couplings and gaskets as described.

Add to Base Bid

_____ Dollars (\$ _____)

10. SCHEDULE OF VALUES

- A. Submit schedule of standard rates for all personnel, including personnel of subcontractors, involved with project.

B. Include schedule of standard markups.

11. COMMENCEMENT, PROGRESS AND COMPLETION OF WORK

A. If written Notice of Intent to Award Contract is issued not later than February 14, 2023 with a Project commencement of February 20, 2023, can you complete the Work in compliance with the requirements of the Contract Documents by September 15, 2023, in full cooperation and coordination with other Contractors, if any.

Yes ___ No ___ .

If "No", state additional calendar days required _____.

B. The undersigned understands that time is of the essence and agrees that the specified time period for completion stated above is a reasonable time for the completion of the Work. All time limits shall be binding.

12. BID ACCEPTANCE:

A. All Bids as stated above are effective and open for acceptance by the Owner for a period of ninety (90) days after date set for opening of Bids.

FIRM NAME _____

BY SIGNATURE _____

TITLE _____

DATED _____

TELEPHONE _____

FAX NBR _____

EMAIL ADDRESS: _____

If a corporation, answer the following:

Incorporated under laws of what state?

SEAL _____ (If Bid is by Corporation)

INVITATION TO BID

Project: Quest CDN – 8356382

1. Bids will be prepared in accordance with Contract Documents prepared by ***Harwood Engineering Consultants, Ltd.***, Phone 414-475-5554, Fax 414-773-9299, 255 N 21st St. Milwaukee, WI, and dated December 23, 2022.
2. Notice is hereby given that sealed Bids are due in the New Berlin City Hall – City Clerk office, by 9:00 a.m. CST/CDT on February 1, 2023. (Reference Bid Form, Item 2)
3. Bids will be publicly read at 9:00 a.m. on 02/01/2023 in the New Berlin City Hall – Common Council Chambers.
4. Oral, faxed or e-mailed Bids will be rejected.
5. All blanks on the Bid Form shall be filled in by typewriter print or manually in ink. If the filled areas are illegible, the Bid shall be rejected. The Bidder shall make no additional stipulations on the Bid Form or qualify the Bid in any manner.
6. Where so indicated on the Bid Form, the values shall be expressed in both words and figures. In the event of discrepancy between the words and figures, the amount written in words shall govern.
7. Bids will be submitted using the Bid Forms provided herein. Bid security shall be by a qualified surety in the form of a bid bond, in the amount of ten percent (10%) of Bid amount, and shall be submitted with the Bid. Bidders shall agree to not withdraw the Bid for a period of ninety (90) days after due date of Bids.
8. Accepted Bidders will be required, as a condition precedent to award of Contract, to furnish in the amount of 100% of the contract prices, satisfactory Performance Bond, Labor and Material Payment Bond and Certificate of Insurance.
9. Bidding Documents will be available on or after 01/11/2023. Second advertisement on 01/18/2023. Bidders may obtain Bidding Documents only from the following site: Quest ebid doc #8356382 – Bid/RFP Listing. Documents will be available for download. Documents will not be mailed. **It is the responsibility of prospective Bidders to check this website for any future amendments, questions, revisions, etc., prior to the opening date. All addenda must be acknowledged on the signature page in the area provided. Failure to do so may result in your response being rejected.**

10. Mandatory pre-bid meeting and walkthrough on 01/25/2023, at 10:00 AM. Meeting location is New Berlin Safety Building, 16300 W National Ave, New Berlin, WI 53151, Public Entrance Door on South side of building. Public Parking is available in the lots on the West side of the building. **Please be on time as no accommodations will be made for late arrivals. A valid driver's license or Wisconsin ID is required to enter the building. No weapons are allowed. NOTE: This will be the only opportunity for a walk through, therefore, be sure to bring all potential subcontractors. Vendors are also reminded to review all Bid Documents, etc. prior to arrival.**
12. The right to reject any or all Bids, either in whole or in part, or to waive any informalities or irregularities is reserved by City of New Berlin.

Published by Order of:
City of New Berlin
Buildings and Grounds
(262) 786-8610
3805 S Casper Dr
New Berlin, WI 53151

SUPPLEMENTARY INSTRUCTIONS TO BIDDERS

GENERAL:

Carefully review Project Manual, including Bidding Requirements, General Requirements, Specifications, Alternates, and Amendments, all of which contain provisions applicable to all Bidders. Successful Bidder will be required to execute all Work belonging to their Contract which is stated in the Specifications, or reasonably implied as necessary to complete their Contract, including removal of existing work and preparing present work to receive new, if such be the requirements of actual job conditions.

Visit site to become acquainted with: Adjacent areas; means of approach to the site; present conditions of project site; and facilities for delivering, storing, placing and handling of materials and equipment. Compare Specifications with existing work in place, inspect demolition requirements and inform yourself of all conditions affecting execution of Work, including other new work, if any, being performed.

BACKGROUND CHECKS:

Conditions for Background Checks:

Background checks will be required for any contracted employee who will work within the Safety Building.

Background Checks:

The New Berlin Police Department will perform background checks on all personnel prior to starting any activity for the City of New Berlin. Any personnel for whom background checks have revealed factors that make them unsuitable for the activity to be undertaken for the City of New Berlin, including, but not limited to, felonies and pending legal cases, will be prohibited from entering the site. This includes replacement personnel.

At a minimum, resources to be checked include, but are not limited to, civil (<http://wcca.wicourts.gov/index.xsl>) and criminal records (<http://wi-recordcheck.org/index.html>), Department of Transportation motor vehicle/licensing records (<http://www.dot.state.wi.us/drivers/records.htm>). In order to do so, Contractor must obtain certain information for each of the Contractor's employees expected to be performing Work for City of New Berlin. At a minimum, the information shall include full name (including middle initial), date of birth, social security information. Additional information that is helpful in completing background checks includes maiden name, sex, race, copies of both sides of driver's license or state identification card and issuing state, and places of residence for the last three years.

WORKSITE AVAILABILITY:

A specific window of opportunity exists for completion of the Work, therefore Work shall commence on the date noted in the Bid Form. **WORK TAKING PLACE IN THE SAFETY BUILDING SHALL TAKE PLACE DURING NORMAL BUSINESS HOURS.**

DOCUMENTS:

Bidders shall be familiar with all Bidding Requirements and proposed Contract Documents. See General Conditions for definition of Contract Documents.

BID FORM:

Alterations of or amendments to Bid Form, attachments thereto, or inclusion of any correspondence, or other written or printed matter or details of any nature other than that specifically called for may disqualify Bid. No e-mailed alterations to the Bid will be accepted.

Only Bids which are made on regular Bid Form will be considered. No Bids for any arbitrary subdivision or sub classification of Work required by requested Bid(s) will be accepted.

Requirements of Signing: Include with each Bid full business address of Bidder. Bids by corporations shall be executed in the full legal name of the corporation, giving State of incorporation and be signed by an authorized officer or officers, who shall, in each case, type or print name and corporate title beneath the signature. Partnership Bids shall state the full name of all partners, e.g., "Smith and Jones, a partnership of John S. Smith and William B. Jones". Such Bids must also be signed by an authorized partner or other representative, typing or printing the name and title of the signer beneath the signature. Individuals operating as a business shall sign Bids, typing or printing the individuals name followed by the words "Sole Proprietor" beneath the signature. When requested by Owner, furnish satisfactory evidence of agency or authority of any person signing on behalf of another.

Submission of Bids: Reference Bid Form, Section 2.

CONTRACT AND CONTRACT DOCUMENTS:

The Contract into which successful Bidder will be required to enter is based on City of New Berlin General Terms and Conditions of Service (as modified by Owner). Familiarize yourself with the provisions of this document.

ACCEPTANCE OF BID (AWARD):

It is the intent of the Owner to award a Contract or accept any Bid which will be in the best interests of the Owner, provided the Bid has been submitted in accordance with the requirements of the Bidding Documents and does not exceed the funds available. The Owner reserves the right to waive informalities or irregularities in a Bid received and to accept the Bid, which in the Owner's judgment, is in the Owner's best interests.

The Owner reserves the right to accept Alternates in any order or combination, unless otherwise specifically provided in the Bidding Documents, and to determine the lowest responsible Bidder on the basis of the Base Bid and Alternates accepted.

WITHDRAWAL OF BIDS:

Matters pertaining to the withdrawal of a Bid and to claims of error, omission or mistake in preparing or submitting a Bid shall be governed by Section 66.0901 of the Wisconsin Statutes.

All Bids shall be effective and open for acceptance for a period of ninety (90) days after date set for opening of Bids.

RESERVATION:

Owner reserves the right to: reject any or all Bids, reject a Bid not accompanied by a required bid security or by other data required by the Bidding Documents, reject a Bid which is in any way incomplete or irregular, waive any irregularities in any Bid, accept any Bid which will be in best interests of Owner.

INADEQUACIES AND OMISSIONS:

Failure to request timely clarification or interpretation of Bidding Documents shall not relieve Bidder/Contractor of responsibility to execute the Work in accordance with the intent of the Contract Documents. Signing of Contract means that the Contractor has thorough comprehension of full intent and scope of Contract Documents.

The Owner and his consultants are not responsible for oral instructions.

INTERPRETATIONS AND CORRECTIONS:

Carefully review and compare all parts of the Bidding Documents with each other, and with other work being bid concurrently or presently under construction to the extent that it relates to the Work for which the Bid is being submitted. Examine the site and local conditions, and immediately report to the Owner errors, inconsistencies or ambiguities discovered.

Bidders and Sub-bidders requiring clarification or interpretation of the Bidding Documents shall submit a written request to the Owner, received in Owner's office at least seven (7) days prior to the date set for receipt of Bids.

Interpretations and corrections of and changes to the Bidding Documents will be made in writing by Addendum only. Interpretations and corrections made in any other manner are not binding. Bidders shall not rely upon verbal instructions or information.

POWER OF ATTORNEY AND BOND REQUIREMENTS:

Submit with each Bid a bond executed by an attorney-in-fact, including a certified and effectively dated copy of his power of attorney. Where the certification is by facsimile, or otherwise does not bear an original signature, the bonding company must be qualified for recognition under facsimile execution.

INVITATION TO BID

Project: **Quest CDN – 8356382**
SB Boiler Replacement
New Berlin Safety Building
16300 W National Ave
New Berlin, WI 53151

1. Scope: The heating system serving the New Berlin Safety building consists of three non-condensing boiler plant, configured in a primary-secondary loop system. The City of New Berlin is soliciting requests to replace the boilers, pumps and the associated interconnecting piping. As part of the project the city will be adding a snow melting system for the two ramps leading into the underground park within the building, and replacing all of the mechanically grooved couplings.
2. Notice is hereby given that sealed Bids are due at 9:00 A.M., on February 01, 2023.
3. Bidding Documents will be available on or after January 11, 2023. Bidders may obtain Bidding Documents only from the following site: Quest ebid doc #8356382 – Bid/RFP Listing. Documents will available for download. Documents will not be mailed. **It is the responsibility of prospective Bidders to check this website for any future amendments, questions, revisions, etc., prior to the opening date. All addenda must be acknowledged on the signature page in the area provided. Failure to do so may result in your response being rejected.**
4. Mandatory pre-bid meeting and walkthrough on 01/25/2023, at 10:00 AM. Meeting location is New Berlin Safety Building, 16300 W National Ave, New Berlin, WI 53151, Public Entrance Door on South side of building. Public Parking is available in the lots on the West side of the building. **Please be on time as no accommodations will be made for late arrivals. A valid driver's license or Wisconsin ID is required to enter the building. No weapons are allowed. NOTE: This will be the only opportunity for a walk through, therefore, be sure to bring all potential subcontractors. Vendors are also reminded to review all Bid Documents, etc. prior to arrival.**

Published by Order of:
City of New Berlin
Buildings and Grounds
(262) 786-8610
3805 S Casper Dr
New Berlin, WI 53151

AGREEMENT BETWEEN OWNER and CONTRACTOR FOR HVAC CONTRACT

ARTICLE I

Work

Contractor shall complete all work as specified or indicated in the contract documents, which shall be inclusive of the bid instructions, bid forms, specifications, City of New Berlin insurance requirements, as well as this Agreement. The work is generally described as follows: replacement of HVAC systems as detailed in the specifications for the western half of the City of New Berlin Safety Building.

This work shall be considered the "Project".

ARTICLE II

Contract Times

Time is of the essence with respect to all time limits, milestones (if any), as well as deadlines for substantial completion and completion of the work provided for in the specifications.

The work will be substantially completed on or before _____, and completed and ready for final acceptance and payment in accordance with this Agreement on or before _____, subject to conditions beyond the control of the Contractor, such as labor or material shortages, weather conditions, strikes, civil unrest or wars. The Owner shall make the final decision as to the adequacy of the justification for the delay. Contractor and Owner recognize that time is of the essence and that the Owner will suffer financial and other losses if the work is not completed and the milestones are not achieved within the time limits specified above. The parties also recognize that delays, expense and difficulties involved in proving, in a legal or arbitration proceedings, of the actual loss suffered by the Owner if not completed on time.

ARTICLE III

Contract Price

The Owner shall pay Contractor for the completion of the work in accordance with the contract documents in the amounts that follow, subject to any applicable adjustments under this Agreement.

- (a) For all unit price work in an amount equal to the sum of the established unit prices for each separately identified item of unit price work times the actual quantity of that item.
 - 1) The estimated total of all unit price work for the base bid is \$_____.

- 2) The estimated total of all unit price work for alternate bid number 1 (removal of abandoned fan coil unit and condensing units) is \$_____.
- 3) The estimated total of all unit price work for alternate bid number 2 (replacement of VAV control valves on a per valve basis) is \$_____.
- 4) The estimated total of all unit price work for alternate bid number 3 (replacement/ installation of missing insulation on a per linear foot basis) is \$_____.
- 5) The estimated total of all unit price work for alternate bid number 4 (providing a 20-year warranty on the mechanically groove couplings) is \$_____.

These bid prices are based on estimated quantities. These quantities shall be adjusted based upon the actual work performed.

- (b) For all work at the prices stated in the Contractor's Bid attached hereto as Exhibit "A".

ARTICLE IV Payment Procedures

Contractors shall submit applications for payments in accordance with the terms of this Agreement upon final completion and acceptance of the work. Owner shall have thirty (30) days after receipt of such request to review the request for correctness and to obtain approval for such payment by its Common Council. The Owner may withhold payment for any portion of the work which is not completed in accordance with the specifications, and shall pay for the work related to any undisputed charges. Upon the successful completion of the work and the acceptance of that work as provided for hereunder, the Owner shall pay the remainder of the contract price.

Upon substantial completion of the work, the owner shall pay an amount sufficient to increase the total payments to the Contractor to one hundred (100%) percent of the work completed, but less such amount set off by Owner as provided for herein, less two hundred (200%) percent of the estimated value of the work to be completed or corrected in accordance with a punch list to be completed prior to final payment. Upon the successful completion of the work and the acceptance of that work as provided for hereunder, the Owner shall pay the remainder of the contract price.

ARTICLE V Contractor's Representations

In order to induce the Owner to enter into this contract, the Contractor makes the following representations;

- (a) The Contractor has examined and carefully studied the contract documents and any data and reference items included in the contract documents.
- (b) The Contractor has visited the site, conducted a thorough visual examination of the site and adjacent areas, and has become familiar with and is satisfied as to the general, local and site conditions that may affect cost, progress and performance of the work.
- (c) The Contractor is familiar with and is satisfied as to all laws and regulations that may affect cost, progress and performance of the work.
- (d) The Contractor has carefully studied all reports or explorations and tests related to the conditions in which the work will be performed. As well as reports and drawings related to the work and technical data in such reports and drawings.
- (e) The Contractor has considered the information known to the Contractor itself, including information commonly known to contractors doing business in the Milwaukee Metropolitan Area, as well as information and observations obtained from visits to the site, the contract documents and site related reports and drawings in the contract documents, with respect to the impact of such information, observations and documents on the cost, progress and performance of the work, the means, methods, techniques, sequences and procedures of construction and the contractor safety precautions and programs.

Based on the information and observation referred to in the preceding paragraph, the Contractor agrees that no further examinations, investigations, explorations, tests, studies or data are necessary for the performance of the work at the contract price, within the contract times, in accordance with the other terms and conditions of the contract.

The Contractor(s) have given the Owner written notice of all conflicts, errors, ambiguities or discrepancies, which the Contractor(s) have discovered in the contract documents and the Contractor(s) certify that the written resolution thereof by the Owners are acceptable to the Contractor.

The contract documents are sufficient to indicate and convey understanding of all terms and conditions for performance and the furnishing of the work.

The Contractor's entry into this contract constitutes an incontrovertible representation by the Contractor that without exception, all prices in in the Agreement are premised upon performing and furnishing the work required by the contract documents.

ARTICLE VI

Assignment of Contract

Unless expressly agreed to by the Owner, no assignment may be made of the rights and responsibilities of the Contractor under this Agreement.

ARTICLE VII Successors and Assigns

The Owner and Contractor each binds themselves, their successors, agents, legal representatives and assigns with respect of all covenants, agreements and obligations contained in the contract documents.

ARTICLE VIII Severability

Any provision or part of the contract documents held be void or unenforceable under any law or regulation, shall be deemed stricken and all remaining provisions shall continue to be valid and binding upon the Owner and Contractor which agree that the contract documents shall be reformed or replaced of such stricken revision or part thereof with a valid and enforceable provision that comes as close as possible to expressing the intention of the stricken provision.

ARTICLE IX Relationship of the Parties

The Contractor agrees to perform the services as provided for hereunder as an independent contractor, not as an employee of the owner. The Contractor shall furnish all services and labors and materials and equipment necessary to conduct and complete the work. The work shall be performed in accordance with the specifications subject to the satisfaction of the Owner.

ARTICLE X Delay

The Contractor shall not be liable for delays or failure to perform the services necessary to complete the work which are caused directly or indirectly by circumstances beyond the Contractor's control, including but limited to, acts of God, fire, flood, war, sabotage, accident, labor dispute, material shortage, governmental action, including regulatory requirements, change conditions, delays resulting from actions of the Owner or third parties not under control of the Contractor, site inaccessibility or inability of others to obtain materials, labor, equipment or transportation. Should any of the above occur, then the date for completion of the services shall be adjusted for such delay, provided that the Contractor reports delay to the Owner within a reasonable time of its discovery. The Owner shall determine whether or not the cause of delaying or not completing a duty or obligation under this Agreement is under the control of the Contractor.

The Contractor acknowledges that it must perform the work and services hereunder, pursuant to the terms and conditions of this Agreement and that such work shall conform to the recognized standards in the Milwaukee Metropolitan Area for the performance of this work as are prevalent in this field of endeavor and like services. Also, its work shall be performed in a good and workman- like manner.

ARTICLE XI

Taxes, Social Security and Governmental Reporting

Personal income tax payments, social security contributions, insurance and all other governmental reporting and contributions required as a consequence of the Contractor(s) receiving payment under this Agreement shall be the sole responsibility of the Contractor(s). The Contractor shall be solely responsible to meet the Owner's insurance needs, as specified below, during the terms of this Agreement or any extensions thereof:

General Liability

General Aggregate	\$2,000,000.00
Personal Advertising Injury	\$1,000,000.00
Each Occurrence	\$1,000,000.00
Fire Damage	\$ 50,000.00
Medical Expense (any one person)	\$ 5,000.00

Automobile Liability

CSL	\$1,000,000.00
(Excess Liability)	
Umbrella Form	\$1,000,000.00 (per occurrence)
	\$2,000,000.00 Aggregate Self-Insured Retention, Not Greater than \$10,000.00

Professional Liability

General Aggregate	\$2,000,000.00
Each Occurrence	\$1,000,000.00

A Certificate of Insurance shall be provided to the Owner as evidence thereof, naming the City as an additional insured on a primary and non-contributory basis, showing the Contractors covered by the above required types and amount of insurance and further providing for a thirty (30) day notice to the Owner prior to change, termination or cancellation of the Agreement, except in the event of cancellation or termination as a result of non-payment of premium, in which case the notice shall not be less than ten (10) days. Such notice provision shall be stated in the unconditional affirmative. Phrases such as, "shall endeavor to notify" are unacceptable and will be rejected. The Contractor shall provide evidence of the additional insured status through a policy endorsement form acceptable to the Owner.

ARTICLE XII

Indemnification

The Contractor shall indemnify and hold harmless the Owner and its agents, employees, elected officials, representatives and assigns, hereinafter referred to as the “Indemnified Parties”, as and against any and all claims, demands, actions, causes of action, losses of expense, including but not limited to, actual attorney’s fees arising out of or resulting from the performance of the work, but only to the extent caused in whole or in part by a negligent acts or omissions of the Contractor, a sub-contractor or anyone directly or indirectly employed by them or anyone for whose acts they may be liable, regardless of whether or not such claims, damages loss or expenses is caused in part by the indemnified parties. Such obligation shall not be construed to negate, abridge or reduce other rights or obligations of indemnity which would otherwise exist as to a party or persons described in this paragraph. To the extent the Owner is separately entitled to coverage, defense or indemnification from a Contractor and/or its insurer for the same losses or expenses, this clause shall not apply, it being understood that the Contractor’s obligation is primary. To the extent that the Contractor retains sub-contractors for the performance of the work, or any portion thereof, the Contractor and/or sub-contractor shall provide evidence of the insurance coverages noted above, as well as the terms of this indemnification provision shall be applicable to such Contractors or sub-contractors.

ARTICLE XIII

Regulations

The Contractor agrees to comply with all the requirements of applicable federal, state and local laws, as well as codes and specification requirements related to the performance of the work under this Agreement.

ARTICLE XIV

Termination of Contract for Cause

If, through any cause, the Contractor shall fail to fulfill, in a timely and proper manner, its obligations under this Agreement, or if the contractor shall violate any of the covenants, agreements or stipulations of the contract, the Owner shall thereupon have the right to terminate the Agreement by giving written notice to the Contractor of such termination. The Contractor will be paid for the work performed through the date of termination. However, notwithstanding that commitment the Contractor shall not be relieved of the liability to the Owner for damages sustained by the Owner and the Owner may withhold any payments to the Contractor for the performance of or set off until such time as the exact amount of damage is due the Owner from the Contractor are determined. If through no fault of the Contractor, the Owner shall fail to fulfill in a timely and proper manner its obligation under this contract, or if the Owner shall violate any of the covenants, agreements or obligations of the contract, the Contractor shall have the right to terminate this contract by giving written notice to the Owner of such termination specifying the effective date thereof, at least five (5) days prior to the effective date of such termination.

ARTICLE XV
Termination for Convenience of the Owner

The Owner may terminate this Agreement at any time for any reason by giving at least twenty (20) days' notice in writing from the Owner to the Contractor. The contract is terminated by the Owner as provided for herein. The Contractor shall be paid an amount which bears the same ratio to the total compensation as the services actually and satisfactorily performed compared to the total services of the Contractor covered by this Agreement, less payments for such services as were previously made, plus all reimbursed expenses payable under the Agreement.

ARTICLE XVI
Governing Law

This Agreement shall be governed and construed in accordance with the laws of the State of Wisconsin. The contract documents shall represent the complete understanding of the parties with respect to the subject matter set forth herein and may only be amended in a subsequent agreement executed by all parties.

Dated this _____ day of _____ 2023.

Contractor:

City of New Berlin

By: _____

By: _____

ADDENDUM TO CITY OF NEW BERLIN CONTRACTS

This Addendum is made and entered into and shall be considered an attachment to all contracts entered into by the City of New Berlin for so long as the City of New Berlin is subject to the U.S. Department of Treasury Restrictions, as well as other federal regulations related to the City's receipt of American Rescue Plan Act Funds. The following Terms and Conditions shall be included in each such agreement and are incorporated as though fully set forth in the original contract.

1. The contractor agrees to comply with the applicable requirements of Section 603 of the American Rescue Plan Act (hereinafter referred to as the "Act") regulations adopted by the US Department of Treasury (hereinafter referred to as the "Treasury") pursuant to Section 603(f) of the Act and the guidance issued by the Treasury regarding the foregoing. The contractor also agrees to comply with all other applicable federal statutes, regulations and executive orders and shall provide for such compliance by other parties, including subcontractors in any agreements it enters into with other parties related to this award.
2. Statutes and regulations prohibiting discrimination and applicable to this contract include, but are not limited to the following:
 - a. Title VI of the Civil Rights Act of 1964 (42 USC, §2000 D, et. seq.) and Treasury's implementing regulations at 31 CFR, Part 22, which prohibit discrimination on the basis of race, color or national origin under programs or activities receiving federal financial assistance.
 - b. Fair Housing Act. Title VIII of the Civil Rights Act of 1968 (42 USC, §3601, et. seq.) which prohibits discrimination in housing on the basis of race, color, religion, national origin, sex, familial status or disability.
 - c. Section 504 of the Rehabilitation Act of 1973, as amended, (29 USC, §794), which prohibits discrimination on the basis of disability under any program or activity receiving federal financial assistance.
 - d. The Age Discrimination Act of 1975, as amended (42 USC, §6101, et. seq.) and Treasury's implementing regulations at 31 CFR, Part 23, which prohibit discrimination on the basis of age and programs or activities receiving federal financial assistance; and
 - e. Title II of the Americans with Disabilities Act of 1990, as amended (42 USC, §12, 12101 et. seq.), which prohibits discrimination on the basis of disability under programs, activities and services provided or made available by state and local governments or instrumentalities or agencies thereto.
3. Equal Employment Opportunity. During the performance of the contract, the contractor will be required to comply with Equal Opportunity Employment Statutes as outlined in 47 CFR, §90.168.
4. Copeland Anti-Kickback Act. The contractor shall comply with 18 USC, § 874, 40 USC, §3145 and the requirements of 29 CFR, Part 3, as may be applicable, which are incorporated by reference into this contract.

5. Contract Work Hours of the Safety Standards Act.
- a. Overtime Requirements. No contract or subcontract contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any work week in which he/she is employed on such work to work in excess of 40 hours in such work week unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of 40 hours in such work week.
 - b. Violation. Liability for unpaid wages; liquidated damages: In the event a violation of the clause set forth in (a) above, the contractor or any subcontractor responsible therefore shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards employed in violation of this section.
 - c. Withholding fund paid wages and liquidated damages: The City of New Berlin shall, upon its own action or upon written request of an authorized representative of the US Department of Labor, withhold or cause to be withheld from any monies payable on account of work performed by the contractor or subcontractor under any such contract or any other federal contract with the same contractor or any other federally assisted contract subject to the contract work hours and Safety Standards Act, which is held by the same contractor such sums as may be determined to be necessary to satisfy any liabilities of such contractors or subcontractors or unpaid wages and liquidated damages as provided in the clause set forth in this section.
 - d. Subcontract. The contractors or subcontractors shall insert in any contract the clauses set forth in Paragraph B, 1-4 of 29 CFR §5.5 and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in Paragraphs B, 1-4 of 21 CFR, §5.5.
6. Clean Air Act and Federal Water Pollution Control Act. Contractor needs to comply with all applicable standards, orders or regulations issued pursuant to the Clean Air Act, as amended, 42 USC, §7401, et. seq.
7. Debarment and Suspension. This award is a covered transaction for purposes of 2 CFR, Part 180 and 2 CFR, Part 3000. As such, the contractor is required to verify that none of the contractors principals (defined in 2 CFR, §180.995) or its affiliate (defined in 2 CFR, §180.1.905) are excluded (defined in 2 CFR, §180.940) or disqualified (defined in 2 CFR, §180.935). Selected contractors must comply with 2 CFR, Part 180, Subpart C and 2 CFR, Part 3000, Subpart C, and must include a requirement to comply with these regulations in any lower tier covered transaction it enters into. This certification is a material representation of fact relied upon by the City of New Berlin. If it is later determined that the contractor did not comply with 2 CFR, Part 180, Subpart C and 2 CFR, Part 3000, Subpart C, in addition to remedies available to the City of New Berlin, the federal government may pursue available remedies including, but not limited to, suspension and/or

disbarment. The contractor and the bidder or proposer agree to comply with the requirements of 2 CFR, Part 180, Subpart C and 2 CFR, Part 3000, Subpart C, while this offer is valid and throughout the period of any contract that may arise from this offer. This contractor and the bidder or proposer further agrees to provide a provision requiring such compliance in its lower tier covered transactions.

8. Byrd Anti-Lobbying Amendment. The contractor shall file the required certification. The contractor and all subcontractors certify that they will not and have not used federal appropriated funds to pay any person or organization for influencing or attempting to influence an officer or employee of any agency, a member of Congress, officer or employee of Congress or an employee of a member of Congress, or employees of the City of New Berlin in connection with obtaining any federal contract, grant or any award covered by 31 USC, §1352. Each tier, including the contractor and all subcontractors, shall also disclose any lobbying with non-federal funds that takes place in connection with obtaining any federal award. Such disclosures are forwarded from tier to tier up to the recipient, who in turn will forward the certifications to the awarding agency. If the agreement exceeds \$100,000.00, the contractor must certify compliance with the Byrd Anti-Lobbying Amendment.
9. Procurement of Recovered Materials. Contractor shall comply with 2 CFR, §200.323 as applicable.
10. Prohibition on Certain Telecommunications and Video Surveillance Services or Equipment. Contractor shall comply with 2 CFR, §200.216, as applicable.
11. Domestic Preferences for Procurements. Contractor shall comply with 2 CFR, §200.322.
12. This Exhibit A is intended to incorporate those federal laws and regulations that apply to this contract. If the contractor believes that any law or regulation described herein is not applicable in this contract per the terms of the federal law or regulation, the contractor shall present their position in that regard to the City of New Berlin with a written change order request. The laws cited herein shall be followed by the contractor and all subcontractors unless the municipality agrees that the cited federal law or regulation does not apply, and the change order is approved by the City of New Berlin Common Council.

ADDENDUM TO CITY OF NEW BERLIN CONTRACTS

This Addendum is made and entered into and shall be considered an attachment as Exhibit B to all contracts entered into by the City of New Berlin for so long as the City of New Berlin is subject to the U.S. Department of Treasury Restrictions, as well as other federal restrictions related to the City's receipt of Federal Funds. The following Terms and Conditions shall be included in each such agreement and are incorporated as though fully set forth in the original contract.

1. No City contractor or employee shall operate any machinery or vehicle while utilizing a smart phone, including, but not limited to, the use of any cellular phone or texting.
2. All City employees and contractors, while engaged in the performance of City business or acting consistent with the performance of services under a contract with the City shall utilize seatbelts and any other safety devices related to the operation of a motor vehicle.
3. City employees or contractors whose duties and responsibilities are funded through the Coronavirus State and Local Fiscal Recovery Funds agree that they will not engage in any lobbying activities while in the course of providing services on behalf of the City of New Berlin, as restricted under the Hatch Act, 5 USC Sec. 1501-1508. No funds appropriated under the Coronavirus State and Local Fiscal Recovery Act shall be utilized for lobbying, and no political payments shall be made through the use of said funds.
4. All City employees and contractors, while in the performance of duties on behalf of the City shall abide by all local, state and federal regulations concerning the ingestion of controlled substances and shall not violate such Statutes or Ordinances. The City shall enforce drug free workplace standards and provide awareness programs for Staff. The City shall further agree to take action regarding individuals using drugs in the workplace according to law.
5. All City employees and contractors, in the course of performing of their duties on behalf of the City, shall, to the extent applicable, comply with the provisions in Wisconsin Statute §19.59 regarding conflicts of interest, as well as City of New Berlin Municipal Code Chapter 28 regarding ethics. Specifically, no City employee or contractor shall accept or solicit money or tangible personal property or otherwise receive consideration in exchange for the agreement to enter into a contract with a third party.
6. City employees shall avoid the acquisition of unnecessary items or property on behalf of the City.
7. City employees shall, to the extent applicable, engage in value engineering as part of any construction work performed on behalf of the City.
8. Contracts shall only be awarded to responsible contractors with experience in performing the services being contracted for.

9. City contracts shall avoid compensating for contractor work performed on a time and material basis and, to the extent practicable, shall have fixed-price contracts.
10. The selection of a contractor by the City should be done in an atmosphere of open and honest competition.
11. In the course of public bidding involving the purchase of equipment, the City shall not specify only a brand name for the purpose of limiting potential contracting parties. The City may include a clause, however, that any equipment being supplied under a City contract must interface well and be compatible with existing equipment utilized by the City of New Berlin, which is identified as the following: _____.
12. The City shall verify that any entity with which it is contracting has not been excluded for contracting pursuant to 2 CFR §180.
13. City contractors do hereby certify that they are not designated by the federal government as being precluded from engaging in federal contracts.
14. The City of New Berlin, its employees, officers, agents, contractors and assigns may not discharge, demote or otherwise discriminate against an employee in reprisal for disclosing information that the employee reasonably believes is evidence of gross mismanagement of a Federal, State or City contract or grant; a gross waste of Federal, State or City funds; an abuse of authority relating to Federal, State or Local Contractor Grant; a substantial and specific danger to public health, safety or welfare; or a violation of law, rule or regulation related to a Federal, State or City contract (including, but not limited to, the competition for or negotiation of a contract) or Grant. The entities to which disclosure of such information includes, but is not limited to the following entities:
 - a. A member of Congress or a representative of a committee of Congress;
 - b. An Inspector General;
 - c. The Government Accountability Office;
 - d. A Treasury employee responsible for contract grant oversight or management;
 - e. An authorized official of the Department of Justice or other law enforcement agency;
 - f. A Court or Grand Jury;
 - g. A management official or other employee of the City;
 - h. A contractor of the City;
 - i. A subcontractor of the City, which has the responsibility to investigate, discover or address misconduct;
 - j. An official of the State of Wisconsin, or other employee, agent or contractor of the State who has the responsibility to investigate, discover or address misconduct.
15. This Policy shall be disclosed to all City officers, agents, contractors or assigns and shall be included as part of the City's Addendum for City contract.
16. The City shall engage in a cost and price evaluation analysis to include independent estimates of the cost of the equipment or service before placing the matter out for bid.

17. When the City is engaged in negotiating purchase of goods and services, the profit in the contract shall be negotiated independently from the materials and labor. In any contract entered into by the City of New Berlin for the acquisitions of goods and services shall require remedies in the event of a breach of the agreement and shall include provisions for termination as to cause.

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:
- B. General project over view: Remove existing sealed combustion gas water heater and turn over to owner. Install new heat exchanger per drawings and specifications fed from the boiler system to serve the domestic hot water system

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
- Off Site Storage
- Codes
- Certificates, Inspections, and Permits
- Existing Buildings
- Submittals
- Operating and Maintenance Data
- Training of Owner Personnel
- Record Drawings
- Electronic Media
- Warranty

PART 2 - PRODUCTS

- Identification
- Sealing and Fire Stopping

PART 3 - EXECUTION

- Demolition
- 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 $\leq 0.25\%$ 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 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.

1.11 CODES

- A. Comply with requirements of Wisconsin Department of Safety and Professional Services (SPS).

1.12 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.

1.13 EXISTING BUILDINGS

- A. VISIT TO SITE
 - 1. Before submitting the proposal for this Division, the Contractor shall schedule and visit the site and shall satisfy himself as to the nature and location of his work and the general and local conditions. They shall have full knowledge of conditions relative to transportation, handling and storage of materials.
 - 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.

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.

1.14 SUBMITTALS

- A. Refer also to Division 00 of 01.
- B. Shop drawing submittals shall be electronic and bound, labeled per section and 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.

1.15 OPERATING AND MAINTENANCE DATA

- A. Refer to Division 01.
- B. Operation and Maintenance manuals shall be submitted electronically with 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.
 - Manufacturer's 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

1.16 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. Training shall be recorded and submitted to owner.

1.17 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.
- C. Provide hard copies and electronic PDFs and DWG files of all as-builts.

1.18 ELECTRONIC MEDIA

- A. Refer to Division 01.

1.19 WARRANTY

- A. Refer to Division 00.

PART 2 – PRODUCTS

2.01 IDENTIFICATION

- A. STENCILS:
Not less than 1 inch high letters/numbers for marking pipe and equipment.
- B. ADHESIVE LABELS:
Pressure-sensitive, adhesive backed, vinyl pipe markers with applicable labeling, 3/4" min. size for lettering and surrounding tape on both ends. With flow arrows on piping. Conforming to ANSI, ANSI and NFPA standards. Seton Opti-Code, or equal. Clean piping before application.
- C. ENGRAVED NAMEPLATES:
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.
- D. 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.
- E. 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.

2.02 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 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.

3.03 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.

3.04 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.

3.05 COORDINATION

- A. Coordinate all work with other contractors and field conditions 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.
 1. Prefabrication of piping shall be done at Contractor's risk. Extra compensation for modifications to prefabricated piping shall not be permitted.

- B. Verify that all devices are compatible for the type of construction and surfaces on which they will be used.

3.06 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 sides of the partition where accessible piping passes through walls or floors. Place flow directional arrows at each pipe identification location.
- D. 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.

3.07 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.

3.08 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.

3.09 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 device/sleeve, provide 2"x 2" x 1/8" galvanized steel angles fastened to floor surrounding the penetration or group of penetrations to prevent water from getting to penetration. Provide urethane caulk between angles and floor and fasten angles to floor minimum 8" on center. Seal corners water tight with urethane caulk.
 2. 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.

3.10 TRAINING

- A. Contractor to provide factory authorized representative and / or field personnel knowledgeable with the operations, maintenance, and troubleshooting of the system and / or components defined within this section for a minimum period of 1 hour

END OF SECTION

SECTION 22 05 15
PIPING SPECIALTIES

PART 1 – GENERAL

1.01 SCOPE

- A. This section contains specifications for plumbing piping specialties for all piping systems. Included are the following topics:

PART 1 - GENERAL

Scope
Related Work
Reference
Reference Standards
Shop Drawings
Design Criteria

PART 2 - PRODUCTS

Thermometers
Thermometer Sockets
Strainers

PART 3 - EXECUTION

Thermometers
Thermometer Sockets
Strainers

1.02 RELATED WORK

Section 22 05 23	General Duty Valves for Plumbing Piping
Section 22 07 00	Plumbing Insulation
Section 22 11 00	Facility Water Distribution
Section 22 30 00	Plumbing Equipment

1.03 REFERENCE

- A. Applicable provisions of Division 00 and 01 govern work under this section.

1.04 REFERENCE STANDARDS

ASTM B650 Electrodeposited Engineering Chromium Coatings on Ferrous Substrates

1.05 SHOP DRAWINGS

- A. Required for all items in this section. Include materials of construction, dimensional data, ratings/capacities/ranges, approvals, test data, pressure drop data where appropriate, and identification as referenced in this section and/or on the drawings.

1.06 DESIGN CRITERIA

- A. All piping specialties are to be rated 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.

PART 2 – PRODUCTS

2.01 THERMOMETERS

- A. Ashcroft, Marsh, Taylor, H. O. Trerice, U. S. Gauge, Weiss, Wika, Weksler.

- B. Stem Type: Cast aluminum case, nine inch scale, clear acrylic window. adjustable angle brass stem with stem of sufficient length so the end of the stem is near the middle of a pipe without reducing the thickness of any insulation, red indicating fluid, black lettering against a white background, with scale ranges as follows:

Service	Hot Water
Scale Range, °F	30 - 180
Increment, °F	2

2.02 THERMOMETER SOCKETS

- A. Brass with threaded connections suitable for thermometer stems and temperature control sensing elements in pipeline. Furnish with extension necks for insulated piping systems.
- B. Install valves to permit removal and installation on thermometer.

2.03 STRAINERS

- A. Armstrong, Illinois, Keckley, Metraflex, Mueller Steam, Sarco, Watts.
- B. Y type; cast bronze body, ASTM B62; 20 mesh stainless steel screens; bolted or threaded screen retainer tapped for a blowoff valve; sweat, threaded or flanged body rated at not less than 150 psi WOG.
- C. Y type; cast iron body, ASTM A126; 20 mesh stainless steel screens; bolted or threaded screen retainer tapped for a blowoff valve; threaded or flanged ends; rated at not less than 150 psi WOG.

PART 3 – EXECUTION

3.01 THERMOMETERS

- A. Stem Type: Install in piping systems as indicated on the drawings and/or details using a separable socket in each location.

3.02 THERMOMETER SOCKETS

- A. Install at each point where a thermometer or temperature control sensing element is located in a pipeline.

3.03 STRAINERS

- A. Install all strainers where indicated allowing sufficient space for the screens to be removed. Install a ball valve in the tapped screen retainer.

END OF SECTION

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
Spring Loaded Check Valves
Balance Valves
Specialty Valves and Valve Accessories
Safety Relief Valves

PART 3 - EXECUTION

General
Shut-off Valves
Balancing Valves
Drain Valves
Spring Loaded Check Valves

1.02 RELATED WORK

Section 22 05 00	Common Work Results for Plumbing
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 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 $\leq 0.25\%$ per the Federal Safe Drinking Water Act as amended January 4, 2011 Section 1417.

1.05 QUALITY ASSURANCE

- A. Substitutions: Refer to Division 00 and 01.

1.06 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.

1.07 DESIGN CRITERIA

- 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°F unless noted otherwise.
- B. BALL VALVES:
3" and smaller: Two piece bronze body; full port, sweat threaded or ASTM F1960 joint connection ends, stainless steel ball and stem; glass filled Teflon seat; Teflon packing and threaded packing nut; blowout-proof stem; 600 psig WOG. Provide valve stem extensions for valves installed in all piping with insulation. Apollo, 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, Nibco S480Y-LF, Watts LF600 or equal.
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, Nibco W910-LF or F910-LF.
- D. 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.
- E. 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 SPECIALTY VALVES AND VALVE ACCESSORIES

- A. 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°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

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 easy 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.
- F. Install lockable handles on all valves on hot, cold and tempered water supply branch lines serving emergency eyewash, and emergency showers.

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.
- B. Label valves that are not easily seen on nearest visible surface.

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.

3.06 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.

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

PART 3 - EXECUTION

Installation
Hanger and Support Spacing

1.02 RELATED WORK

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 QUALITY ASSURANCE

- A. Refer to Division 00 and 01, Approved Equals and Substitutions.

1.05 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 it 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.

1.06 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.

1.07 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.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. B-Line, Anvil, 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, Anvil 69 or 70. Carbon steel, adjustable clevis, standard. B-Line B3100, Anvil 260.
- B. HANGERS FOR PIPE SIZES 2" AND LARGER:
Carbon steel, adjustable clevis, standard. B-Line B3100, Anvil 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, Anvil 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, Anvil 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, Anvil PS 1400 series.

- E. VERTICAL SUPPORT:
Carbon steel riser clamp. B-Line B3373, Anvil 261 for above floor use. Anvil 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

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Size, apply and install supports and anchors in compliance with manufacturer's 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"

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 and Jackets
Insulation Inserts and Pipe Shields
Accessories
PART 3 - EXECUTION
Installation
Piping, Valve and Fitting Insulation
Equipment Insulation

1.02 RELATED WORK

Section 22 05 00	Common Work Results for Plumbing
Section 22 11 00	Facility Water Distribution
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. 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).
- E. 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 (potable and non-potable)
 - Storm Water
 - Equipment piping with a surface temperature below 65 degrees F

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. **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				
		<u>1" & Smaller</u>	<u>1-1/4" to 2"</u>	<u>2-1/2" to 3"</u>	<u>4" to 6"</u>	<u>8" & Larger</u>
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"
Tempered Water	Rigid Glass Fiber	1/2"	1/2"	1-1/2"		

*** = 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.

3.03 EQUIPMENT INSULATION

- A. Do not insulate over equipment access manholes, fittings, nameplates or ASME stamps. Bevel and seal insulation at these locations.
- B. **SEMI-RIGID FIBERGLASS:**
Apply insulation to equipment shells using weld pins, bonding adhesive, banded and wired in place. Fill all joints, seams and depressions with insulating cement to a smooth, even surface. Cover with reinforcing fabric and 2 coats of mastic. Use vapor barrier mastic on systems requiring a vapor barrier.

END OF SECTION

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
Flushing and Disinfection of Potable Water Systems
Dielectric Unions and Flanges
Unions and Flanges
Piping System Leak Tests

1.02 RELATED WORK

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.

2.02 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.
- C. 2" AND SMALLER COPPER:
 - 1. ANSI B16.18 cast bronze union coupling or ANSI B15.24 Class 150 cast bronze flanges.
- D. 2-1/2" AND LARGER STEEL:
 - 1. 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.
- E. 2-1/2" AND LARGER COPPER:
 - 1. ANSI B15.24 Class 150 cast bronze flanges with full face teflon gaskets.

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 FLUSHING AND DISINFECTION OF POTABLE WATER SYSTEMS

- A. 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 a minimum of 1 minute and until water appears clear. Fill system with a solution of water and chlorine containing at least 10 parts per million of chlorine and allow to stand for 24 hours. Flush system with potable water until chlorine concentration is no higher than source water level.
- B. 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.
- C. Piping that is pressure tested shall be drained completely dry. The piping system is not to be left full of stagnant water. The piping system, water heaters and water softeners shall not be filled until within 10 days of occupancy to guard against microbial growth.

3.06 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. Inspect system for leaks. Where leaks occur, repair the area with new materials and repeat the test; caulking will not be acceptable.
- E. Entire test must be witnessed by the Division's representative. All pressure tests are to be documented.

<u>System</u>	<u>Test Medium</u>	<u>Initial Test Pressure Duration</u>	<u>Final Test Pressure Duration</u>
Above Ground Domestic 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 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
Instantaneous Heat Exchanger
Inline Close Coupled 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.

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 INSTANTANEOUS HEAT EXCHANGER

- A. Manufacturer: Cemline or approved equal.
- B. HX-1: CEMLINE Corporation Model V120SPH150-DW. Factory fabricated and packaged instantaneous boiler water to domestic hot water heater. Tank shall be 24"x63" tall. 120 gallon storage capacity.
- C. Design criteria: Plate exchanger to heat 200 gallons per hour (GPH) from 40° F to 120°F with 6.7 GPM of 160°F inlet hot water.
- D. Storage heater shall be Cemline Series SPH; factory assembled and packaged. Water heater shall be constructed in accordance with ASME Code for a working pressure of 125 psig. The packaged water heater shall be constructed with a vertical steel tank, cement-lined with 316-L Stainless threaded openings.
- E. Heater shall be mounted on a steel support skid and shall have concealed lifting lugs.
- F. Heater shall be insulated with 3" Fiberglass protected by an enameled metal jacket, 20 gauge minimum thickness.
- G. Heater shall be factory assembled and piped including electronic operated 2-way temperature regulating valve. Heat exchanger shall be 316-L stainless steel double walled brazed plate style with an integrated cover and shall have an integral valved circulator to circulate domestic water through the heat exchanger into the bottom of the tank.
- H. Heater shall be supplied with solid-state control module with LCD touch screen display and LED pilot lights to indicate on-off, primary high limit, and secondary high limit. Solid-state control module shall be provided with a field programmable digital electronic PID controller allowing the owner to set operating and temperature limits on the display screen. Solid-state control module shall have red alarm light and alarm horn with built in alarm silence relay. Solid-state control module shall be supplied with dry contact closure outputs to indicate to building automation system (BAS) the occurrence of power on, primary high temperature, and secondary high temperature. The control module shall allow the BAS to turn the heater on or off through a remote contact closure. The control module shall allow the BAS to remotely set the temperature of the heater using a 4-20 mA input signal. The control module shall allow the BAS to remotely monitor the operating temperature via a 4-20 mA signal. Control module shall communicate with the BAS using Modbus protocol via an RS-485 connection. Control module shall be supplied with an on-off switch and shall be mounted in a NEMA 4 panel. All solenoids and limits shall be 24 VAC.
- I. Heater shall be furnished with a water pressure gauge and an A.S.M.E. pressure-temperature relief valve of sufficient size to relieve total BTU input of the coil.
- J. Manufacturer shall assume responsibility for correct sizing of components to assure performance designated in design criteria.
- K. Warranty: Non-prorated 10 year warranty for heat exchanger and vessel against any failure. Provide factory warranty with shop drawing submittals and operation and maintenance manuals.

2.02 INLINE SYSTEM LUBRICATED CENTRIFUGAL PUMPS

- A. Manufacturer: Bell and Gossett, Grundfos, Taco.

- B. CP-1: Bell and Gossett NBF 22-U, 92 watt, 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.
- C. Casing: Bronze or stainless steel; flanged suction and discharge connection.
- D. Impeller: Bronze, stainless steel or thermoplastic, keyed to the shaft, single suction enclosed type, hydraulically and dynamically balanced.
- E. Bearings: System lubricated carbon sleeve bearings.
- F. Shaft: Stainless steel or ceramic.
- G. Seal: Stainless steel can isolating rotor and stator.
- H. 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.

2.03 EXPANSION TANKS

- A. Manufacturer: Amtrol, Bell and Gossett, Wessels.
- B. ET-1: Bell and Gossett model PTA-12, 5 gallon ASME rated, vertical steel pre-charged 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 heat exchanger on concrete housekeeping pads. Adjust and level equipment.
- D. Connect equipment to water and drain piping using unions or flanges and isolation valves.
- F. Pipe temperature and pressure relief valves to floor.
- G. Startup and test equipment adjusting operating and safety controls for proper operation.
- I. Lubricate pumps before startup. Adjust pumps for rated flow. Clean and blow down strainers after 8 hours of operation.

END OF SECTION

SECTION 23 21 13
PIPE AND PIPE FITTINGS

PART 1 - GENERAL

1.01 SCOPE

This section contains specifications for all HVAC pipe and pipe fittings for this project. Included are the following topics:

PART 1 - GENERAL

- Scope
- Related Work
- Reference Standards
- Submittal Drawings
- Quality Assurance
- Delivery, Storage, and Handling
- Design Criteria
- Welder Qualifications

PART 2 - PRODUCTS

- Heating Hot Water Pipe and Fittings
- Heating Hot Water Pipe and Fittings (Copper)
- Glycol Water Piping
- Natural Gas
- Chemical Treatment
- Vents and Relief Valves
- Dielectric Unions and Flanges
- Unions, Flanges, and Gaskets
- Mechanical Grooved Pipe Connections

PART 3 - EXECUTION

- Preparation
- Erection
- Welded Pipe Joints
- Threaded Pipe Joints
- Mechanical Grooved Pipe Connections
- Copper Pipe Joints
- Boiler Feedwater, Blowdown, Drain, and Trim
- Water Systems
- Cleaning Water Piping Systems
- Venting Water Systems
- Glycol Water Piping
- Natural Gas
- Chemical Treatment
- Vents and Relief Valves
- Dielectric Unions and Flanges
- Unions and Flanges
- Pipe Hangers and Supports
- Boiler External Piping Hydrostatic Test
- Piping System Leak Tests

1.02 RELATED WORK

- A. The contractor shall provide work, services, equipment, accessories, and materials shown or described by the applicable sections of any part of any section or division of the contract documents.

1.03 REFERENCE STANDARDS

ANSI B16.3	Malleable Iron Threaded Fittings
ANSI B16.4	Cast Iron Threaded Fittings
ANSI B16.5	Pipe Flanges and Flanged 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 A47	Standard Specification for Ferritic Malleable Iron Castings
ASTM A53	Pipe, Steel, Black and Hot-Dipped, Zinc Coated Welded and Seamless
ASTM A105	Forgings, Carbon Steel, for Piping Components
ASTM A106	Standard Specification for Seamless Carbon Steel Pipe for High Temperature Service
ASTM A126	Gray Cast Iron Castings for Valves, Flanges, and Pipe Fittings
ASTM A181	Forgings, Carbon Steel for General Purpose Piping
ASTM A197	Cupola Malleable Iron
ASTM A234	Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures
ASTM A536	Ductile Iron Casting
ASTM B75	Seamless Copper Tube
ASTM B88	Seamless Copper Water Tube
ASTM B152	Copper Sheet, Strip, Plate, and Rolled Bar
ASTM B280	Seamless Copper Tube for Air Conditioning and Refrigeration Field Service

1.04 SUBMITTAL DRAWINGS

- A. Refer to Division 01, General Conditions, Submittals.
- 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.

1.05 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. Order all copper water tube with each length marked with the name or trademark of the manufacturer and type of tube; with each shipping unit marked with the purchase order number, metal or alloy designation, temper, size, and name of supplier; all in accordance with ASTM B88.
- C. Order all copper refrigeration tube with each shipping unit marked with the purchase order number, metal or alloy designation, temper, size, and name of supplier; with soft straight lengths or coils identified with a tag indicating that the product was manufactured in accordance with ASTM B280; and with each hard temper straight length identified throughout its length by a blue colored marking not less than 3/16 inch in height and a legend at intervals of not greater than three feet that includes the designation "ACR" and pipe outside diameter.
- D. Any installed material not meeting the specification requirements must be replaced with material that meets these specifications without additional cost to the Owner.

1.06 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. If end caps are not present on tube bearing the "ACR" designation, clean and re-cap in accordance with ASTM B280. 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.
- E. To assure uniformity and compatibility of piping components in grooved end piping systems all grooved products utilized shall be supplied by Victaulic. Grooving tools shall be supplied by the same Manufacturer as the grooved components.

1.07 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 type F pipe is specified, ASTM A53 grade A type E or S, or ASTM A53 grade B type E or S may be substituted at Contractor's option. 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.
- F. Where ASTM B88, type L hard temper copper tubing is specified, ASTM B88, type K hard temper copper tubing may be substituted at Contractor's option.

1.08 WELDER QUALIFICATIONS

- A. Welding procedures, welders, and welding operators for all building service piping and steam piping less than or equal to 15 psig to be in accordance with certified welding procedures of the National Certified Pipe Welding Bureau.
- B. Welding procedures, welders, and welding operators for all steam system piping at service pressures above 15 psig to be qualified complying with the provisions of the latest revision of ANSI/ASME B 31.1-Power Piping or Section IX of the ASME Boiler and Pressure Vessel Code for boiler external piping.
- C. 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.
- D. 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.
- E. The **Architect Engineer** 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 work shall be corrected and the welder shall be prevented from doing further welding on the project.

PART 2 - PRODUCTS

2.06 HEATING HOT WATER PIPE AND FITTINGS

- A. Pipe
 - 1. 2" and Smaller: ASTM A53, type F, standard weight (schedule 40) black steel pipe with ASTM A126/ANSI B16.4, class 125, standard weight cast iron threaded fittings.
 - 2. 2-1/2" and Larger: ASTM A53, standard weight (schedule 40) black steel pipe with ASTM A234 grade WPB/ANSI B16.9 standard weight, seamless, carbon steel weld fittings.
 - 3. Contractor may use ASTM B88 seamless, type L, hard temper copper tube with ANSI B16.22 wrought copper solder-joint fittings in lieu of steel pipe for all sizes. Mechanically formed tee fittings may be used in lieu of wrought copper solder-joint tee fittings for branch takeoff up to one-half (1/2) the diameter of the main.
- B. Fittings:

1. Water System Fittings: 2" and under, standard malleable or CI, screwed, 2-1/2" and over, standard seamless steel long radius welding fittings.
2. Unions: 2" and under, 150 lb. standard malleable iron screwed, brass seat, Grinnell #463, or other approved. 2-1/2" and over shall be flanged.
3. Flanges: 2-1/2" and over, 150 lb. weld neck flat faced flanges. All flanges shall conform to valves specified.
4. Gasket: All sizes to be full faced 1/16" Cranite, or other approved.
5. Bolting: All bolting shall be hex head machine bolts with hex nuts conforming to ASTM Specification A-107.

2.07 HEATING HOT WATER PIPE AND FITTINGS (COPPER)

- A. Pipe:
 1. Hot water pipe 4" and under, ASTM B88 seamless, Type L, hard copper.
 2. Order all copper water tube with each length marked with the name or trademark of the manufacturer and type of tube; with each shipping unit marked with the purchase order number, metal or alloy designation, temper, size and name of supplier; all in accordance with ASTM B88.
- B. Fittings:
 1. Wrought copper, ASTM B16.22, solder joint fittings.

2.12 GLYCOL WATER PIPING

- A. Piping:
 1. 2" and Smaller: ASTM A53, type F, standard weight (Schedule 40) black steel pipe with ASTM A126/ANSI B16.4, Class 125, standard weight cast iron threaded fittings.
 2. 2-1/2" and Larger: ASTM A53, standard weight (Schedule 40) black steel pipe with ASTM A234 grade WPB/ANSI B16.9 standard weight, seamless, carbon steel weld fittings.
- B. Fittings:
 1. Water System Fittings: 2" and under, standard malleable or CI, screwed, 2-1/2" and over, standard seamless steel long radius welding fittings.
 2. Unions: 2" and under, 150 lb. standard malleable iron screwed, brass seat, Grinnell #463, or other approved. 2-1/2" and over shall be flanged.
 3. Flanges: 2-1/2" and over, 150 lb. weld neck flat faced flanges. All flanges shall conform to valves specified.
 4. Gaskets: All sizes to be full faced 1/16" Cranite, or other approved.
 5. Bolting: All bolting shall be hex head machine bolts with hex nuts conforming to ASTM Specification A-107.

2.17 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.

2.20 CHEMICAL TREATMENT

- A. Use pipe and pipe fittings as specified for the system to which the chemical treatment piping is connected. Plastic pipe furnished with the chemical treatment materials may also be used if its pressure/temperature rating is acceptable for the service.

2.21 VENTS AND RELIEF VALVES

- A. Use pipe and pipe fittings as specified for the system to which the relief valve or vent is connected.

2.26 DIELECTRIC UNIONS AND FLANGES

- A. 1-1/4" and Smaller: Watts Regulator Company, Perfection Corporation, Central Plastics Company or EPCO Sales, Inc., dielectric unions with female pipe thread by solder end connections, non-asbestos gaskets, having a pressure rating of not less than 250 psig at not less than the design operating temperature of the fluid being conveyed.
- B. 1-1/2" and Larger: Watts Regulator Company, Perfection Corporation, or EPCO Sales, Inc., dielectric flanges with steel weld neck by copper solder joint end connections, non-asbestos gaskets, having a pressure rating of not less than 125 psig at not less than the design operating temperature of the fluid being conveyed.

2.27 UNIONS, FLANGES, and GASKETS

- 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 ANSI B16.18 cast copper alloy unions on copper 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 neck, or slip-on pattern 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. Nuts and bolts used on flanges shall comply with ASME B31.1 and ASME B31.9 as appropriate for the system.
- C. Gasket material for Steam Systems to be spiral wound gasket with external ring to prevent gasket blowout, ASME B16.20. Suitable for use with flat face and raised face flanges. 304 stainless steel/non-asbestos filler/carbon steel outer guide ring. Filler to be graphite or PTFE on low pressure systems, 900 degree F graphite or ceramic on high pressure steam. Flexitallic Style CG, Leader Style SR, Garlock Flexseal or approved equal.
- D. Gasket material for Steam Condensate, Water and Glycol Systems: Branded, compressed, non-asbestos sheet gaskets. Klingersil C4401, Garlock 3000, JM Clipper 978 or approved equal.

2.28 MECHANICAL GROOVED PIPE CONNECTIONS

- A. Manufacturers: Victaulic; alternative products require written approval by the engineer prior to bidding. Applicable only to replacement of existing couplings, all new work requires welded piping, refer to parts 2.06 and 2.07.
- B. Mechanical grooved pipe couplings and fittings may be used with steel pipe on the systems indicated below. Either cut-groove or equivalent roll-groove products are acceptable providing the system temperature and pressure requirements are met. Where ductile iron fittings are indicated, they shall conform to ASTM 536. Where forged steel fittings are indicated, they shall conform to ASTM A234, Grade WPB. Where fabricated steel fittings are indicated, they shall conform to ASTM A53, type F in sizes 3/4" through 4" and type E or S, grade B in sizes 5" through 24". Do not use fabricated fittings where ductile iron or forged steel fittings are available. Gaskets in most cases shall be EPDM suitable for temperatures to 230 degrees F.
- C. The following services may use mechanical grooved pipe connections within the building.
 - 1. Existing replacement couplings only
- D. Fittings and couplings must be suitable for the temperature and pressure involved. In no case is the final system to have a pressure rating of less than 125 psig at the design temperature of the fluid.
- E. Acceptable fittings and couplings are listed below, based on Victaulic. When used on galvanized piping, fittings and couplings shall be galvanized. When used on black steel piping, fittings and couplings shall have an enamel coating.
 - 1. Couplings: Ductile iron standard flexible couplings, Style 77; lightweight couplings, Style 75; and rigid couplings, Style 07. Reducing couplings are not acceptable.
 - 2. Flanges: Ductile iron Style 741 or 743 except at lug type butterfly valves where standard welding flanges shall be used.
 - 3. Fittings: Ductile iron elbows and tees of the manufacturer's standard line may be used in

all sizes except bullhead tees will not be accepted. Fabricated steel fittings may be used in all sizes where fitting wall thickness conforms to standard weight pipe. Fitting ends shall be factory grooved designed to accept Victaulic Standard or AGS "W" Series couplings. Mechanical-T Style 920/920N fittings with malleable iron housings may be used for up to 2" outlet size.

4. Expansion Joints: Credit for the inherent flexibility of mechanical grooved pipe connections when used for expansion joints may be allowed upon specific application by the Contractor. Three flexible couplings at first three connection points both upstream and downstream of pumps may be used in lieu of flexible connectors. Request shall be made in writing and shall include service, location, line size, proposed application and supporting calculations for the intended service.
 - a. 2" through 6" Sizes: Packless, gasketed, slip type expansion joint with grooved end telescoping body for installation with Style 07 rigid couplings, providing up to 3" axial end movement for working pressures up to 350 psig. Victaulic Style 150 Mover®.
 - b. 3/4" and Larger Sizes: Combination of grooved end short nipples joined in tandem with Style 75 or 77 flexible couplings to provide increased expansion. Joint movement and expansion capabilities determined by number of couplings and nipples used in the joint. Pressure rating dependent on size and style of flexible couplings used. Victaulic Style 155.

F. Acceptable fittings and couplings are listed below, based on Victaulic, where 2" through 8" Type K, L, or M copper tubing is used. Copper pipe shall be roll grooved in accordance with Victaulic current listed standards conforming to AWWA C606.

1. Couplings consist of two ductile iron housings cast with offsetting, angle pattern bolt pads coated with copper colored alkyd enamel. Gasket shall be pressure responsive, synthetic rubber of a FlushSeal® design, secured together with plated steel bolts and nuts. Couplings shall be manufactured to connect copper tubing sized tube and fittings. Victaulic Style 606.
2. Grooved end fittings shall be ASME B16.22 wrought copper with copper tubing sized grooved ends designed to accept Victaulic couplings. Flaring of tube and fitting ends to IPS dimension is not permitted.
3. Grooved copper flange adapters will be cast of ductile iron coated with copper colored enamel, flat faced, for engaging into roll grooved copper tube and fittings and bolting directly to flanges with ANSI Class 125 and 150 bolt hole patterns. Victaulic Style 641.

G. Acceptable fittings and couplings are listed below, based on Victaulic, where ASTM A312 or A376, Schedule 40, seamless stainless steel, Type 304 pipe is used. Stainless steel pipe shall be roll or cut grooved in accordance with Victaulic current listed standards conforming to AWWA C606.

1. Couplings consist of two segments of cast stainless steel, conforming to ASTM A351, A743, and A744, pressure responsive, synthetic rubber gasket and stainless steel bolts and nuts.
 - a. Rigid Type: Cast with key designed to clamp the bottom of the groove to provide an essentially rigid joint. Victaulic Style 489.
 - b. Flexible Type: Use in locations where vibration attenuation and stress relief are required. Victaulic Style 77S.
2. Stainless steel fittings shall be Type 304 or 316 stainless steel conforming to ASTM A403 or A312 with grooves designed to accept Victaulic couplings.
3. Flange adapters shall be CF8M stainless steel conforming to ASTM A351, A743, and A744, flat faced, for incorporating flanged components with ANSI Class 150 bolt hole pattern to a grooved piping system. Victaulic Style 441.

H. The use of mechanical grooved pipe connections will not relieve the Contractor from providing the vibration isolation specified in Section 23 05 48.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Remove all foreign material from interior and exterior of pipe and fittings.

3.02 ERECTION

- A. All piping to be new positively marked for field identification and installed to allow for free expansion, including right angle loops, cold springing or other satisfactory method. All branch take offs from mains shall be made with adequate right angle swing arms to allow for expansion. Lines and risers to be perfectly straight, plumb, true, properly graded and free from depression or pockets. Open ends of all piping to be kept closed during construction.
- B. 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. In all cases, consult drawings for exact location of pipe spaces, ceiling heights, door and window openings, or other architectural details before installing piping. Maintain sizes and location indicated with no changes to be made unless approved by the Architect. Follow the Architect's direction in locating the pipe runs before locating openings in floor slabs and walls.
- C. Provide anchors, expansion joints, swing joints and/or expansion loops so that piping may expand and contract without damage to itself, equipment, or building.
- D. Mitered ells, notched tees, and orange peel reducers are not acceptable. On threaded piping, bushings are not acceptable.
- E. "Weldolets" and "Thredolets" may be used for branch takeoffs up to one-half (1/2) the diameter of the main.
- F. Install drains throughout the systems to permit complete drainage.
- 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, control 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.
- I. Unions, couplings and flanges are to be used in all connections to all equipment, so that equipment can be removed by breaking connections.
- J. All shut-off and balancing valves shall be located for ease of accessibility. Relocate valves which would be inaccessible if installed as shown.
- K. Pipe, valves, fittings, etc., shall be hydrostatically tested in accordance with ANSI Code for Pressure Piping B31.1. The requirements of hydrostatic tests, indicated herewith, will be considered met if the hydrostatic test applied to the erected piping system is completed to the satisfaction of the Architect. The duration of the hydrostatic tests shall be four (4) hours for all pipe sizes.
- L. Piping shall be fabricated of materials and to dimensions as scheduled or indicated on the drawings and material specification separately listed and shall be of the longest lengths commercially available. All pipe and fittings shall have the manufacturers identifying mark stenciled, stamped or rolled into the surface in accordance with ASTM Specifications. All piping shall be provided with protective coating suitable for applying prime coat of paint.
- M. All piping shall be installed in accordance with the recognized best practices of the trade meeting, in any case, the approval of the Architect. The Contractor is responsible for planning and coordination with other Trades in avoidance of obstacles and interferences met in the field. Piping shall be installed parallel to planes of the building structure. All overhead piping is shown in a general location, except where specific details are included showing the exact location and arrangement. The Contractor shall arrange all piping as required to suit building structure and to avoid interferences with existing or new installations. Contractor shall field check points of connection to existing building services and shall be responsible for providing all off-sets and piping required, whether or not shown on the plans.
- N. All pipe ends shall be fully reamed to size and all threads shall be clean cut and tapering. Joints in screwed piping shall be made up with an approved graphite compound or teflon tape applied to

male threads only to avoid leaving compound inside the pipe.

- O. Unions shall be provided where screwed valves, control equipment, etc., are installed in continuous runs of piping. Unions shall be provided in all screwed types of piping where required for disassembly and for convenience in making repairs.
- P. All piping shall be cleaned out before installation by blowing out with compressed air or by other approved method. Provide temporary plugs or caps for all open ends of pipe when work is not being carried on to completion.
- Q. Where flanged connections are installed at pumps, piping shall be assembled and supported with flange bolts loose to avoid placing any external stress on the pump body.
- R. All underground steel piping shall be protected against corrosion. All straight lengths of steel pipe and specials are to be cleaned, lined, coated and wrapped with coal-tar enamel in accordance with the requirements of the AWWA Standard Specifications. The primer and coal-tar enamel shall be made by one manufacturer and shall be bitumastic Jet-Set and Bitumastic 70-B Enamel AWWA, as manufactured by Koppers Co., or equal. The penetration of the coal-tar enamel shall be in accordance with the manufacturer's specific recommendations. The primer and coal-tar enamel shall be applied in accordance with the manufacturer's best practice, and by experienced men in the employ of the coating manufacturer or under the constant supervision of an experienced representative of that manufacturer. All piping shall be Holiday tested and repaired, and the entire system shall be provided with Cathodic protection.
- S. Wherever copper, brass or bronze piping systems are connected to steel or iron piping systems, this connection shall be made with dielectric isolators. The use of brass or bronze valves, fitting, etc. is not an acceptable substitute for dielectric isolators. These dielectric isolators shall be so designed that no non-ferrous piping materials come in contact with ferrous materials. These materials shall be isolated by the use of teflon or nylon isolating materials made up in the form of screwed type unions or insulating gaskets and bolt sleeves and washers for standard flanged connection. Where it will not be necessary to disconnect these piping systems, the connections may be made by the use of nylon or teflon bushings. All of these insulating units shall be selected for pressures to be encountered.
- T. Install all control valves furnished by the Temperature control contractor.
- U. Provide shutoff valves at all equipment, coils, chillers, boilers, etc. as shown on drawings or required to allow isolation of the apparatus.

3.03 WELDED PIPE JOINTS

- A. Welding is required on all piping located in building overhangs, underground piping, all piping 2-1/2" and over, and permitted on all, or part, of other piping in lieu of screwed joints.
- B. Pipe welding shall comply with the provisions of the latest revision of the ASME Boiler and Pressure Vessel code, and the ANSI Code for Pressure Piping B32.1, or such state or local requirements as may supplement codes mentioned above.
- C. Each manufacturer or contractor shall be responsible for the quality of welding done by his organization and shall repair or replace any work not in accordance with these specifications.
- D. All welding fittings shall be as manufactured by Ladish, Tube Turn or Midwest. Branch connections sized under 1/2 the main pipe diameter may be made with intersection welds with no project allowed of the small pipe into the larger pipe.
- E. Welding of galvanized pipe or fittings will not be acceptable.
- F. Make all welded joints by fusion welding in accordance with ASME Codes, ANSI B31, and State Codes where applicable.
- G. 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 thread lubricant or teflon tape when making joints; no hard setting pipe thread cement or caulking will be allowed.

3.05 **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 available for the application.
- B. Lubricate pipe and coupling gasket, align pipe, and secure joint in accordance with the coupling manufacturer's specifications.
- C. Support pipe as indicated in Pipe Hangers and Supports Section of these specifications except as modified below. Support each horizontal pipe section at least once between couplings and whenever a change in direction of line flow takes place. Support vertical pipe at every other floor or every other pipe length, whichever is most frequent. Set the base of the riser or the base fitting on a pedestal or foundation.
- D. Follow coupling Manufacturer's (Victaulic) installation recommendations if they are more stringent than the above requirements.
- E. Where couplings are indicated or permitted, provide the proper groove depths and pipe wall thickness required for 150 psi working pressure as recommended by the manufacturer.
- F. The gasket style and elastomeric material (grade) shall be verified as suitable for the intended service as specified. Gaskets shall be supplied by Victaulic.
- G. Grooved end shall be clean and free from indentations, projections and roll marks in the area from pipe end to groove for proper gasket sealing.
- H. A Victaulic factory trained field representative shall provide onsite training to Contractor's Field Personnel in the installation of grooved piping products. Factory trained representative shall periodically review the product installation. Contractor shall remove and replace any improperly installed products.

3.07 **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 emery cloth or sandpaper. Remove residue from the cleaning operation, apply flux, and assemble joint. Use 95-5 solder or brazing to secure joint as specified for the specific piping service.
- B. Where mechanically formed tee fittings are allowed, form mechanically extracted collars in a continuous operation, consisting of drilling a pilot hole and drawing out the tube surface to form a collar having a height of not less than three times the thickness of the tube wall. Use an adjustable collaring device. Notch and dimple the branch tube. Braze the joint, applying heat properly so that pipe and tee do not distort; remove distorted connections.

3.13 **WATER SYSTEM**

- A. Run water mains level or pitch horizontal mains up 1 inch in 40 feet in the direction of flow. Install air chambers and manual air vents at all high points where air may collect. If vent is not in an accessible location, extend air vent piping to the nearest code acceptable drain location with vent valve located at the drain.
- B. Main branches and runouts to terminal equipment may be made at the top, side, or bottom of the main provided that there are drain valves suitably located for complete system drainage and manual air vents are located as described above.
- C. Use top connection to main for up feed risers and bottom connection to main for down feed risers. Connections at a main may be made with a tee and a 45 degree elbow.

- D. 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.
- E. 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.
- F. Install 3/4" Crane #58 drain valves with composition discs and hose threads at bottom of all coils, radiation and at all low points in the system on piping up to 4" size. Install 2" globe valves on all piping 5" and up unless shown differently on the drawings and pipe 2" drains to nearest drain.

3.14 CLEANING WATER PIPING SYSTEMS

- A. Use Dearborn compound cleaner #BC-45, Mogul, Vulcan or Nalco in the amount of 5 pounds per one gallon of water to pre-clean the piping system. Dissolve the compound so that it is in solution, preferably in warm water, and in such quantities that foaming will not be a problem. Introduce the solution into system at 62-1/2 pounds per 1,000 gallons in system.
- B. Provide 5-gallon shot feeder with shut-off and drain valves at all secondary system circulating pumps.
- C. Circulate the solution in the system with all automatic valves fully open and water temperature at 210 degrees F. Double the quantity of solution to be circulated in the system if heat cannot be provided.
 - 1. Drain the entire system after 24 hours. Fill system with clear water, and circulate for a period of 24 hours while continuously draining and filling the system.
- D. Obtain system water analysis one week later and recommendations for treatment and treat water in accordance with these recommendations.
- E. All chemicals used and the disposal method must comply with Federal, State and Local environmental standards.

3.15 VENTING WATER SYSTEMS

- A. After the system has been cleaned, vent all heating and cooling coils, radiation, equipment and high points of the system. Feed more water to the system to provide at least 4 pounds per square inch pressure at the highest point of the system. Perform this work using recognized good practice.
- B. Follow-up venting operation as needed to purge all air from the system.

3.18 GLYCOL WATER PIPING

- A. Any antifreeze material used must be compatible with the piping material, pipe joining materials, gaskets, and valves specified.

3.20 MAKEUP WATER

- A. Install where indicated and/or specified, including all valves, piping specialties and dielectric unions required for a functional system.
- B. Extend from connection by the Plumbing Contractor with the same materials.

3.22 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 on threaded natural gas lines.
- B. For pressure up to 2 psig, piping maybe screwed and fittings maybe malleable iron or forged steel.

- C. For pressure above 2 psig, piping 2" and above shall be welded and fittings shall be forged steel.
- D. Do not install gas pipe below a building or its foundation. Gas piping in a ventilation air plenum may not have any valves or unions.
- E. If an above ground vent terminates in an area subject to snow accumulation, terminate the line at least five feet above grade.
- F. All joints in underground polyethylene gas pipe must be made by qualified personnel proficient in the joining methods of ASTM D2513 thermoplastic gas pressure pipe and polyethylene fittings. Do not install polyethylene gas pipe inside buildings.
- G. Install an auxiliary gas regulator, shut off valves, dirt leg and union at each appliance. Provide a valved connection at the main for equipment and appliances furnished by others.
- H. Piping through a roof shall be run through an approved roof penetration with flashing and counter flashing.
- I. Each gas pressure reducing valve vent and relief valve vent shall be separately run full size to a point outside of the building, terminated with a screened vent cap, and located according to gas utility regulations.
- J. Installation shall comply with NFPA-54, National Fuel Gas Code.
- K. Paint all exterior gas piping with rust inhibiting paint of color as selected by Architect. Inspect piping immediately prior to painting and remove all rust.

3.24 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.

3.25 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.

3.29 DIELECTRIC UNIONS AND FLANGES

- A. Install insulating or dielectric unions or flanges at each point where a copper-to-steel pipe connection is required in the following systems.
 - 1. Cold water or non-potable makeup water
 - 2. Hot water system
 - 3. Chilled water system
- B. Do not use dielectric unions or flanges at terminal heating/cooling devices.

3.30 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.

3.31 PIPE HANGERS AND SUPPORTS

- A. Provide Grinnell, Fee Mason or Elcen adjustable hangers, special pipe supports, spring hangers, saddles, anchors, clamps, rods, miscellaneous iron supports and appurtenances as required to hang or support the piping systems. Provide all miscellaneous iron for hanger supports which are required in addition to the building structural steel. All work shall conform to ASA Code B31.1 and MSS Standard Practice SP-58.

- B. Where pipes are supported from steel joist, for pipe 6" and larger (or combination of pipes with combined weight equal to or greater than a 6" pipe) support pipe as follows:
1. If the pipe runs parallel to joists, locate the pipe(s) midway between and support equally off of two joist panel points at maximum spacing of 8'-0" on center.
 2. If the pipe runs perpendicular to joists, provide supports at 10'-0" on center maximum.
- C. Where hangers are supported from existing beams or concrete slabs of sufficient thickness, provide Phillips concrete fastener or expansion case (Fig. 117).
- D. Where hangers are supported from new concrete slabs, provide concrete inserts (Fig. 279, 281, 282) depending upon load requirement.
- E. Spring type hangers, Consolidated Kinetics type SFH, or Grinnell Fig. 178 shall be installed throughout all boiler rooms and equipment rooms where reciprocating or rotating equipment is installed. The same hangers shall be installed at least four pipe hangers away from all equipment set on vibration isolators, and at the top of risers to absorb vertical movement.
- F. Suspend all steam and hot water mains thru 3" from clevis type hangers (Fig. 260). Suspend all steam and hot water piping from 4" thru 12" from clevis type roller hanger (Fig. 181) with pipe covering saddles. Suspend all steam and hot water piping 14" and up from trapeze type roller hanger (Fig. 171) with pipe covering saddles. Provide spring cushion roller type hanger (Fig. 178) with trapeze type roller hanger (Fig. 171) where required for vertical movement.
- G. Suspend all cold water, chilled water and condenser water piping from clevis type hangers (Fig. 260). At each chilled water hanger, provide an 18" long section of calcium silicate pipe covering, cover with a white fire retardant vapor barrier jacket and insert an insulation protection shield (Fig. 167) between the insulation and the hangers.
- H. Spacing of hangers shall not exceed the following schedule. This Contractor shall provide any additional steel members required to maintain the spacing. Provide hangers adjacent to concentrated loads such as valves, pumps, flanges, etc.

<u>PIPE SIZES</u> <u>INCHES</u>	<u>HANGER SPACING</u> <u>FEET</u>	<u>ROD SIZE</u> <u>INCHES</u>
1	7	3/8
1-1/4	8	3/8
1-1/2	9	3/8
2	10	3/8
2-1/2	11	1/2
3	12	1/2
4	14	5/8
6	17	5/8
8	19	3/4
10	22	1
12	23	1
14	25	1
16	27	1
18	28	1
20	30	1
24	32	1

- I. Where pipe work is to be racked, use Unistrut racks with base mounted Fig. 271 pipe roll or Fig. 257 graphite slide assembly.
- J. Remove all rust from all hangers or hanger rods prior to completion of project. Provide single coat of rust inhibiting paint where rust has been removed to prevent further rusting.

3.32 BOILER EXTERNAL PIPING HYDROSTATIC TEST

- A. For purposes of hydrostatic testing, boiler external piping shall be as defined in ANSI B31.1, Power

Piping, paragraph 100.1.2.A. Conduct test with Contractor supplied apparatus in accordance with ANSI B31.1, paragraph 137.1.1 and ASME Boiler and Pressure Vessel Code, Section 1, paragraph PG-99.

3.33 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. 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 engineer at the engineer's discretion. If leaks are found, repair the area with new materials and repeat the test; caulking will not be acceptable.
- C. Do not insulate pipe until it has been successfully tested.
- D. 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.
- E. 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.
- F. 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.
- G. 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
Heating hot water	100 psig	Water	8 hr
Glycol Water Piping	100 psig	Water	8 hr
Natural gas	100 psig	Air	24 hr

- H. All pressure tests are to be documented and submitted to the engineer.

END OF SECTION

SECTION 23 09 25

SEQUENCE OF OPERATION FOR HVAC CONTROLS

PART 1 - GENERAL

1.01 SCOPE

- A. This section includes control sequences for HVAC equipment as well as equipment furnished by others that may need monitoring or control. Included are the following topics:

PART 1 - GENERAL

Scope

Related Work

Description of Work

Submittals

PART 2 - PRODUCTS

Not Applicable

PART 3 - EXECUTION

General Control

System Control Types

Control Sequences

1.02 RELATED WORK

- A. Applicable provisions of Division 01 govern work under this Section.

1.03 DESCRIPTION OF WORK

- A. Control sequences are hereby defined as the manner and method by which automatic controls function. Requirements for each type of operation are specified in this section.
- B. Operation equipment, devices and system components required for automatic control systems are specified in other control sections of these specifications.
- C. All temperature, humidity, and pressure sensing, and all other control signal transportation for the control sequences shall be furnished under Section 23 09 24(,23 09 25,) and 23 09 14. All electronic and electric input/output signals shall be extended with adequate lead length for termination within the appropriate control panel.
- D. Sequences for equipment controlled by Direct Digital Controls (DDC) as specified are accomplished by hardware and software provided under Section 23 09 24 (and 23 09 25). Sequences for equipment controlled by electric controls are accomplished by hardware provided under Section 23 09 14.

1.04 SUBMITTALS

- A. Refer to Division 1, General Conditions, and Submittals for descriptions of what shall be included in the submittals.
- B. The contractor providing the DDC equipment shall provide a complete narrative of the sequence of operations for equipment that is controlled through the DDC system. The contractor providing electric control equipment shall provide a complete narrative of the sequence of operation for equipment that is controlled directly from that equipment (without control logic through the DDC system). The narrative of the sequence of operation shall not be a verbatim copy of the sequences contained herein, but shall reflect the actual operation as applied by the contractor.

PART 2 - PRODUCTS

Not applicable to this Section.

PART 3 - EXECUTION

3.01 GENERAL

A. SET-POINTS:

1. All set-points indicated in the control specification are to be adjustable. The set-points shall be readily available to be modified in the mechanical system software system summary (either textual or graphic based) and under the same software level as hardware points. Less used set-points may be provided on a lower software level. The set-points indicated herein are only specified as a calculated starting point (or initial system operation). It is expected that set-point adjustments and control loop tuning shall be required to provide optimum system operation based on requirements of the building. The control contractor shall work with the balancing contractor, Architect, and the Owner to provide the final system set-point adjustments and control loop tuning after the system is in operation and building is in use. Any questions regarding the intended operation of the HVAC equipment and control systems shall be referred to the Architect through the appropriate construction communication process. The following set-points should be used as initial set-points unless otherwise specified in the individual control sequences:
 - a. Occupied Space Terminal Unit Heating: 70° F (Non-plant)
 - b. Occupied Space Terminal Unit Cooling: 74° F (Non-plant)
 - c. Entry Way Heating: 60° F
 - d. Mechanical or Unoccupied Space Ventilation: 82° F
 - e. Mechanical or Unoccupied Space Heating: 60° F
 - f. Occupied Space Terminal Unit Heating (Plant) 65° F
 - g. Occupied Space Temperature Unit Cooling (Plant) 80° F

B. ANTI-CYCLING:

1. When HVAC equipment or a sequence is specified to be started and stopped by a temperature, humidity, pressure set-point or any other controlled variable, there shall be an adjustable differential set-point that shall be set to prevent short cycling of the systems and equipment due to minor changes in the controlled variable. Temperature differential set-points shall be set at 2° F and non-temperature set-points shall be set at 10% of the controlled range unless otherwise specified. Set-points shall indicate when the process shall be turned on. Cooling differentials shall be set for below set-point and heating differentials shall be set above set-point and will be used to turn the process off. For example, an economizer sequence called to switch at 60° F would turn on at 58° F and off at 60° F since it is a cooling function. A heating lockout set-point of 50° F would turn on heating control at 50° F and off at 52° F Non-temperature differentials shall be set above set-point if the set-point is indicating a minimum value or below set-point if the set-point is indicating a maximum value. Provide minimum runtime timers for loads that are cycled to prevent over-cycling. Timers shall be set as specified or as required by the equipment manufacturer to prevent damage or excessive wear to the equipment. Unless otherwise specified in the individual control sequences, fans and pumps shall have a minimum runtime on timers of 15 minutes (adj.) and off timers of 5 minutes (adj.). Safeties shall override runtime timers.

C. DEADBANDS:

1. Provide deadbands for all DDC control loops to prevent constant hunting of output signals to controlled devices. Deadbands shall be set to provide adequate control around set-point as follows unless otherwise specified in the individual control sequences:
 - a. Temperature Control: $\pm 0.5^{\circ}$ F
 - b. Humidity Control: $\pm 1\%$ RH
 - c. Airflow Control: $\pm 2\%$ of total flow
 - d. AHU Static Pressure Control: ± 0.01 in. w.c.

D. ALARMS:

1. Provide all alarmed points with adjustable time delays to prevent nuisance tripping under normal operation and on equipment start-up. Provide alarms on all points as indicated on point charts.
- E. EQUIPMENT START/STOP FAILURE STATES:
1. All start/stop points for equipment shall utilize normally open contacts unless called out specifically in the individual control sequences.
- F. LEAD/LAG SEQUENCING:
1. For sequences that call for lead/lag of equipment connected to building automation systems, the lead device shall be able to be chosen through a selectable day of the week and time of day DDC. Coordinate with the Owner for scheduling switchover and frequency. Unless otherwise directed, switchover shall occur at 10AM Tuesday and shall rotate the lead device on a bi-weekly cycle rotating through all devices sequentially. For standalone lead/lag sequence controllers (non-DDC), the lead device shall be selected by a switch on the panel face.
- G. VARIABLE FREQUENCY DRIVE (VFD) MOTOR RUN STATUS:
1. Use the VFD programmable relay dry contact output specified is to be provided with the VFD under Section 15750B to prove motor run status and detect belt loss or coupling break. If a bypass contactor is provided with the VFD, provide an adjustable current switch and wire it in parallel with the VFD output for proving motor status.
- H. VFD BYPASS & SAFETY INTERLOCKS:
1. VFD's equipped with bypass starters shall be interlocked so that the start/stop and safety circuits that are called out for VFD operation shall be functional when the VFD is indexed to the bypass starter mode. Unless otherwise specified in the sequence below, the switch from inverter to bypass starter modes shall be through a manual switch provided on the VFD/bypass starter package.
- I. VFD MINIMUM SPEED:
1. The VFD start-up technician shall work with the Temperature Control Contractor determine the minimum speed required for the motor controlled by the VFD to provide cooling of the motor as installed to prevent heat related problems. This minimum speed shall be set in the VFD controller.
- J. CURRENT SWITCH SETUP:
1. When current switches are used for proving fan or pump status, they shall be set up so that they will detect belt or coupling loss by the reduction in current draw on loss of coupled load. The current switch set up shall be verified and reset by the Temperature Control contractor after the balancer is complete.
- K. DAMPER INTERLOCKS FOR FANS WITH STARTERS:
1. For fan systems with magnetic starters and shutoff dampers, the damper interlock shall be hardwired in such a way that the damper shall open if the fan starter hand / off / auto switch is in the hand or in the auto position and being called to start. After the damper end switch has proven the damper open, a hardwire interlock from the end switch to the starter holding coil for the fan shall cause the fan to start. For fan systems that are ducted in parallel, see specific sequence for fan system on interlock requirements.
- L. SMOKE DAMPER CONTROL:
1. Smoke dampers provided in shafts are required to close by building code in the event their associated duct detectors are in alarm or if the associated fan(s) that supply or exhaust air through them are shutdown. If a fan fails to start, after an appropriate time delay (not longer than five minutes), the associated smoke dampers shall close. If DDC controlled and fan fails to start, smoke dampers shall close, the fan shall be latched off, and an alarm sent through the DDC system. A software reset point shall be provided to reset the fan system. On fan system start-up, a time delay shall allow the dampers to open before the fan is started. All necessary software and hardware interlocks shall be provided to perform these functions.

- M. FAN INTERLOCKING:
 - 1. Provide interlocks between supply, return, and exhaust fan systems as scheduled on the plans or called out in individual control sequences. If DDC controlled, interlocks shall be done through DDC start/stop points unless otherwise specified in individual control sequences. If not DDC controlled, interlocks shall be accomplished via hardwire interlocks between fan starters or VFD's.
- N. THERMOSTATS AND SENSORS:
 - 1. All devices and equipment including terminal units, specified to be controlled in a control sequence by a thermostat or sensor, shall be provided with a thermostat or sensor, whether or not the device is indicated on the plans. Consult the Architect for the thermostat or sensor location.
- O. ORIGINAL EQUIPMENT MANUFACTURER (OEM) CONTROLLER DDC INTEGRATION:
 - 1. Provide DDC programming to define all equipment integral input/output points, set-points, data points, calculations, etc. that are available through the manufacturers communication interface. Consult with the Owner's operations personnel to determine if some of the points should be omitted (for clarity or lack of value).

3.02 SYSTEMS CONTROL TYPES

- A. All new equipment and systems are required to be control by DDC systems.
- B. Systems not listed for DDC shall be controlled using electric, electronic, and integral equipment controls (where provided). Control equipment not listed as appropriate. Confer with the Engineer for required control sequences.

3.03 SEQUENCES

- A. BOILER CONTROL
 - a. Provide a dual outside/inside controller with adjustable ratio to automatically vary the boiler supply water temperature in accordance with outside temperature by modulating the burner and sequencing the boilers to provide 200°F (adj) water, reduce to 140°F (adj) when ambient temperature is above 65°F (adj). Provide control sequence for each boiler to provide the ability for the operator to select and display; On/Off status, runtime, alarm indications, and supply and return water temperature.
 - b. Provide a push button boiler shutdown switch located at each door inside of the boiler room in accordance with ASME CSD-1. All boiler power circuits shall be routed through the switch(s) to drop power to all boilers. Upon initiation of switch, all boilers shall their power circuits interrupted and an alarm indicated at the DDC interface.
 - c. Provide a boiler sequence control to operate for maximum efficiency and to provide lead/lag boiler selection and lead/lag backup.
 - d. The boiler controls shall be interlocked to start the primary boiler pump upon a call to heat, prove flow, enable the boiler burner, and operate the boiler pump for 2 minutes (adj) after the burner is off.
- B. CIRCULATING PUMP CONTROL
 - a. The heating system circulating pumps (with one as standby) piped in parallel shall operate continuously. Provide a flow switch control across each pump to sound an alarm at the DDC workstation in the event that either pump fails, and automatically start the standby pump.
 - b. A DDC shall monitor the differential pressure between the HWS and HWR main. DDC shall modulate the speed of the lead secondary hot water pump to maintain 8 PSI differential pressure (adj).
- C. OUTDOOR SNOW MELTING SYSTEM

- a. DDC shall enable operation of snow melting system when outdoor ambient temperature falls below 37°F (adj.). Once enabled, operate the radiant floor heating for a minimum of 15 minutes should outdoor temperature fluctuate above the enable setpoint.
- b. DDC shall operate the hot water boiler system when there is a call for snow melting system.
- c. Provide a dedicated specialized snow melting controller for each control zone. This dedicated controller shall:
 - i. Maintain the floor slab temperature at 35°F (adj.).
 - ii. The controller shall start the zone pump whenever snow melting system is active. The controller shall modulate the associated 3-way valve to maintain a radiant floor hot water supply temperature of 105°F (adj.). Should water temperature exceed 110°F (adj.) the controller shall stop the circulation pump and post an alarm.
 - iii. DDC shall monitor each snow melting controller for trouble by a binary input from a controller normally open dry-contact.

END OF SECTION

SECTION 23 09 24

DIRECT DIGITAL CONTROL SYSTEMS FOR HVAC

PART 1 - GENERAL

1.01 SCOPE

- A. Building currently has a Kain Energy Corporation DDC system. As part of this project the boilers and snow melt system are to be provided with DDC controls that are capable of incorporation in to the existing system and into any certified BACnet based controls system.
- B. Work in this section includes wiring, materials, equipment, accessories, software, programming and labor necessary to constitute a complete Direct Digital Control (DDC) system.

PART 1 - GENERAL

- Scope
- Related Work
- Quality Assurance
- Submittal
- System Start Up
- Training
- Material Delivery and Storage

PART 2 - PRODUCTS

- General
- Local Control Panels
- Direct Digital Controls
- Networking/Communications
- Digital (DDC) Panels
- System Software Features
- Application Specific Controllers - HVAC Applications
- Operator Interface
- System Performance and Protocol Interfaces
- Operator Work Station

PART 3 - EXECUTION

- General
- Installation
- Sequence of Operation
- DDC Points List
- Warranty
- Manufacturer's Field Services

1.02 RELATED WORK

- A. The contractor shall provide work, services, equipment, accessories, and materials shown or described by the applicable sections of any part of any Section or Division of the contract documents.

1.03 QUALITY ASSURANCE

- A. Installer shall be a firm specializing and experienced in DDC control system installation for no less than 5 years.
- B. RESPONSE TIME: During warranty period, four (4) hours or less, 24-hours/day, 7 days/week.
- C. ELECTRICAL STANDARDS: Provide electrical products, which have been tested, listed and labeled by Underwriters' Laboratories (UL) and comply with NEMA standards.
- D. DDC Standards: Provide equipment in compliance with F.C.C. rules governing the control of interference caused by Digital Electronic Equipment to Radio Communications (1979 Amendment to Part 15, Subpart J).

1.04 SUBMITTALS

- A. PRODUCT DATA: Submit manufacturer's specifications for each control device furnished, including installation instructions and startup instructions.
- B. Job tailored design drawings and annotated software program documentation shall be submitted for system sequences, along with descriptive narratives of the sequence of operation of the entire system involved. Sequence of operation shall be specific. I.E. Controller C-1 located in boiler room panel P-1 shall control the temperature at sensor T-3 at 150F.
- C. See "Common Work Results for HVAC" for other submittal, O&M manuals, and record drawing requirements.

1.05 SYSTEM START-UP

- A. Following the completion of all start-ups for all Mechanical Systems and assembly of all start up reports, balance reports and O&M Manuals a final start up procedure shall occur.
 - 1. Mechanical Contractor, Balancing Contractor, Controls Contractor, Engineer and Architect shall spend up to 4 hours on site. Engineer shall direct the contractors to start and stop and change set points on miscellaneous equipment to test their operations and determine if systems are set up properly. Also up to 10% of all components will be double checked for balancing, and any other devices be retested, in his presence, for verification of report data with no additional cost.
 - 2. Mechanical Contractor, Balancing Contractor, Controls Contractor, Engineer and Architect shall continue to return to the site to double check items that were not acceptable on the previously visits until Engineer, Architect and Owner accept the systems

1.06 TRAINING

- A. Provide a minimum of (4) hours of training to the Owner, concerning the proper operation and maintenance of the control system provided. Training sessions shall be conducted during normal business hours after system startup and acceptance by the Owner.
- B. Submit operating and maintenance manuals to owner a minimum of five (5) working days prior to training session. Use these manuals as the basis for instruction at all training sessions.
- C. Video record the training sessions. Submit two copies of the training session DVD to owner prior to request for final payment.
- D. Provide two follow up visits for troubleshooting and instruction, plus six months after the end of the warranty period. Length of each visit to be not less than 2 hours or the time necessary to provide required information and complete troubleshooting and inspection activity for all controls. Coordinate the visit with the Owner.

1.07 MATERIAL DELIVERY AND STORAGE

- A. Provide factory shipping cartons for each piece of equipment and control device. This contractor is responsible for storage of equipment and materials inside and protected from the weather.

PART 2 - PRODUCTS

2.01 GENERAL

- A. System shall operate with 120 VAC power supply, fully protected with a shutdown-restart circuit, and associated hardware and software.
- B. The control system shall consist of a high speed, peer-to-peer network of DDC controllers and a web based operator interface. Depict each mechanical system and building floor plan by a point-and-click graphic. A web server with a network interface card shall gather data from this system

and generate web pages accessible through a conventional web browser on each PC connected to the network. Operators shall be able to perform all normal operator functions through the web browser interface.

2.02 LOCAL CONTROL PANELS

- A. Use control panels with suitable mounting brackets for either wall or floor mounting. Locate panel adjacent to system served.
- B. Fabricate panels of 14 gauge furniture grade steel or 6063-T5 extruded aluminum alloy, totally enclosed on six sides, hinged door and keyed lock, with manufacturer's standard shop painted finish and color.
- C. Provide UL listed cabinets for use with line voltage devices.
- D. Plastic control enclosures will be approved provided all conduits are bonded and grounded.
- E. Transformers and controllers except concealed VAV shall be in panels or cabinets of equipment served.
- F. Permanently label all controls; tag all control wiring. Wiring and tubing tags shall be within 1" or termination.

2.03 DIRECT DIGITAL CONTROLS

- A. System to be capable of integrating multiple building functions, including equipment supervision and control, alarm management, energy management, and trend data collection.
- B. DDC to consist of peer to peer controllers (ASC's) that operate stand-alone upon communications failure.
- C. The system shall be modular in nature, and shall permit expansion of both capacity and functionality through the addition of sensors, actuators, ASC's, and operator devices.
- D. The failure of any single component or network connection shall not interrupt the execution of control strategies at other operational devices.
- E. **AUTOMATIC CONTROL VALVES AND ELECTRONIC ACTUATORS:**
 - 1. Provide valves for installation requirements and pressure class, based on maximum pressure and temperature in the piping system.
 - 2. Water service valves shall be sized for a 3 psi maximum pressure drop. Valves shall be rated for minimum 250°F operating temperature. Valve CV shall be 1.5 minimum.
 - 3. Valves shall be installed by the Mechanical Contractor.
 - 4. All control valves shall be sized for the performance, pressure, size, and/or shut off rating as required of system. Valves shall be rated for 150% of system total pump pressure for minimum close-off pressure without objectionable noise.
 - 5. Provide valve operators of the electric type fully compatible with the control system. Operations shall provide two-position floating point or modulating action as specified.
 - 6. The following valves shall have spring return and fail:
 - a. Open. Hot water coils in equipment bringing in outside air and hot water HX valves, others as noted.
 - b. Closed. Chilled water coils, humidifiers, natural gas.
- I. **ELECTRONIC TEMPERATURE SENSORS**
 - 1. Duct mounted sensors shall be mounted through a hole in the duct and be positioned so as to be easily accessible for repair or replacement. A seal shall be used on the sensor assembly to prevent air leaks.
 - 2. Protective covers shall be provided on temperature sensors to prevent accidental damage.
 - 3. Outside air sensors shall be designed to withstand the environmental conditions to which they will be exposed; equipped with solar shields. Mount outdoor reset thermostats and

- sensors indoors with sensing elements outdoors.
- 4. Accuracies shall be per sensor chart.
- 5. Provide separable sockets for liquids and flanges for air bulb elements.
- 6. Space sensors labeled (T) shall be provided with set local point adjustment that can be limited or overridden through the BAS. Room sensors/thermostats and sensors with an "N" next to them shall operate the equipment fan for night setup/set back operation. Those with a "B" shall have a button to return the space to occupied temperature and operate the necessary fan for 1 hour adjustable.
- 7. Provide insulated backplates where necessary to prevent the wall construction from affecting the accurate operation of the thermostat/sensor.

J. ELECTRONIC PRESSURE SENSORS

- 1. Provide pressure sensors and other pressure-indicating sensors of commercial grade quality located at the point of measurement and installed according to the manufacturer's recommendations.
- 2. Provide pressure sensors of the direct acting or reverse acting, unidirectional or bi-directional type such that the digital control system shall be able to convert the 0 to 5 volts DC input signal available from the sensor into a digital signal for use by the digital control.
- 3. Provide pressure sensors utilizing the smallest possible operating range which will sufficiently cover the range required for normal operating conditions.
- 4. Provide pressure sensors of the ultra-precision type with a tolerance at 70°F of no greater than +.8% of full scale.
- 5. Provide pressure sensors with an end-to-end (full scale) accuracy of +2% of full scale.

K. HUMIDITY SENSORS

- 1. Use capacitive thin-film polymer sensor types with a range of 0-100% RH with a response time of 120 seconds or less. Provide covers for room humidity sensors as specified for temperature sensors.
- 2. For outside air applications, use sensor designed for outside air use along with weather enclosure. Provide sensor equal to Vaisala Model HMD60UO w/DTR503B enclosure and weather resistant mounting hardware.

N. DIFFERENTIAL PRESSURE SWITCHES (DPSW)

- 1. Differential pressure switches shall be rated for 150% of maximum system pressures that may be encountered. Provide with pressure differential that will be required to meet specified operation and/or to prevent nuisance "toggling" of the device in the system served. Unless indicated otherwise DPSW shall be used for safety shutdown and filter status.

O. CURRENT STATUS SWITCHES

- 1. Provide a current sensor with adjustable threshold and digital output with LED display, equal to a Veris Model H-708/H-904. Threshold adjustment must be by a multi-turn potentiometer or set by multiprocessor that will automatically compensate for frequency and amperage changes associated with variable frequency without false readings, drives or, if equipped, the relay in the VFD. Provide current sensors for motors/flow status.

R. SENSOR/DDC THERMOSTAT MINIMUM ACCURACIES:

Temperature except averaging	plus or minus 1F
Temperature averaging	Plus or minus 1.2F
Humidity	Plus or minus 2% RH from 20-80%
Pressure Air>.1" application	Plus or minus 1% full scale
Pressure Air =or<.1" application	Plus or minus .25% full scale
Pressure steam or liquids	Plus or minus .5% full scale
CO2	Plus or minus 50PPM or 5% of scale
Air Flow Stations	Plus or minus 5% 100-200 FPM
Air Flow Stations	Plus or minus 2% 250-5000 FPM
Note: Accuracies include non-linearity, hysteresis, deadband, and non repeatability.	

S. ELECTRONIC START/STOP CONTROL EQUIPMENT

1. Provide electronic on/off or start/stop control components which shall use either momentary relays or magnetic latching relays with integral hand-off-auto magnetic latching relays with integral hand-off-auto switches as appropriate for the control application.
 2. Provide an auxiliary relay contact or an auxiliary contract in the equipment control starter for equipment status sensing.
 3. Provide a current sensing device where the control sequence indicates the requirements for positive status proof.
- V. CONTROL SYSTEM INSTRUMENTATION
1. PIPE THERMOMETERS:
9 inch stem type with an adjustable swivel mount. Scale graduations of 2°F and mid-range accuracy of $\pm 1^\circ\text{F}$. Install thermometers in separable brass wells filled with conductive fluid.
 2. REMOTE BULB THERMOMETERS:
3-1/2 inch dial type with recalibration screw on face. Accuracy within 1% of scale range. Thermometers with sensing elements in air ducts with an area of above 4 square feet are to have averaging elements. Provide separable wells for all pipeline applications.
- W. TRANSFORMERS
1. Transformers shall have reset buttons.

2.06 APPLICATION SPECIFIC CONTROLLERS - HVAC APPLICATIONS

- A. Equipment shall be controlled by stand-alone peer to peer controllers with non-volatile memory (ASC's).
- B. Each ASC shall be a microprocessor based, multi-tasking, real-time digital control processor with sufficient processor and memory to support its own operating system and databases including:
 1. Control Processes
 2. Energy Management Applications
 3. Communication Port
- C. Provide communication handheld operator's port at each ASC to allow access to the entire network from any ASC or room sensor terminal and/or laptop computer.
- D. The minimum features shall be available through the communications port:
 1. Display temperatures
 2. Display status
 3. Display set points
 4. Display control parameters
 5. Override binary output control
 6. Override analog set points
 7. Modification of gain and offset constants
- E. All system set points, proportional bands, control algorithms, and any other programmable parameters shall be stored such that a power failure of any duration does not necessitate reprogramming the ASC. The ASC's shall provide the sequences of operation for each piece of equipment specified. If the contractor provides equipment that doesn't match the specifications and hasn't received proper A/E substitution authorization, he shall replace, at his expense, said equipment or system at A/E's direction.

2.08 SYSTEM PERFORMANCE AND PROTOCOL INTERFACES

- A. The system shall report all alarms and implement all commands within 15 seconds of occurrence.
- B. Provide all BacNet and LonWorks interfaces required to provide the points and sequences described in the contract documents.

PART 3 - EXECUTION

3.01 GENERAL

- A. All electric/electronic work required as an integral part of the Direct Digital Control system work is the responsibility of this section unless specifically indicated otherwise.
 - 1. All low voltage wiring provided by this Contractor shall be enclosed in conduit (EMT) when exposed. All line voltage provided by this Contractor shall be enclosed in conduit (EMT). All control wiring outdoors shall be enclosed in watertight conduit suitable for outdoor use.
 - 2. Provide electrical back box for all thermostats. All low voltage wiring to thermostats located in walls shall be in conduit (EMT) from thermostat to ceiling cavity. Seal all openings in back box with UL GB electrical conduit seal.
 - 3. All wiring and conduit shall be secured at regular intervals and run parallel with the lines of the building.
 - 4. Power to local temperature control panels not shown on drawings, shall be provided by this Contractor.
 - 5. All conduits shall be concealed in walls, ceiling, etc. where possible.
 - 6. If contractor plans to use owners LAN, the contractor shall obtain permission and provide any required data jacks plus wiring to the owner agreed connection point.
- B. SET POINTS:
 - 1. All set points indicated in sequences shall be adjustable.
- C. This contractor shall provide all labor, materials, engineering, software, permits, tools, checkout and certificates required to install a complete Direct Digital Control system as herein specified.
- D. Any and all points added with this project shall be grouped for display purposes into the system such that all points associated with a new or existing DDC system can appear together on the CRT display or printed log. Assignment of points to a group shall not be restricted by hardware configuration of the points of direct digital control. It shall be possible to assign a point to appear in more than one system. An English descriptor and an alpha/numeric identifier shall identify each system.
- E. This Direct Digital Control system as herein specified shall be fully integrated and completely installed by this section. It shall include all required computer CPU software and hardware. Include the engineering, installation, supervision, calibration, software programming, and checkout necessary for a fully operational system.
- F. Provide separate adjustable heating and cooling set points for both the occupied and unoccupied modes.

3.02 INSTALLATION

- A. All work and materials are to conform in every detail to the rules and requirements of the National Electrical Code and present manufacturing standards. All material shall be UL approved.
 - 1. Include the engineering, installation, supervision, calibration, software programming, and check-out necessary for a fully operational system.
 - 2. Line voltage wiring to power the control system Controllers to be by this contractor.
 - 3. Provide electronic sensors, transmitters, potentiometers, controllers, power supplied and transducers as required.
- B. Install system and materials in accordance with manufacturer's instructions, rough-in drawings and details on drawings.
- C. All line and low voltage wiring to power the DDC Control to be by this contractor. All necessary breakers and fuses for the DDC controls shall be by this Contractor and shall meet the requirements as set forth in Division 26 specification.
- D. All controls and control panels serving equipment fed by emergency power shall also be served by emergency power, with all sequences of operation fully functional in both power modes.
- E. Provide uninterruptable power supplies where necessary to provide proper startup of equipment or to accomplish power restart control sequences specified.

- F. Mount control panels adjacent to associated equipment on vibration-free walls or free-standing angle iron supports. One cabinet may accommodate more than one system in same equipment room. Provide engraved plastic nameplates for instruments and controls inside cabinet and on cabinet face.
- G. Provide as-built control drawings of all systems served by each local panel in a location adjacent to or inside of panel cover. Provide a protective cover or envelope for drawings.
- H. Extension of the data-net between DDC Controllers and to (LAN) Local Area Network to be by this contractor. Cable tray routing of the communication trunks is acceptable providing that all wiring not in the tray is run in conduit. Sensor or any I/O wiring cannot be run in cable trays.
- I. Provide an input for a service shutdown toggle switch for each Air Handling Unit system provided inside the temperature control panel that will initiate a logical shutdown of the Air Handling Unit system.
- J. All tubing, cable and individual wiring is to be permanently tagged, with numbers corresponding with "Record Drawings", spares are to be labeled as "Spare".
- K. Provide technician to work with air balancing contractor and/or provide balancing contractor with necessary hardware to over-ride DDC controllers for air balancing. This Contractor shall assist the Testing and Balancing contractor by completing all control work as follows:
 - 1. Verify that all control components are installed in accordance with project requirements and are functional.
 - 2. Verify that all controlling instruments are calibrated and set for design operating conditions.
 - 3. Calibrate room thermostats after installation, and before the thermostat control verification tests are performed. The balancing agency shall provide the accuracy of final settings by taking temperature readings. The readings shall be in a typical conditioned space for each separately controlled zone.
 - 4. Allow sufficient time in the project to provide assistance and instruction to the balancing agency in the proper use and setting of control.
- L. Provide documentation to demonstrate that all points, input and output have been checked out and verified operational, note any points not operating properly with notation of reason.
- M. Thermostats and Room Sensors
 - 1. The thermostats and room sensors shown on the plans are to facilitate understanding. Not all may be shown. The contractor shall locate them by the light switch unless they would be affected by sunlight, or other heat sources. When installed adjacent to light switch, align to match light switch. Do not locate in mirrors, white/black boards, movie screens, cabinets, etc.
 - 2. Align with centerline of adjacent light switches. Contact Engineer if this will result in a conflict.
 - 3. Locate 44" above floor in accordance with the requirements of ADA.
 - 4. Provide insulated subbase for all thermostats and sensors installed on outside walls or walls exposed to outside air temperatures. Subbase shall provide a minimum of one half inch of insulation.

3.05 WARRANTY

- A. Provide one year warranty, starting upon system acceptance by Owner.
- B. Warranty: Include coverage for the complete temperature control system specified.

3.06 MANUFACTURER'S FIELD SERVICES

- A. Prepare and start systems.
- B. After completion of installation, test and adjust control equipment. Submit data showing set points

and final adjustments of controls.

END OF SECTION

SECTION 23 09 14

PNEUMATIC AND ELECTRICAL INSTRUMENTATION AND CONTROL DEVICES FOR HVAC

PART 1 - GENERAL

1.01 SCOPE

- A. This section includes pneumatic control system specifications for all HVAC work as well as related pneumatic control for systems found in other specification sections. Included are the following topics:

PART 1 - GENERAL

- Scope
- Related Work
- Reference Standards
- System Description
- Submittals
- Design Criteria
- Operating and Maintenance Manuals
- Training

PART 2 - PRODUCTS

- Manufacturers
- Air Piping
- Control Air Supply
- Air Compressors
- Surge Tanks
- Refrigerated Air Dryers
- Pressure Reducing Air Valves
- Control Dampers
- Smoke and Fire/Smoke Dampers
- Control Valves
- Control System Instrumentation
- Thermostats
- Humidistats
- Receiver Controllers
- Transmitters
- Duct Smoke Detector and Fire Alarm Interface Modules
- Air Flow Stations
- Air Flow Measuring Station with Integral Damper
- Water Flow Measurement
- Steam Flow Measurement
- Time Clocks
- Temperature Control Panels
- Pneumatic System Accessories
- Temperature Sensors
- Humidity Sensors
- Pressure Transducers (Air)
- Pressure Transducers (Liquid)
- Differential Pressure Switches
- Current Status Switches
- Electric to Pneumatic Transducers
- Power Supplies

PART 3 - EXECUTION

- Installation
- Air Compressors
- Refrigerated Air Dryers

Control and Smoke Dampers
Control Valves
Control System Instrumentation
Room Thermostats and Temperature Sensors
Low Limit Thermostats (Freezestats)
Air Flow Stations
Liquid and Steam Flow Sensors
Pressure Transducers
Temperature Control Panels
Differential Pressure Switches
Current Status Switches
Sequence of Operations
Testing, Adjusting and Balancing

1.02 RELATED WORK

- A. This Contractor shall provide work, services, equipment, accessories, and materials shown or described by the applicable sections of any part of any section or division of the contract documents.

1.03 REFERENCE STANDARDS

ANSI B16.22	Wrought Copper and Wrought Copper Alloy Solder Joint Pressure Fittings
ANSI/ASTM B32	Specification for Solder Metal
ASTM B75	Seamless Copper Tube
ASTM D1693	Environmental Stress-Cracking of Ethylene Plastics
UL 94	
UL 555S	Leakage Rated Dampers for Use in Smoke Control Systems

1.04 SYSTEM DESCRIPTION

- A. System is to use direct digital control logic with electric actuation.
- B. All cables to the electronic input/output devices, sensors, relays and interlocking wiring (all of which shall be supplied and installed under this section of specification) interfaced with the Direct Digital Control System shall be extended into the DDC panel with a minimum of 5 ft. of cable to allow for termination by the DDC Contractor. This contractor shall provide a technician to inspect and validate all tubing and wiring associated with the DDC interface in coordination with and under direction of the DDC Contractor.
- C. All pneumatic tubing and electrical wiring are to be permanently tagged or labeled (with-in one inch of terminal strip) with a numbering system to correspond with the "Record Drawings".

1.05 SUBMITTALS

- A. Include the following information:
1. Manufacturer's data sheets indicating model number, pressure/temperature ratings, capacity, methods and materials of construction, installation instructions, and recommended maintenance. General catalog sheets showing a series of the same device is not acceptable unless the specific model is clearly marked.
 2. Schematic flow diagrams of systems showing fans, pumps, coils, dampers, valves, and other control devices. Label each device with setting or adjustable range of control. Indicate all wiring, clearly, differentiating between factory and field installed wiring.
 3. Details of construction, layout, and location of each pneumatic control panel, including instruments location in panel and labeling.
 4. Schedule of control dampers indicating size, leakage rating, arrangement, pressure drop at design airflow, and number and size of operators required.
 5. Schedule of control valves indicating system in which the device is to be used, rated capacity, flow coefficient, flow required by device served, actual pressure drop at design

- flow, size of operator required, and locations where valves are to be installed.
 - 6. A complete description of each control sequence.
 - 7. Calculations completed to determine size of control air compressor(s) and dryer(s).
- B. Installing contractor must be a manufacturer's branch office or an authorized representative of the control equipment manufacturer that provides engineering and commissioning of the manufacturers control equipment: submit written confirmation of such authorization from the manufacturer. Indicate in letter of authorization that installing contractor has successfully completed all necessary training required for engineering, installation, and commissioning of equipment and systems to be provided for the project, and that such authorization has been in effect for a period of not less than three years.
- C. Prior to request for final payment, submit record documents which accurately record actual location of control components including panels, thermostats, wiring, and sensors. Incorporate changes required during installation and start-up.

1.06 DESIGN CRITERIA

- A. Size all control apparatus to properly supply and/or operate and control the apparatus served.
- B. Provide control devices subject to corrosive environments with corrosion protection or construct them so they are suitable for use in such an environment.
- C. Provide devices exposed to outside ambient conditions with weather protection or construct them so they are suitable for outdoor installation.
- D. Use only UL labeled products that comply with NEMA Standards. Electrical components and installation to meet all requirements of the Division 26 Specification Sections for this project.

1.07 OPERATING AND MAINTENANCE MANUALS

- A. Furnish four (4) bound operating and maintenance manuals for review and approval to the Architect prior to substantial completion, performance testing, and training. Operation and maintenance instructions for the equipment and systems provided shall include the following:
 - 1. Recommendations for frequency of service and preventative maintenance.
 - 2. List indicating types and grades of oil and/or grease, packing materials, normal and abnormal tolerances for devices, and method of equipment adjustment.
 - 3. A description of recommended replacement parts and materials which the owner should stock.
 - 4. A summary of equipment vendors, or location where replacement parts can be purchased.
 - 5. Manufacturer's literature indicating features, materials of construction, and operating limits of installed equipment. (Brochures giving brief descriptions of multiple pieces of control apparatus are not acceptable.)
 - 6. A complete set of record control drawings.
 - 7. Name, address, and telephone number of the person or office to contact for service during the warranty period.
 - 8. Name, address, and telephone number of the person or service organization to be contacted for service after the warranty period.

1.08 TRAINING

- A. Provide a minimum of 4 hours of training to the Owner, concerning the proper operation and maintenance of all control systems and all sensing, monitoring, and control equipment. Provide an initial 2 hour training session to the owner upon completion of the project and an additional 2 hour meeting 6 months later. Training sessions shall be conducted during normal business hours after system start-up and acceptance by the Owner.

- B. Submit approved operating and maintenance manuals to the Owner a minimum of five (5) working days prior to training session. Use these manuals as the basis for instruction at all training sessions.
- C. Video record the training sessions. Submit two copies of the training session recording to Owner prior to request for final payment.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Johnson Controls, Incorporated, Honeywell, Siemens (Landis - Powers) or Invensys (Siebe).

2.09 CONTROL VALVES

- A. Provide all control valves as shown on the details and as required to perform functions specified. Spring ranges must be selected to prevent overlap of operation and simultaneous heating and cooling.
- B. Size operators to allow smooth and positive operation of devices served and to provide sufficient capacity for tight shutoff against system temperatures and pressure encountered. Use rolling diaphragm, spring loaded, and piston type operators.
- C. Provide operators that are full proportioning or two-position, as required for specified sequence of operation. Provide spring-return for applications involving fire, freeze protection, moisture protection or specified normally open/closed operation.
- D. Provide operators and pilot positioners with linkages and brackets for mounting on device served. Valve shall be sized with a minimum close off pressure of 150% of maximum system operating pressures.
- E. WATER SYSTEMS:
 - 1. Use equal percentage valves for two-way control valves; size for a maximum 3 psi pressure drop.
 - 2. Use three-way valves sized for a maximum pressure drop of 3 psi and that have linear characteristics so that the valve pressure drop remains constant regardless of the valve position.
 - 3. Globe valves 2" and smaller: Bronze body, brass plug and seat, stainless steel stem, composition disc, screwed ends, suitable for use on water systems at 150 psig and 240° F.
 - 4. Globe valves 2 1/2" and larger: Iron body, brass plug and seat, stainless steel stem, spring loaded Teflon, or EPDM packing, flanged ends, suitable for use on water systems at 150 psig and 240°F.
 - 5. Butterfly valves: Iron body, stainless steel shaft, bronze bearings, and resilient seat. Disc is to be aluminum-bronze, nickel-plated ductile iron, cast iron with welded nickel edge, or stainless steel. Valve assembly is to be bubble tight, suitable for use on water systems at 150 psig and 240°F. Provide pilot positioners on all operators for butterfly valves used in modulating applications.

2.11 THERMOSTATS

- A. Provide insulated subbase for all thermostats installed on outside walls or walls exposed to outside air temperatures. Subbase is to provide a minimum of one half inch of insulation.
- I. REMOTE BULB THERMOSTATS: One or two-pipe, proportioning, direct or reverse acting to match device being controlled. Thermostat is to have adjustable setpoint and throttling range. Capillary to remote bulb shall be armored.

- K. IMMERSION TYPE THERMOSTAT SENSORS: Rod and tube type with linear output. Provide separable wells with heat conductive fluid for installation in pipeline. Units shall be factory calibrated.

2.20 TEMPERATURE CONTROL PANELS

- A. Constructed of steel or extruded aluminum, with hinged door, keyed lock, and baked enamel finish. Install controls, relays, transducers and automatic switches inside panels. Label devices and provide wiring/piping diagram within enclosure. Provide raceways for wiring and poly within panel for neat appearance and to separate high and low voltage wiring. Provide termination blocks and fused disconnect for 120VAC power wiring. All cabinets shall be UL listed for line voltage applications.
- B. Manual switches including damper "minimum-off" positioning switches, "summer-winter switches", "manual-automatic switches", dial thermometers, pressure gauges, and receiver indicating gauges shall be flush mounted in front door of panel. Clearly identify each item with engraved nameplates.

2.22 TEMPERATURE SENSORS

- A. Thermistor temperature sensor manufacturers: PreCon, BAPI, and ACI.
- B. Use thermistor or RTD type temperature sensing elements constructed so accuracy and life expectancy is not affected by moisture, physical vibration, or other conditions that exist in each application. RTD's shall be of nickel or platinum construction and have a base resistance of 1000Ω at 70°F and 77°F respectively. 100Ω platinum RTD's are acceptable if used with temperature transmitters.
- C. The temperature sensing device used must be compatible with the DDC controllers used on the project.

RTD

Accuracy (Room Or Probe)	minimum $\pm 0.65^{\circ}\text{F}$
Accuracy (Averaging)	minimum $\pm 1.2^{\circ}\text{F}$
Range	minimum -40 - 220°F

Thermistor

Accuracy (All)	minimum $\pm 0.36^{\circ}\text{F}$
Range	minimum -30 - 230°F
Heat Dissipation Constant	minimum 2.7 mW/°C

Temperature Transmitter

Accuracy	minimum $\pm 0.1^{\circ}\text{F}$ or $\pm 0.2\%$ of span
Output	4-20 mA

- D. Provide limited range or extended range sensors if required to sense the range expected for a respective point. Use RTD type sensors for extended ranges beyond -30°F to 230°F. If RTD's are incompatible with DDC controller direct temperature input use temperature transmitters in conjunction with RTD's.
- E. Use wire size appropriate to limit temperature offset due to wire resistance to 1.0°F. If offset is greater than 1.0°F due to wire resistance, use temperature transmitter. If feature is available in DDC controller, compensate for wire resistance in software input definition.
- F. Use averaging elements on duct sensors when the ductwork is four square feet or larger.
- G. In piping systems use temperature sensors with separable wells designed to be used with temperature element.

2.27 CURRENT STATUS SWITCHES

- A. Provide a current sensor with adjustable threshold and digital output with LED display, equal to Veris model H-708/H-904. Threshold adjustment must be by a multi-turn potentiometer or set by multiprocessor that will automatically compensate for frequency and amperage changes associated with variable frequency drives. When used on variable speed motor applications, use a current sensor that will not change state due to varying speeds.

2.29 POWER SUPPLIES

- A. Provide all required power supplies for transducers, sensors, transmitters and relays. All low voltage transformers shall have a resettable secondary circuit breaker.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. System installation shall be by trained mechanics employed by the control equipment manufacturer or an authorized representative of the manufacturer. Where installing contractor is an authorized representative of the control manufacturer, such authorization shall have been in effect for a period of no less than three years.
- B. Install all control equipment, accessories, wiring, and piping in a neat and workmanlike manner. All control devices must be installed in accessible locations. All fin pipe radiation, convector, or cabinet unit heater valves shall have operators fully concealed behind the cover. Valves 2" and smaller shall be of the screwed type.
- C. Provide all line and low voltage electrical relays and wiring for control systems, devices and components. Install all high voltage and low voltage wiring in metal conduit or EMT. All conduit and EMT must be installed in accordance with electrical sections (Division 26) of this specification and the National Electrical code.
- D. Conduit may be a minimum of 1/2 " for low voltage control provided the pipe fill does not exceed 40%.
- E. Minimum low voltage wiring gauge to be 18 AWG for outputs and 20 AWG for inputs. All low voltage wiring is to be stranded.
- F. Control panels serving equipment fed by emergency power shall also be served by emergency power.
- G. At each receiver controller input port, install a 1-1/2" diameter dial indicator with scale to match input range (in degrees F., % R.H., in. w.c., etc.). Equip control air output line with a 1-1/2" diameter air pressure gauge.
- H. Install "hand/off/auto" selector switches on systems where automatic interlock controls are specified and "hand/off/auto" selector switches are not supplied with the equipment controlled. Control panel power will not be required for "hand" switch to operate. When switch is in "hand" position, allow manual operation of the selected device without operating the interlocked motors but allowing all unit safety devices to stay in the circuit.
- I. All pneumatic tubing and electrical wiring are to be permanently tagged or labeled within one inch of terminal strip with a numbering system to correspond with the "Record Drawings".
- J. After completion of installation, test and adjust control equipment. Submit data showing set points and final adjustments of controls.

3.06 CONTROL VALVES

- A. All temperature control valves furnished by the control manufacturer are to be installed by the Mechanical Contractor under the coordinating control and supervision of the Control Contractor in locations shown on plans or where required to provide specified sequence of control.
- B. Provide pilot positioners on all valves where more than one pneumatic operator is controlled in sequence, for all valves 3" and larger, or where required to provide sufficient power. Where two or more valves are operated in sequence, pilot positioners to have adjustable start point (2-12 psig) and span (5-13 psig).

3.13 TEMPERATURE CONTROL PANELS

- A. Mount control panels adjacent to associated equipment on vibration-free walls or freestanding angle iron supports. One cabinet may accommodate more than one system in same equipment room. Provide engraved plastic nameplates for instruments and controls inside cabinet and on cabinet face.
- B. Provide as-built control drawings of all systems served by each local panel in a location adjacent to or inside of panel cover. Provide a protective cover or envelope for drawings.

3.15 CURRENT STATUS SWITCHES

- A. Provide for each fan or pump specified, or shown on point list. Set threshold adjustment to indicate belt or coupling loss. Readjust threshold for proper operation after final balancing is completed.

END OF SECTION

SECTION 23 07 00

HVAC INSULATION

PART 1 - GENERAL

1.01 SCOPE

- A. This section includes insulation specifications for heating, ventilating and air conditioning piping, ductwork and equipment. Included are the following topics:

PART 1 - GENERAL

Scope
Reference Standards
Quality Assurance
Description
Definitions
Submittals

PART 2 - PRODUCTS

Materials
Insulation
Jackets
Accessories

PART 3 - EXECUTION

Installation
Jackets
Piping, Valve and Fitting Insulation
Equipment Insulation

1.02 RELATED WORK

- A. The Contractor shall provide work, services, equipment, accessories, and materials shown or described by the applicable sections of any part of any Section or Division of the contract documents.

1.03 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

1.04 QUALITY ASSURANCE

- A. Refer to Division 01, General Conditions, Equals and Substitutions.
- B. Label all insulating products delivered to the construction site with the manufacturer's name and description of materials.

1.05 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:
 - 1. Pipe Insulation
 - 2. Duct Insulation
 - 3. Equipment Insulation
- B. Install all insulation in accordance with the latest edition of MICA (Midwest Insulation Contractors Association) Standard and manufacturer's installation instructions.
- C. Piping and ductwork insulation shall meet the requirements of the [Wisconsin Department of Safety and Professional Services Chapter SPS 363](#), current edition.

1.06 DEFINITIONS

- A. Concealed: shafts, furred spaces, space above finished ceilings, utility tunnels, attic and crawl spaces. All other areas, including walk-through tunnels, shall be considered as exposed.

1.07 SUBMITTAL DRAWINGS

- B. 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.

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:
 - 1. Pipe 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

- A. Manufacturers: Armarell, Certainteed, Manson, Childers, Dow, Extol, Fibrex, Halstead, H.B. Fuller, Imcoa, Johns Manville, Knauf, Owens-Corning, Pittsburgh Corning, or Schuller.
- 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.
- D. 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. Piping: 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.

3. Ductwork: Foil-scrim-kraft vapor barrier jacket, factory applied to insulation, maximum permeance of .02 perms.

E. 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.

2.03 JACKETS

B. ALL SERVICE JACKETS (ASJ):

1. Heavy duty, fire retardant material with white kraft reinforced foil vapor barrier, 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.

E. SELF-ADHERING JACKETS (SAJ):

1. Venture Tape 1579CW 13 ply, self-adhering multiple laminated waterproofing material with reflective aluminum foil, high density polymer films and cold weather acrylic adhesive providing zero (0.0) permeability. Minimum 15.5 mils (0.0155 inches) material thickness, 34 lb. puncture resistance when tested in accordance with ASTM D1000 and flame spread/smoke developed rating of 10/20 when tested in accordance with UL 723.
2. Vapor retarding tape shall be specifically designed and manufactured for use with the self-adhering jacket specified above. Tape shall be provided by the same manufacturer that provides jacketing. Vapor retarding tapes used with self-adhering jackets shall have a maximum permeance of 0.0 perms.

G. VAPOR RETARDING JACKETS (VRJ):

1. Polyvinylidene chloride (PVDC) vapor retarding jacket material with minimum 6 mils material thickness and maximum permeance of 0.01 perms. Material shall not support the growth of mold or mildew. Dow Saran or equivalent.
2. Vapor retarding tape shall be specifically designed and manufactured for use with the vapor retarding jacket specified above. Tape shall be provided by the same manufacturer that provides jacketing. Vapor retarding tapes used with vapor retarding jackets shall have a maximum permeance of 0.01 perms.

H. INSULATION INSERTS AND PIPE SHIELDS:

1. Manufacturers: B-Line, Pipe Shields, Value Engineered Products
2. Construct inserts with calcium silicate or polyisocyanurate (service temperatures below 300 degrees F only), 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 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.
3. 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 shield gauge are increased to compensate for lower insulation compressive strength.
4. Precompressed 20# density molded fiberglass blocks, Hamfab or equal, of the same thickness as adjacent insulation may be substituted for calcium silicate inserts with one 1"x6" block for piping through 2-1/2" and three 1"x6" blocks for piping through 4". Submit shield schedule to demonstrate equivalency to preengineered/premanufactured product described above.
5. Wood blocks will not be accepted.

- I. EXPANSION JOINT AND VALVE INSULATION BLANKETS:
1. Manufacturers: Advance Thermal Corporation, TANI Division B.D. Schiffler or approved equal.
 2. Jacket shall be 7 ounce per square yard Teflon coated Nomex fabric which is designed for wet and dry steam applications to 550°F. Equal to Advance Thermal Corp. Steamguard-1 cloth. The covers shall be installed to shed water and have a 1-inch rain flap.
 3. All seams shall be sewn twice with double locked stitching. One seam shall be sewn with 3-ply Nomex and the other with 3-ply stainless steel. Hog rings and staples shall not be used.
 4. The insulation shall be a 2 inch thick, 6 lb. density ceramic fiber which is held in place with 12 gauge stainless quilt pins which do not puncture the inner surface of the cover.
 5. Covers shall be designed to allow access to the expansion and ball joints packing cylinder plungers for repacking with removing the covers.
 6. Adjacent pipe insulation must be installed to allow the piping to expand into expansion joints without damaging the insulation or removable covers.

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. Clean all surfaces to be insulated before installation.
- 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. Insulate sections of equipment requiring periodic servicing with removable sheet metal casings filled with the same thickness of material as the adjoining insulation.
- D. Remove insulation if defects develop after insulating. After repair of defects, replace the insulation equal to original without cost to the project.

- E. Install all duct insulation without sagging, and repair all tears and punctures without cost to the project.
- F. No thermal insulation required on casings, plenums or ducts located inside the building which has an acoustical lining.
- G. Repair insulation on existing systems, if applicable, where new points of connection occur.
- H. Install insulation with smooth and even surfaces. Poorly fitted joints or use of filler in voids will not be accepted. Provide neatly beveled and coated terminations at all nameplates, uninsulated fittings, or at other locations where insulation terminates. Install with longitudinal joints facing wall or ceiling.
- I. Install fabric reinforcing without wrinkles. Overlap seams a minimum of 2 inches.
- J. 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.
- K. Insulation shall be continuous through sleeves and openings except where fire rated penetration materials require interruption of insulation. Vapor barriers shall be maintained continuous through all penetrations.
- L. Provide a complete vapor barrier for insulation on the following systems:
 - 1. Cold Water Make-Up
 - 2. Chilled Water
 - 3. Refrigerant
 - 4. Insulated Duct
 - 5. Equipment with a surface temperature below 65°F
 - 6. Glycol/Brine

3.02 JACKETS

- A. SELF ADHERING JACKETS (SAJ)
 - 1. Install according to Manufacturer's recommendations. Cut allowing minimum 4" overlap on ends and 6" on longitudinal joints. Align parallel to surface. Remove release paper and press flat to surface to avoid wrinkles. Rub entire surface for full adhesion and sealing at joint overlaps. On exterior applications, provide a bead of compatible caulk along exposed edges.
 - 2. Piping with self-adhering jackets (SAJ) shall have elbows, fittings, valves, and butt joints wrapped with 2 layers of vapor retarding tape. Piping with a PVC jacket (PFJ) installed over the self-adhering SAJ jacket may be provided with a single, lapped layer of vapor retarding tape for elbows, fittings, and valves under the PVC jacket. Vapor retarding tape shall be compatible with the jacket material used.
- B. VAPOR RETARDING JACKETS (VRJ)
 - 1. Piping with vapor retarding jackets (VRJ) shall have elbows, fittings, valves, and butt joints wrapped with 2 layers of vapor retarding tape. Piping with a PVC jacket (PFJ) installed over the vapor retarding jackets (VRJ) may be provided with a single, lapped layer of vapor retarding tape for elbows, fittings and valves under the PVC jacket. Vapor retarding tape shall be compatible with the jacket material used.

3.03 PIPING, VALVE, AND FITTING INSULATION

- A. 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.
- B. 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.

- C. Where insulated piping is installed on hangers and supports, the insulation shall be installed continuously through the hangers and supports. High density inserts shall be provided as required to prevent the weight of the piping from crushing the insulation. Pipe shields are required at all support locations. The insulation shall not be notched or cut to accommodate the supporting channels.
- D. Fully insulate all reheat coil piping, fittings, valves, temperature control valves (with the exception of unions) up to coil connections. Insulate the exposed ends of hot water reheat coils that are installed in cooling terminals or air streams that deliver cooling for air conditioning.
- E. **INSULATION INSERTS AND PIPE SHIELDS:**
 - 1. 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.
- F. **FITTINGS AND VALVES:**
 - 1. Fittings, valves, unions, flanges, couplings and specialties shall be insulated with either factory molded or built up insulation of the same thickness as adjoining insulation. Where the ambient temperature exceeds 150°F, cover insulation with fabric reinforcing and mastic or where temperatures do not exceed 150°F, furnish and install PVC fitting covers.
- K. **PIPE INSULATION SCHEDULE:**
 - 1. Provide insulation on new and existing remodeled piping as indicated in the following schedule:

<u>Service Types</u>	<u>Insulation</u>	<u>Jacket</u>	<u>Insulation Thickness By Pipe Size</u>				
			<u><1"</u>	<u>1" to 1-1/2"</u>	<u>1-1/2" to 4"</u>	<u>4" to 8"</u>	<u>>8"</u>
Hot water Heating	Rigid Fiberglass	ASJ	1.5"	1.5"	2"	2"	2"
Glycol Piping	Rigid Fiberglass	VRJ or SAJ	1"	1"	1"	1"	1"

- L. The following piping and fittings are not to be insulated:
 - 1. Hot water piping inside radiation, convector, or cabinet heater enclosures
- M. For systems with fluid temperatures 65°F or less, furnish and install removable elastomeric insulation covers, plugs, or caps for all mechanical equipment and devices that require access by balancing contractors or service and maintenance personnel. Examples include, but are not limited to: flow sensing devices, circuit setters, manual ball valve air vents, drain vents, blowdown valves, pressure/temperature test plugs, grease fittings, pump bearing caps, equipment labels, etc. Cover shall be tight fitting to ensure a complete vapor barrier.

3.05 EQUIPMENT INSULATION

- A. **GENERAL:**
 - 1. Do not insulate over equipment access manholes, fittings, nameplates or ASME stamps. Bevel and seal insulation at these locations.
- I. **EQUIPMENT INSULATION SCHEDULE:**
 - 1. Provide equipment insulation as follows:

<u>Equipment</u>	<u>Insulation Type</u>	<u>Jacket</u>	<u>Insulation Thickness</u>
Air Separator (Hot Water)	Semi-Rigid Fiberglass	ASJ or FMJ	1.5"

<u>Equipment</u>	<u>Insulation Type</u>	<u>Jacket</u>	<u>Insulation Thickness</u>
Heat Exchangers	Semi-Rigid Fiberglass	ASJ	2"
Hot Water Storage Tanks	Semi-Rigid Fiberglass	ASJ	2"

2. Insulate air handling unit casings, chambers, or plenums (filters, mixing chambers, sound attenuators, etc.) in accordance with requirements of adjacent duct insulation.

END OF SECTION

SECTION 23 05 93

TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.01 SCOPE

- A. This section includes all air and water testing, adjusting and balancing for the entire project. Included are the following topics:

PART 1 - GENERAL

Scope
Reference
Reference Standards
Description
Quality Assurance
Related Work
Pre-Installation Meeting
System Start Up
Pre-Balance Conference
Submittals

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

Preliminary Procedures
Existing Equipment
Performing Testing, Adjusting and Balancing
Hydronic Balancing
Air Balancing
Deficiencies
Verification
Equipment

1.02 REFERENCE

- A. The contractor shall provide work, services, equipment, accessories, and materials shown as described by the applicable sections of any part of any section or division of the contract documents.

1.03 REFERENCE STANDARDS

AABC	National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems, Fifth Edition, 1989
ASHRAE	ASHRAE Handbook, 2007 HVAC Applications, Chapter 37, Testing Adjusting and Balancing
NEBB	Procedural Standards for Testing Adjusting Balancing of Environmental Systems, Fifth Edition, 1991

1.04 DESCRIPTION

- A. This Contractor shall be an independent Air Balance and Testing Agency not associated with the Mechanical Contractor. The Contractor shall specialize in the balancing and testing of heating, ventilating and air conditioning systems, and all work shall be done under the direct supervision of a qualified heating and air conditioning engineer employed by the agency. The Contractor shall be certified as a member of Associated Air Balance Council (AABC) or National Environmental Balancing Bureau (NEBB), and have at least three (3) years of independent practice.
- B. Provide total mechanical systems testing, adjusting and balancing. Requirements include the balance of air and water distribution, adjustment of new and existing systems to provide design

quantities indicated on the drawings, electrical measurement and verification of performance of all equipment, all in accordance with standards published by AABC or NEBB.

- C. Test, adjust and balance all air and hydronic systems so that each room, piece of equipment and terminal device is using the quantities indicated on the drawings and in the specifications.
- D. Accomplish testing, adjusting and balancing work in a timely manner that allows for the completion of the entire project in the time stated in the Instruction to Bidders and in accordance with the completion schedule established for this project.
- E. The test and balance agency is required to make necessary periodic site visits to verify that essential provisions necessary for the work are provided to accomplish the specified testing, adjusting and balancing work. If problems are found, handle as specified in Part 3 under Deficiencies.

1.05 QUALITY ASSURANCE

- A. This Contractor shall provide a NEBB Certificate of Conformance Certification if a NEBB certified Contractor or a certificate showing participation in the AABC National Performance Guaranty Program.
- B. The Architect / Engineer reserve the right to direct this Contractor to recheck up to 10% of air and water terminals at no additional cost to the Owner.

1.06 RELATED WORK

- A. Division 23 drawings and specifications define the scope of the systems to be balanced. Refer to construction bulletins for proposed changes and to change orders for changes that have been accepted.
- B. Division 26 drawings and specifications define the scope of the electrical power systems that serve the mechanical equipment. Refer to Division 23 specifications for line and low voltage control wiring work that serves mechanical systems.

1.07 PRE-INSTALLATION MEETING

- A. Test and balance agency will be required to attend a pre-installation meeting with all other project contractors before the construction process is started. The test and balance agency should be prepared to give input on the time requirements for the work required in this section.

1.08 SYSTEM START-UP

- A. Following the completion of all start-ups for all Mechanical Systems and assembly of all start up reports, balance reports and O&M Manuals a final start up procedure shall occur.
 - 1. Mechanical Contractor, Balancing Contractor, Controls Contractor, Engineer and Owner shall spend up to 8 hours on site. Engineer shall direct the contractors to start and stop and change set points on miscellaneous equipment to test their operations and determine if systems are set up properly. Also up to 10% of all components will be double checked for balancing, and any other devices be retested, in his presence, for verification of report data with no additional cost.
 - 2. Mechanical Contractor, Balancing Contractor, Controls Contractor, Engineer and Architect shall continue to return to the site to double check items that were not acceptable on the previously visits until Engineer, Architect and Owner accept the systems.

1.09 PRE-BALANCE CONFERENCE

- A. Prior to beginning testing, adjusting and balancing, schedule and conduct a conference with the Architect and the mechanical system and temperature control system installing Contractors. 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.

1.10 SUBMITTALS

- A. See also Related Work in this section.
- B. Submit testing, adjusting and balancing reports bearing the seal and signature of the NEBB or AABC Certified Test and Balance Supervisor. The reports shall be certified proof that the systems have been tested, adjusted and balanced in accordance with the referenced standards; shall be an accurate representation of how the systems have been installed and are operating; and shall be an accurate record of all final quantities measured to establish normal operating values of the systems.
- C. Submission: Submit four (4) complete sets of reports to Owner for review. If information is deemed incomplete or further testing, adjusting, and balancing is deemed necessary, reform the additional work and resubmit four (4) final complete sets.
- D. Format: Bind report forms in three-ring binders or portfolio binders. Label edge or front with label identifying project name, project number and descriptive title of contents. Divide the contents of the report into the below listed divisions, separated by divider tabs:
 - 1. General Information
 - 2. Summary
 - 3. Hydronic Systems
 - 4. Special Systems
 - 5. Comments, Deficiencies, and Recommendations
- E. Contents: Provide the following minimum information, forms and data:
 - 1. General Information: Inside cover sheet identifying Test and Balance Agency, Contractor, Architect, Engineer, Project Name and Project Number. Include addresses, contact names and telephone numbers. Also include a certification sheet containing the seal and signature of the Test and Balance Supervisor.
 - 2. Summary: Provide summary sheet describing mechanical system deficiencies. Describe objectionable noise or drafts found during testing, adjusting and balancing. Provide recommendations for correcting unsatisfactory performances and indicate whether modifications required are within the scope of the contract, are design related or installation related. List instrumentation used during testing, adjusting and balancing procedures.
 - 3. The remainder of the report to contain the appropriate standard NEBB or AABC forms for each respective item and system. Fill out forms completely. Where information cannot be obtained or is not applicable indicate same.
 - 4. Reports shall include concept flow diagrams of air handling system components and hydronic system components. Diagrams shall include pressure profiles for initial and final results.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.01 PRELIMINARY PROCEDURES

- A. Obtain preconstruction meeting report, applicable construction bulletins, applicable change orders, and approved shop drawings of equipment, outlets/inlets and temperature controls.
- B. Check filters for cleanliness, dampers and valves for correct positioning, equipment for proper rotation and belt tension, temperature controls for completion of installation and hydronic systems for proper charge and purging of air.
- C. Identify deficiencies preventing completion of testing, adjusting and balancing procedures and notify General Contractor and Mechanical Contractor to resolve the issues. Do not proceed until

- | | | |
|--|--------------------------------------|-------------|
| | Supply grilles, registers, diffusers | -2% to +10% |
| | Return/exhaust grilles, registers | 0% to -10% |
| | Room pressurization air | -5% to +5% |
| | Minimum Outside Air | 0% to +10% |
| | Air terminal units (maximum values) | -2% to +10% |
- M. Final water system measurements must be within the following range of specified GPM:
- | | | |
|--|--------------------|-----------|
| | Heating flow rates | -5% to 5% |
| | Cooling flow rates | 0% to +5% |
- N. Contact the temperature control subcontractor for assistance in operation and adjustment of controls during testing, adjusting and balancing procedures. Cycle controls and verify proper operation and setpoints. Include in report description of temperature control operation and any deficiencies found.
- O. Permanently mark equipment settings, including damper and valve positions, control settings, and similar devices allowing settings to be restored. Set and lock memory stops.
- P. Leave systems in proper working order, replacing belt guards, closing access doors and electrical boxes, and restoring temperature controls to normal operating settings.

3.04 HYDRONIC BALANCING

- A. This agency shall prepare all water systems for balancing after the system is completely installed in the following manner.
1. Open all manual and automatic valves to full position.
 2. Remove and clean all strainers and check chemical condition of all water systems.
 3. Examine water in system to determine if treatment has been accomplished and that the system is clean.
 4. Check pump rotations.
 5. Check expansion tanks and air vents. Make certain all air is removed from system.
 6. Check all operating controls for settings and operation.
- B. After the system has been prepared, proceed as follows:
1. Check hot water, chilled water and condenser water pump flow-rate and operating current.
 2. Adjust water flow-rate through converters, chillers, condensers and towers.
 3. Adjust water flow-rate through each chilled water and hot water coil and at each flow meter.
 4. Adjust steam pressures at boilers and pressure reducing stations.
 5. Check fuel consumption at the boilers.
 6. Temperature rise at converters.
 7. Check flow-rate at all flow meters.
 8. Reset all operating controls as required.
 9. Record inlet and outlet water temperatures at chillers condensers, and all chilled water coils.
 10. Record pressure drops of each chiller and condenser.
 11. Record operating current of all chilled water equipment.
 12. Record inlet and outlet water temperatures at all hot water coils.
 13. Record chemical condition of chilled water, condenser water, and hot water systems.
 14. Record inlet and outlet temperatures at boilers (low and high inputs)

3.06 DEFICIENCIES

- A. Division 23 Contractor to correct any installation deficiencies found by the test and balance work 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 Architect and installing contractor of these items and the installing contractor shall correct the deficient work. All corrective work to be done at no cost to the project.

3.07 VERIFICATION

- A. The Architect / Engineer may require that up to 10% of the supply, return, exhaust terminals, and any other devices be retested, in his presence, for verification of report data with no additional cost.

3.08 EQUIPMENT

- 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 or AABC Standards and instrument manufacturer's specifications. All instruments used for measurements shall be accurately calibrated and maintained in good working order. Calibration and maintenance of all instruments shall be in accordance with the requirements of NEBB or AABC Standards. Certification of calibration shall be forwarded to Architect upon request.
 - 1. The agency shall provide all instruments necessary to effect a complete air balance. All instruments shall have been calibrated within the previous six (6) months, and certification of the calibration shall be available for the Architect's review just prior to initial testing.
- B. Division 23 shall provide the original pulleys, belt drives, volume dampers, access openings, baffles, air thermometers, manometers, etc., and shall replace the original pulleys and belt drives as required to meet the design air quantities.
- C. Division 23 shall provide all additional volume dampers, turning vanes and baffles as required to air balance the systems and to eliminate excessive noise generated by the air system.
- D. Division 23 shall provide all balancing valves, thermometers, pressure gauges, chemical cleaners and shall fill all systems with water prior to water balancing.
- E. Where the installed system work does not require or include permanent hydronic flow measuring devices but flow measurement is necessary to test, balance, and document performance, the Test and Balance Contractor shall utilize an ultrasonic strap on flow meter or other similar noninvasive technology to obtain the data.

END OF SECTION

SECTION 23 05 48

VIBRATION AND SEISMIC CONTROLS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.01 SCOPE

- A. This section includes specifications for vibration isolation material for equipment, piping systems, and duct systems. Included are the following topics:

PART 1 - GENERAL

Scope

Related Work

Design Criteria

PART 2 - PRODUCTS

Materials

Vibration Isolation Manufacturers

Type 1: Neoprene Pad

Type 2: Neoprene Pad

Type 3: Un-Housed Spring with Neoprene

Type 4: Housed Spring with Neoprene

Type 5: Spring Hanger with Neoprene

Type 6: Precompressed Spring with Neoprene

Type 7: Spring Hanger with Deflection Indicator

Type 8: Spring Hanger with Neoprene

Type AG: Vertical Pipe Anchor and Guide

Type IB: Inertia Base

Type S: Steel Base

Type T: Horizontal Thrust Restraint

Flexible Piping Connections

Performance

PART 3 - EXECUTION

Installation

1.02 RELATED WORK

- A. The contractor shall provide work, services, equipment, accessories, and materials shown or described by the applicable sections of any part of any section or division of the contract documents.

1.03 DESIGN CRITERIA

- A. Isolate all motor driven mechanical equipment from the building structure and from the systems which they serve to prevent equipment vibrations from being transmitted to the structure. Consider equipment weight distribution to provide uniform isolator deflections.
- B. For equipment with variable speed capability, select vibration isolation devices based on the lowest speed.
- C. Provide flexible piping connections for all piping connected to rotating or reciprocating equipment mounted on vibration isolators except do not use flexible piping connectors on natural gas piping or with inline pumps. Piping connected to a coil which is in an assembly mounted on vibration isolators is to have flexible piping connections and piping vibration hangers as specified below. Piping connected to a coil which is in an assembly where the fan is separately isolated by means of vibration isolators and duct flexible connections does not require flexible piping connectors or piping vibration hangers.
- D. Credit will be recognized for the inherent flexibility and vibration absorption characteristics of mechanical grooved pipe connections.
- E. Coordinate the selection of devices with the isolator and equipment manufacturers.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Use materials that will retain their isolation characteristics for the life of the equipment served. Use industrial grade neoprene for elastomeric materials.
- B. Treat all isolators to resist corrosion. For isolation devices exposed to the weather or used in high humidity areas, hot dip galvanize steel parts, apply a neoprene coating on all steel parts, or use stainless steel parts; include limit stops to resist wind.
- C. Provide pairs of neoprene side snubbers or restraining springs where side torque or thrust may develop.
- D. Use isolators with a ratio of lateral to vertical stiffness not less than 1.0 or greater than 2.0.

2.02 VIBRATION ISOLATOR MANUFACTURERS

- A. Mason Industries, Amber/Booth Co., Vibration Mounting & Controls, Peabody Noise Control, or approved equal.

2.03 TYPE 1: NEOPRENE PAD

- A. Neoprene waffle pad, 40 durometer with 16 gauge shims between layers. Similar to Mason type WMW.

2.04 TYPE 2: NEOPRENE PAD

- A. Double deflection neoprene mount having a minimum static deflection of 0.35 inches. Cover all metal surfaces with neoprene to resist corrosion. Include friction pads on both top and bottom surfaces so mounts need not be bolted to the floor but include bolt holes for those areas where bolting is required. For equipment such as small vent sets and close coupled pumps, include steel rails for use between the isolator and the equipment to accommodate equipment overhang. Similar to Mason type ND or type DNR (with rails).

2.05 TYPE 3: UNHOUSED SPRING WITH NEOPRENE

- A. Combination freestanding, un-housed spring and neoprene with rib molded antifriction base. Include leveling bolts for securing to the equipment. Springs to be laterally stable under load and selected so they have an additional travel to solid equal to 50% of the rated deflection. Use height saving brackets when appropriate to the application. Similar to Mason type SLF.

2.06 TYPE 4: RESTRAINED SPRING WITH NEOPRENE

- A. Combination spring and neoprene with rib molded base similar to Type 3 mount above, but with a housing that includes vertical limit stops to prevent spring extension when weight is removed such that the installed and operating heights are the same. Maintain a minimum clearance of 1/2" around restraining bolts, and between the housing and the spring, so as not to interfere with the spring action. Design isolator so limit stops are out of contact during normal operation. Use height saving brackets when appropriate to the application. Similar to Mason type SLR.

2.07 TYPE 5: SPRING HANGER WITH NEOPRENE

- A. Vibration hanger with a steel spring and 0.3" deflection neoprene element in series. Use neoprene element molded with a rod isolation bushing that passes through the hanger box. Select spring diameters and size hanger box lower holes large enough to permit the hanger rod to swing through a 30 degree arc before contacting the hole and short circuiting the spring. Select springs so they have a minimum additional travel to solid equal to 50% of the rated deflection. Similar to Mason type 30N or W30.

2.08 TYPE 6: PRECOMPRESSED SPRING HANGER WITH NEOPRENE

- A. Vibration hanger similar to Type 5 but precompressed to the rated deflection to keep the piping or equipment at a fixed elevation during installation. Design hanger with a release mechanism to free the spring after the installation is complete and the hanger is subjected to its full load. Similar to Mason type PC30N.

2.09 TYPE 7: SPRING HANGER WITH DEFLECTION INDICATOR

- A. Steel spring hanger in a steel housing which include a deflection indicator scale, designed to accommodate vertical pipe expansion. Preset hanger at the factory for the required load. Design hanger for 130% of rated deflection but use no more than 100% of rated deflection when selecting the hanger. Similar to Mason type HES.

2.10 TYPE 8: SPRING HANGER WITH NEOPRENE

- A. Steel spring hanger located in a neoprene cup manufactured with a grommet to prevent short circuiting of the hanger rod. Neoprene cup to contain a steel washer designed to properly distribute the load on the neoprene and prevent its extrusion. Design spring diameter and size hanger box lower hole sufficiently large to permit the hanger rod to swing through a 30° arc before contacting the hole perimeter and short circuiting the spring. Select spring so it has a minimum additional travel to solid equal to 50% of the rated deflection. Provide hanger with an eye bolt on the spring end and provision to attach the housing to the flat iron duct straps. Similar to Mason type W30 or 30N.

2.11 TYPE AG: VERTICAL PIPE ANCHOR AND GUIDE

- A. All directional acoustical pipe anchor and guide consisting of a telescopic arrangement of two sizes of steel tubing separated by a minimum half inch thickness of heavy duty neoprene and duck or neoprene isolation material. Provide vertical restraints of similar material to prevent vertical travel in either direction. Design isolation materials for a maximum allowable load of 500 psi, balanced for equal resistance in any direction. Similar to Mason type ADA.

2.12 TYPE IB: INERTIA BASE

- A. Rectangular structural beam or channel concrete form for floating foundation. Include support for suction and discharge base ells for split case pump bases. Use perimeter steel members with a minimum depth equal to 1/12 of the longest dimension of the base but not less than 6"; base depth need not exceed 12" unless specifically recommended by the base manufacturer for mass or rigidity. Include concrete reinforcements consisting of steel angles or 1/2" bars welded in place on 6" centers running in two layers perpendicular to each other and 1-1/2" above the bottom; provide additional steel if required by the structural conditions. Furnish form with steel bolting templates and anchor bolt sleeves to receive equipment anchor bolts where anchor bolts fall in concrete locations. Use height saving brackets in all mounting locations to maintain a base clearance of at least 1" above the floor or housekeeping pad. Similar to Mason type KSL or BMK.

2.13 TYPE S: STEEL BASE

- A. Structural steel base, rectangular in shape for all equipment other than centrifugal refrigeration machines and pump bases which may be "T" or "L" shaped. Include support for suction and discharge base ells for split case pump bases. Use perimeter steel members with a minimum depth equal to 1/10 of the longest dimension of the base. Base depth need not exceed 14" provided that the deflection and misalignment is kept within acceptable limits as determined by the manufacturer. Use height saving brackets in all mounting locations to provide a base clearance of at least one inch above the floor or housekeeping pad. Similar to Mason type WF. Mason type M bases are not acceptable.

2.14 TYPE T: HORIZONTAL THRUST RESTRAINT

- A. Spring element in series with a neoprene pad as described for Type 3 mount with the same deflection as specified for the mounting or hanger. Design the assembly so the spring element is contained within a steel frame, so it can be preset for thrust at the factory, and adjusted in the field for a maximum of 1/4" movement at start and stop. Include threaded rod and angle brackets for attachment to both equipment and ductwork or equipment and structure. Similar to Mason type

WB.

2.15 FLEXIBLE PIPING CONNECTIONS

- A. Suitable for pressure, temperature, and fluid involved; minimum pressure rating for any system is 125 psig at the design temperature of the fluid. Use 12 inch minimum line length of flexible hose or length required to absorb 3/4" lateral movement, whichever is greater.
- B. MANUFACTURERS:
 - 1. Flexonics, Mason, Mercer Rubber, Metraflex, or approved equal.
- C. WATER AND/OR PUMPED CONDENSATE:
 - 1. Multiple plies of nylon tire cord fabric reinforced with an EPDM cover and liner. Do not use steel wire or rings as pressure reinforcement. Use threaded or soldered connections for sizes 2" and smaller and floating steel or ductile iron flanges for sizes 2-1/2" and larger; design the steel flange end so the steel flange is recessed to lock a steel wire bead ring in the raised face of the EPDM flange. Construct straight-through connections with twin spheres. Use control rods when recommended by the manufacturer. Similar to Mason Super-Flex MF series.

2.16 PERFORMANCE

- A. Select vibration isolation devices as indicated below or to provide not less than 95% isolation efficiency, whichever is greater.

Type Of Equipment	Floor Span or Column Spacing							
	On Grade		20 Feet		30 Feet		40 Feet	
	Iso. Type	Min. Static Defl. In.	Iso. Type	Min. Static Defl. In.	Iso. Type	Min. Static Defl. In.	Iso. Type	Min. Static Defl. In.
Pumps:								
Base Mounted								
Flexible Coupled								
Through 40HP	3-IB	0.75	3-IB	0.75	3-IB	1.50	3-IB	1.50

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install vibration isolation devices for motor driven equipment in accordance with the manufacturer's installation instructions.
- B. Set steel and inertia bases for two-inch clearance between the concrete floor or housekeeping pad and the base.
- C. Do not allow installation practices to short circuit any isolation device.
- D. Install flexible piping connections on the equipment side of shut-off valves.
- E. All floor-mounted centrifugal fans, pumps, air handling units, computer room cooling units, reciprocating equipment, etc., shall be mounted on bases. The bases shall not be set on raised computer type floors but instead shall set on specified isolators located on the structural floor (usually concrete).
- F. All suspended equipment shall be suspended from isolators as required or as indicated on the drawings.

- G. All steel fan and motor bases shall be rectangular in shape, consisting of wide flange steel frames, with the motor located within the rectangular shape. All bases shall incorporate height saving devices.
- H. All inertia bases for fan and motor sets, pumps, equipment, etc., shall be steel frame and concrete inertia block type, rigid, plumb and level. All steel side brackets to be plumb and level and securely attached to steel frame or inertia block. Lay out all equipment bases carefully to keep vertical center of gravity of load close to horizontal plane through top of isolation mounts. The weight of a concrete inertia block shall equal the weight of the supported equipment plus framing and associated pipe and ductwork. The minimum inertia block thickness shall be 6".
- I. All springs shall employ un-housed, stable, free-standing springs with a horizontal to vertical spring stiffness ratio of approximately one. Snubbers to limit extreme horizontal deflections during start and stops shall be used. All spring mounts shall be provided with ribbed or waffled neoprene pads at least 1/4" thick to prevent transmission of high frequency vibrations to the buildings. Pads shall be loaded approximately 50 psi, and if bolts are necessary, they shall be isolated from mounts by soft neoprene sleeves at least 1/8" thick.
- J. Supply and return ductwork which is to be lagged with plaster is shown on the drawings. This Contractor shall wire tie 3/4" channels around the ductwork to which he shall fasten metal lath to all four sides of the ductwork. Cover metal lath with 3/4" sand aggregate plaster. See drawings for ductwork to be covered.
- K. Wherever ducts and pipes pass through critical partition walls and floors, the annular openings should be packed with glass fiber and sealed on both sides with a non-hardening material such as "Tremco" acoustical sealant. The annular openings shall be cleanly cut and not over 3/8" wide.
- L. No rigid connections shall be made between spring mounted equipment and the structure. All fans shall be connected to ducts with flexible sleeves at least 6" wide and very slack. Same type sleeves shall be installed on either side of the mufflers to prevent flanking vibration.
- M. Piping connections to spring mounted equipment shall be installed with spring type hangers at least three pipe hangers away from the unit.
- N. Electrical connections to equipment must be long, flexible and as slack as possible. This Section is responsible to coordinate and advise Division 26 to use flexible conduit for connections to motors which will permit movement of equipment without transmitting vibration.

END OF SECTION

SECTION 23 05 29

HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.01 SCOPE

- A. This section includes specifications for supports of all HVAC equipment and materials as well as piping system anchors. Included are the following topics:

PART 1 - GENERAL

Scope
Related Work
Reference Standards
Description
Submittals
Design Criteria

PART 2 - PRODUCTS

Pipe Hanger and Support Manufacturers
Structural Supports
Pipe Hangers and Supports
Beam Clamps
Concrete Inserts
Anchors
Corrosive Atmosphere Coatings

PART 3 - EXECUTION

Installation
Hanger and Support Spacing
Vertical Riser Clamps
Anchors

1.02 RELATED WORK

- A. The contractor shall provide work, services, equipment, accessories, and materials shown or described by the applicable sections of any part of any section or division of the contract documents.

1.03 REFERENCE STANDARDS

MSS SP-58	Pipe Hangers and Supports - Materials, Design and Manufacture
MSS SP-69	Pipe Hangers and Supports - Selection and Application
MSS SP-89	Pipe Hangers and Supports - Fabrication and Installation Practices

1.04 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 pressure piping.
- B. Do not hang any mechanical item directly from a metal deck or run piping so it rests on the bottom chord of any truss or joist.
- C. 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.
- D. Protect insulation at all hanger points; see Related Work above.

1.05 SUBMITTALS

- A. Schedule of all hanger and support devices indicating shields, attachment methods, and type of device for each pipe size and type of service. Reference section 23 05 00.

1.06 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 base mounted pumps, compressors, or other rotating or reciprocating equipment is to have vibration isolation supports for a distance of one hundred pipe diameters or three supports away from the equipment, whichever is greater. Standard pipe hangers/supports as specified in this section are required beyond the 100 pipe diameter/3 support distance.
- C. Piping flexible connections and vibration isolation supports are required for piping connected to coils that are in a fan assembly where the entire assembly is mounted on vibration supports; the vibration isolation supports are required for a distance of one hundred pipe diameters or three supports away from the equipment, whichever is greater. Piping flexible connection and vibration isolation supports are not required when the fan section is separately and independently isolated by means of vibration supports and duct flexible connections. Standard pipe hangers/supports as specified in this section are required when there are no vibration isolation devices in the piping and beyond the 100 pipe diameter/3 support distance.
- D. Piping supported by laying on the bottom chord of joists or trusses will not be accepted.
- E. Fasteners depending on soft lead for holding power or requiring powder actuation will not be accepted.
- F. Allow sufficient space between adjacent pipes and ducts for insulation, valve operation, routine maintenance, etc.

PART 2 - PRODUCTS

2.01 PIPE HANGER AND SUPPORT MANUFACTURERS

- A. Anvil International B-Line, Fee and Mason, Kindorf, Michigan Hanger, Unistrut, or approved equal. Anvil figure numbers are listed below; equivalent material by other manufacturers is acceptable.

2.02 STRUCTURAL SUPPORTS

- A. Provide all supporting steel required for the installation of mechanical equipment and materials, whether or not it is specifically indicated or sized, including angles, channels, beams, etc. to suspend or floor support tanks and equipment.

2.03 PIPE HANGERS AND SUPPORTS

- A. On all steam piping, provide clevis type (Fig. 181) roller hangers with insulation protection shields for use between a hanger and insulation.
- B. HANGERS FOR STEEL PIPE SIZES 1/2" THROUGH 2": Carbon steel, adjustable, clevis, black finish. Anvil figure 65 or 260.
- C. HANGERS FOR STEEL PIPE SIZES 2-1/2" AND OVER: Carbon steel, adjustable, clevis, black finish; or adjustable steel yoke, cast iron roll, double hanger. Anvil figure 260. Use Anvil figure 181 for steam lines.
- D. MULTIPLE OR TRAPEZE HANGERS: Steel channels with welded spacers and hanger rods if calculations are submitted.
- E. WALL SUPPORT:
 - 1. Welded steel bracket with hanger. B-Line 3068 Series, Anvil 194 Series.
 - 2. 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, Anvil type PS200 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, Anvil PS 1400 series.

- F. VERTICAL RISER SUPPORT: Carbon steel riser clamp, copper plated when used with copper pipe. Anvil figure 261 for steel pipe, figure CT121 for copper pipe.
- G. FLOOR SUPPORT FOR PIPE SIZES THROUGH 4": Cast iron adjustable pipe saddle, locknut nipple, floor flange, and concrete pier or steel support.
- H. FLOOR SUPPORT FOR PIPE SIZES 5" AND OVER: Adjustable cast iron roll and stand, steel screws, and concrete pier or steel support.
- I. COPPER PIPE SUPPORT: Carbon steel ring, adjustable, copper plated or polyvinylchloride coated.
- J. INSULATION PROTECTION SHIELDS: Galvanized carbon steel of not less than 18 gauge for use on insulated pipe 2-1/2 inch and larger. Minimum shield length is 12 inches. Equal to Anvil figure 167.
- K. STEEL HANGER RODS:
 - 1. Threaded both ends, threaded one end, or continuous threaded, black finish.
 - 2. Size rods for individual hangers and trapeze support as indicated in the following schedule.
 - 3. Total weight of equipment, including valves, fittings, pipe, pipe content, and insulation, are not to exceed the limits indicated.

<u>Maximum Load (Lbs.)</u> <u>650°F Maximum (Temp.)</u>	<u>Rod Diameter</u> <u>(inches)</u>
610	3/8
1130	1/2
1810	5/8
2710	3/4
3770	7/8
4960	1
8000	1-1/4

- 4. Provide rods complete with adjusting and lock nuts.

2.04 BEAM CLAMPS

- A. MSS SP-69 Type 23 malleable black iron clamp for attachment to beam flange to 0.62 inches thick for single threaded rods of 3/8, 1/2, and 5/8 inch diameter, for use with pipe sizes 4 inch and less. Furnish with a hardened steel cup point set screw. Anvil figure 86.
- 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 but limited in application to pipe sizes 8 inch and less without prior approval. Anvil figure 228.

2.05 CONCRETE INSERTS

- A. MSS SP-69 Type 18 wedge type or universal concrete inserts.
- B. Wedge type to be constructed of a black carbon steel body with a removeable malleable iron nut that accepts threaded rod to 7/8 inch diameter. Wedge design to allow the insert to be held by concrete in compression to maximize the load carrying capacity. Anvil Figure 281.
- C. Universal type to be constructed of black malleable iron body with a removeable malleable iron nut that accepts threaded rod to 7/8 inch diameter. Anvil Figure 282.

- D. Use drilled steel shell with plug type inserts when the inserts are placed after the concrete is poured.

2.07 ANCHORS

- A. Use welding steel shapes, plates, and bars to secure piping to the structure.

2.13 CORROSIVE ATMOSPHERE COATINGS

- A. Factory coat supports and anchors used in corrosive atmospheres with hot dip galvanizing after fabrication, ASTM A123, 1.5 ounces/square foot of surface, each side. Mechanical galvanize threaded products, ASTM B695 Class 150, 2.0 mil coating. Field cuts and damaged finishes to be field covered with zinc rich paint of comparable thickness to factory coating.
- B. Corrosive atmospheres include the following locations:
 - 1. Exterior locations
 - 2. Parking ramps

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install supports to provide for free expansion of the piping and duct 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.
- B. Coordinate hanger and support installation to properly group piping of all trades.
- C. 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.
- D. Perform all welding in accordance with standards of the American Welding Society. Clean surfaces of loose scale, rust, paint or other foreign matter and properly align before welding. Use wire brush on welds after welding. Welds shall show uniform section, smoothness of weld metal and freedom from porosity and clinkers. Where necessary to achieve smooth connections, joints shall be dressed smooth.

3.02 HANGER AND SUPPORT SPACING

- A. Place a hanger within 12 inches of each horizontal elbow, valve, strainer, or similar piping specialty item.
- B. Where several pipes can be installed in parallel and at the same elevation, provide multiple or trapeze hangers.
- C. Support riser piping independently of connected horizontal piping.
- D. Adjust hangers to obtain the slope specified in the piping section of this specification.
- E. Space hangers for pipe as follows:

<u>Pipe Material</u>	<u>Pipe Size</u>	<u>Max. Spacing</u>
Steel	1/2" through 1-1/4"	6'-6"
Steel	1-1/2" through 6"	10'-0"
Steel	8" through 12"	14'-0"
Steel	14" and Over	20'-0"

<u>Pipe Material</u>	<u>Pipe Size</u>	<u>Max. Spacing</u>
Thermoplastic	All Sizes	6'-0"
Copper	1/2" through 1-1/4"	5'-0"
Copper	1-1/2" and Larger	8'-0"

- F. Where pipes are supported from steel joist, for pipe 6" and larger (or combination of pipes with combined weight equal to or greater than a 6" pipe) support pipe as follows:
1. If the pipe runs parallel to joists, locate the pipe(s) midway between and support equally off of two joist panel points at maximum spacing of 8'-0" on center.
 2. If the pipe runs perpendicular to joists, provide supports at 10'-0" on center maximum.

3.03 VERTICAL RISER CLAMPS

- A. Support vertical piping with clamps secured to the piping and resting on the building structure or secured to the building structure below at each floor.
- B. Piping 5" and above, of lengths exceeding 30 feet, shall be additionally supported on base elbows secured to the building structure, with flexible supporting hangers provided at top of riser to allow for pipe expansion.

3.05 ANCHORS

- A. Install where indicated on the drawings and details. Where not specifically indicated, install anchors at ends of principal pipe runs and at intermediate points in pipe runs between expansion loops. Make provisions for preset of anchors as required accommodating both expansion and contraction of piping.

END OF SECTION

SECTION 23 05 23

GENERAL DUTY VALVES FOR HVAC

PART 1 - GENERAL

1.01 SCOPE

- A. This section includes valve specifications for all HVAC systems except where indicated under Related Work. Included are the following topics:

PART 1 - GENERAL

Scope
Related Work
Design Criteria

PART 2 - PRODUCTS

Manufacturers
Water System Valves
Gate Valves
Ball Valves
Butterfly Valves
Globe Valves
Swing Check Valves
Spring Loaded Check Valves
Balance Valves
Drain Valves
Combination Shut-off, Check, and Balancing Valves
Water Pressure Reducing Valves
Water Relief Valves
Self-Contained Control Valves
Natural Gas Systems
Shut-off Valves
Gas Pressure Regulators

PART 3 - EXECUTION

General
Shut-off Valves
Balancing Valves
Calibrated Balancing Valves
Drain Valves
Safety Relief Valves
Spring Loaded Check Valves
Swing Check Valves
Combination Shut-off, Check, and Balancing Valves
Pressure Reducing Valves
Gas Pressure Regulators

1.02 RELATED WORK

- A. The contractor shall provide work, services, equipment, accessories, and materials shown or described by the applicable sections of any part of any section or division of the contract documents.

1.03 DESIGN CRITERIA

- A. Where valves are specified for individual mechanical services (i.e. hot water heating, steam, etc.) all valves shall be of the same manufacturer unless prior written approval is obtained from the **Architect Engineer**.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Anvil, Apollo, Armstrong, Bell & Gossett, Bray International, Cash-Acme, Consolidated, Conval, Crane, Crosby, DeZurik, Durco, Fisher, Grinnell, Griswold, Hammond, Hancock, Hoffman, Jamesbury, Keystone, Kunkle, Leslie, Lunkenheimer, Metraflex, Milwaukee, Mueller, Newco, Nexus, Nibco, Powell, RP&C, Sarco, Spence, Stockham, Taco, Tasco, Thrush-Amtrol, Vogt or Watts.

2.03 WATER SYSTEM VALVES

- A. All water system valves to be rated at not less than 125 psig water working pressure at 240°F unless noted otherwise.
- B. GATE VALVES:
 - 1. 2" and smaller: Use ball valves; gate valves will not be accepted in sizes 2" and smaller.
 - 2. 2-1/2" and larger: Use butterfly valves; gate valves will not be accepted in sizes 2-1/2" and larger.
- C. BALL VALVES:
 - 1. 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. Provide stem extensions when valves are installed in insulated pipe with vapor barrier so valve handles clear insulation. Apollo 70-100/200 series, Hammond 8301/8311, Milwaukee BA100/150, Nibco T/S 585-70/580-70, Stockham S206/216.
 - 2. 2-1/2" and over: Use butterfly valves; ball valves will not be accepted in sizes over 2 inches.
- D. BUTTERFLY VALVES:
 - 1. 2" and smaller: Use ball valves; butterfly valves will not be accepted in sizes 2 inches and smaller.
 - 2. 2-1/2" and larger: Cast iron body; stainless steel shaft; Teflon, nylatron, or acetal bearings; EPDM resilient seat. Disk to be bronze, aluminum-bronze, nickel plated ductile iron, cast iron with welded nickel edge, or stainless steel. Pressure rated to 150 psig. Valve assembly to be bi-directional bubble tight to 150 psig with no downstream flange/pipe attached. Polymid or polyocated vavles are NOT acceptable. Valve stems shall allow operators to clear insulation without interference. Provide stem extensions when valve operators interfere with pipe insulation. Use threaded lug type valves for installation with class 125/150 flanges. Centerline Series 200, DeZurik BGS II, Keystone Fig. 222, Nibco LD2000 (2-1/2"-12"), Nibco LD1000 (14" and above), Victaulic 300 series (2-1/2"-12")/709 series (14"-24").
 - 3. Provide ten-position lever actuators for valves 6" and smaller. Provide worm gear operators for valves 8" and larger.
 - 4. Where butterfly valves are indicated or specified to be installed at the location of a flow sensing device, provide the butterfly valves with a memory stop.
- E. GLOBE VALVES:
 - 1. Do not use globe valves for water service, except in temperature control applications.
- F. SWING CHECK VALVES:
 - 1. 2" and smaller: Class 125, bronze body, threaded or soldered ends, regrindable seat, bronze disc, threaded cap, suitable for installation in a horizontal or vertical line with flow upward. Crane 137/1342, Hammond IB912/IB940, Lunkenheimer 2144/2145, Milwaukee 509/1509, Nibco T-413-B/S-413-B, Powell 578/1825, Stockham B-309/B-319.
 - 2. 2-1/2" and larger: Class 125, cast iron body, flanged ends, bronze trim, bolted cap, renewable bronze seat and disc, non-asbestos gasket, suitable for installation in a horizontal or vertical line with flow upward. Crane 373, Hammond IR1124, Lunkenheimer 1790, Milwaukee F2974, Nibco F918, Powell 559, Stockham G-931.
- G. SPRING LOADED CHECK VALVES:
 - 1. 2" and smaller: Class 125, bronze body, threaded, solder or wafer ends, bronze trim, stainless steel spring, teflon seat unless only bronze available. APCO 300 series, ConBraCo 61 series, Mueller 303BP, Nibco T-480-Y/S-480-Y, Val-Matic 1400 series.
 - 2. 2-1/2" and larger: Class 125, cast iron or semi-steel body, wafer or globe flanged type, bronze trim, bronze or EPDM seat, stainless steel spring, stainless steel stem if stem is required. Valves with ductile iron in contact with the working fluid will not be accepted.

Metraflex 900 series, Milwaukee 1800 series, Mueller Steam 101M-AP/105M-AP, Nibco F910 series, Victaulic series 716.

- H. **BALANCE VALVES:**
1. 2" and smaller:
Bronze or copper alloy body with calibrated ball, globe or venturi/valve arrangement, integral pointer and calibrated scale to register degree of valve opening, memory stop, drain tapping, threaded or soldered ends, with or without integral unions, P/T or Shraeder pressure taps with integral check valves and seals, adjustable memory stop, suitable for 200 psig water working pressure at 250°F. Armstrong CBV, Bell & Gossett Circuit Setter Plus, Taco Accu-Flo, Victaulic series 786/787, Nibco 1710, Nexus Octuri, Griswold Quickset.
- I. **DRAIN VALVES:**
1. Use 3/4 inch ball valve with threaded hose adapter except strainer blowdown valves to be the same size as the blowdown connection. Use 1-1/4" valves as drains at boilers.
- J. **COMBINATION SHUT-OFF, CHECK, AND BALANCE VALVES:**
1. 2" and larger: Cast or ductile iron body, threaded or flanged or grooved end connections, stainless steel spring, bronze disc with EPDM seat, calibrated memory stop, backseating valve stem, inlet and outlet pressure tappings, capable of being repacked under full line pressure, and suitable for a minimum working pressure of 175 psig at 240°F when used in hot water heating systems. Armstrong Flo-Trex, Bell & Gossett Triple Duty, Taco Multi-Purpose Valve.
- K. **WATER PRESSURE REDUCING VALVES:**
1. Brass or bronze body, diaphragm operated, with an integral anti-syphon check valve, inlet strainer, and adjustable reduced pressure range but pre-set for the scheduled pressure, 125 psig at 225°F. Bell & Gossett, Cash-Acme, Taco, or Watts.
- L. **WATER RELIEF VALVES:**
1. Iron or bronze body, direct pressure actuated, teflon seat, stainless steel stem and spring, suitable for 125 psig water working pressure at 240° F and ASME stamped, with Btu capacity and set point as scheduled. Bell & Gossett, Cash-Acme, Consolidated, Kunkle, Watts.
- M. **SELF CONTAINED CONTROL VALVES:**
1. Cast bronze or forged brass body, actuator with integral temperature sensor and adjustment-spring balanced bellows, stainless steel spindle riding against an O-ring within the packing gland, O-ring packing gland replaceable while the system is in operation with standard tools and without any need for isolation valves, suitable for 125 psig water working pressure at 240°F. Valves to return to the open position upon failure of temperature control unit. Bell & Gossett, Danfoss, Taco.

2.09 NATURAL GAS SYSTEMS

- A. **SHUT OFF VALVES:**
1. 2" and smaller: Ball valve, bronze body, threaded ends, lever actuated, chrome plated bronze or stainless steel ball, full or conventional port, teflon seat, blowout-proof stem, two-piece construction, suitable for 150 psig working pressure, U.L. listed for use as natural gas shut-off.
 2. 2-1/2" through 4": Cast iron body, flanged ends, bronze bearings, electroless nickel plated cast iron plug with Hycar resilient plug seal, Buna-N stem seal packing, lever actuator, 175 psi W.O.G., U.L. listed for use as natural gas shut-off.
 3. 5" and larger: Cast iron body, flanged ends, stainless steel bearings, resilient faced plugs, totally enclosed hand wheel actuators, 175 psi W.O.G., U.L. listed for use as natural gas shut-off. DeZurik, Homestead, Rockwell, Walworth.
- B. **GAS PRESSURE REGULATORS:**
1. Gas pressure regulators shall be similar to Fisher HSR for 0-400 CFH and S-200 Series for 401 CFH and above of sizes and pressures as required or indicated on the drawings.
 - a. 2" and smaller: Cast iron body, aluminum spring and diaphragm, Nitrile diaphragm, threaded ends, 150 psi W.O.G., -20°F to 150°F.

PART 3 - EXECUTION

3.01 GENERAL

- A. Properly align piping before installation of valves in an upright position; operators installed below the valves will not be accepted.
- B. Install valves in strict accordance with valve manufacturer's installation recommendations. Do not support weight of piping system on valve ends.
- C. Install all temperature control valves.
- D. Install all valves with the stem in the upright position. Valves may be installed with the stem in the horizontal position only where space limitations do not allow installation in an upright position or where large valves are provided with chain wheel operators. Where valves 2-1/2" and larger are located more than 12'-0" above mechanical room floors, install valve with stem in the horizontal position and provide a chain wheel operator. Valves installed with the stems down will not be accepted.
- E. Install stem extensions when shipped loose from valve.
- F. 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 all equipment, coils, chillers, boilers, at each branch take-off from mains, at each automatic valve, etc. as shown on drawings or required for isolation or repair of the apparatus.
- B. WATER SYSTEM:
 - 1. Butterfly valves installed at the location of a flow sensing device are to have a memory stop.

3.03 BALANCING VALVES

- A. Provide balancing valves for all major equipment and at each major branch takeoff and at the discharge of each pump and as indicated on drawings and details.
- B. CALIBRATED BALANCE VALVES:
 - 1. Install where indicated on the drawings and details for balancing of hydronic systems.

3.04 DRAIN VALVES

- A. Provide drain valves for complete drainage of all systems. Locations of drain valves include low points of piping systems, equipment locations specified or detailed including reheat coils, and other locations required for drainage of systems.

3.05 SAFETY RELIEF VALVES

- A. Use air pressure to clean piping prior to installation of safety relief valves.
- B. Install relief valves in locations indicated on drawings, downstream of all pressure reducing valves, and on all boilers.
- C. Install valves in the vertical position, with drain holes, including those from dip pan elbows, piped to the nearest drain.
- D. Inlet and outlet piping connecting to valves must be the same size as valve connections or larger.
- E. Vent steam safety valves to a location outside of building, in the most direct manner possible. Install drip pan elbow as detailed at first vertical rise of the vent pipe. Keep pipe between safety valve and drip pan elbow as short and straight as possible.

- F. Support piping and drip pan elbow independently to prevent stress at connections to safety valves. Install vent pipe so that its weight does not rest on the drip pan elbow. Extend drain line from drip pan elbow and relief valve to nearest drain.
- G. Pipe discharge from water system relief valves to nearest drain.

3.06 SPRING LOADED CHECK VALVES

- A. Install a spring loaded check valve in each pump discharge line where two pumps operate in parallel and no combination shutoff, check and balancing valve is being used.

3.07 SWING CHECK VALVES

- A. Provide swing check valves where specified, detailed, and at steam condensate lines where they rise at outlet of traps. In such cases, provide isolation valves to allow repair or replacement of check valve.

3.08 COMBINATION SHUT-OFF, CHECK, AND BALANCING VALVES

- A. Contractor may use combination shut-off, check and balancing valves where separate shut-off valve, check valve, and balancing valve are specified or detailed in pump discharge piping.

3.09 PRESSURE REDUCING VALVES

- A. Provide gate valve and strainer at inlet. Provide gate valve at outlet.
- B. Install pressure gauges to indicate inlet and outlet pressure at each pressure reducing valve in accordance with Section 23 05 15 - Piping Specialties.
- C. Use eccentric reducers at inlet and outlet of reducing valves where connections are not the same size as adjacent piping.

3.10 GAS PRESSURE REGULATORS

- A. Vent independently and full size to outside in accordance with codes. Use a larger size vent when required by the manufacturer's installation instructions.

END OF SECTION

SECTION 23 05 15
PIPING SPECIALTIES

PART 1 - GENERAL

1.01 SCOPE

- A. This section contains specifications for HVAC piping specialties for all piping systems. Included are the following topics:

PART 1 - GENERAL

Scope
Submittals
Design Criteria

PART 2 - PRODUCTS

Thermometers
Thermometer Sockets
Test Wells
Pressure/Temperature (P/T) Test Plugs
Pressure Gauges
Pump Connectors
Flexible Metal Hose
Strainers
Water Filters
Centrifugal Separators
Expansion Tanks Diaphragm Type
Air Separators
Air Vents
Suction Diffusers
Flow Sensing Devices
Differential Pressure Gauge
Water Meters
Buffer Tank

PART 3 - EXECUTION

Thermometers
Thermometer Sockets
Test Wells
Pressure/Temperature (P/T) Test Plugs
Pressure Gauges
Expansion Loops
Pump Connectors
Flexible Metal Hose
Strainers
Water Filters
Centrifugal Separators
Expansion Tanks
Air Separators
Air Vents
Suction Diffusers
Flow Sensing Devices
Differential Pressure Gauge
Water Meters

1.02 SUBMITTALS

- A. Required for all items in this section. Include materials of construction, dimensional data, ratings, capacities, ranges, pressure drop data where appropriate, and identification as referenced in this section and/or on the drawings.

1.03 DESIGN CRITERIA

- A. All piping specialties are to be rated 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.

PART 2 - PRODUCTS

2.01 THERMOMETERS

- A. Manufacturers: Ashcroft, Marsh, Taylor, H. O. Trerice, U. S. Gauge, Weiss, Weksler, Miljoco.
- B. Stem Type, cast aluminum case, nine inch scale, clear acrylic window. adjustable angle brass stem with stem of sufficient length so the end of the stem is near the middle of a pipe without reducing the thickness of any insulation, blue indicating spirit filled fluid (mercury in glass thermometers are not acceptable), black lettering against a white background, with scale ranges as follows:

<u>Service</u>	<u>Scale Range, °F</u>	<u>Min. Increment, °F</u>
Hot Water	30 – 240	2
Glycol Water	30 – 130	2

- C. Dial Type, bi-metal 4-1/2" diameter with case ring and stem of 304 stainless steel, heavy duty glass, hermetically sealed construction with external adjustment. White face with black numbers. Range - 20° to 200°F in 2-degree increments.

2.02 THERMOMETER SOCKETS

- A. Brass with threaded connections suitable for thermometer stems and temperature control sensing elements in pipeline. Furnish with extension necks for insulated piping systems.

2.03 TEST WELLS

- A. Similar to thermometer sockets except with a brass cap that thread into the inside of the test well to prevent dirt from accumulating. Secure cap to body with a short chain. Furnish with extension necks, where appropriate, to accommodate the pipeline insulation.

2.04 PRESSURE/TEMPERATURE (P/T) TEST PLUGS

- A. Manufacturer's: Peterson Equipment Company and Texas Fair Fax Company.
- B. For systems with a maximum operating temperature of 150°F:
 - 1. Brass plug with 1/4" NPT threads, EPDM or neoprene valve core, knurled cap with cap strap. Use extended length plugs to clear insulated piping. Adaptors shall have 1/4" FPT connection for standard pressure gauges.
- C. For systems with a maximum operating temperature greater than 150°F:
 - 1. Brass plug with 1/4" NPT threads, Norel valve core, knurled cap with cap strap. Use extended length plugs to clear insulated piping. Adaptors shall have 1/4" FPT connection for standard pressure gauges.

2.05 PRESSURE GAUGES

- A. Manufacturers: Ametek/U. S. Gauge Division, Ashcroft, Marsh, Taylor, H. O. Trerice, Weiss, Weksler, Miljoco.
- B. Cast aluminum case of not less than 4.5 inches in diameter, double strength glass window, black lettering on a white background, phosphor bronze bourdon tube with bronze bushings, recalibration from the front of the dial, 99% accuracy over the middle half of the scale, 98.5% accuracy over the remainder of the scale, with scale range as follows:

<u>Service</u>	<u>Scale Range, psig</u>	<u>Min. Increment, psig</u>
Hot Water	0 – 100	2
Pump	30" Hg - 30	2

- C. **PRESSURE SNUBBERS:**
 - 1. Bronze construction, suitable for system working pressure, 1/4" size, for gauges used at circulating pumps.
- D. **COIL SYPHONS:**
 - 1. Bronze or steel construction, suitable for system working pressure, 1/4" size.
- E. **GAUGE VALVES:**
 - 1. Use valves as specified in Section 23 05 23 – General Duty Valves for HVAC. For water systems, use 1/4" ball valves. For steam systems, use 1/4" gate valves suitable for system working pressure.

2.07 PUMP CONNECTORS

- A. Manufacturers: MetraFlex Double Cablesphere, Proco Products Style 242 with control rods and plates, Engineered Flexible Products Style 302 with control rods and plates.
- B. Flexible pump connectors / expansion joints shall be of the molded twin spherical type reinforced with an external root ring between spheres. Neoprene and nylon construction with internal steel wire, molded within the raised face ends, for added strength. Pressure rated for 225 psi at 240°F with a minimum 4:1 factor safety factor. Flanges shall be one piece, free floating, Class 150 galvanized plate steel type with tapped or drilled holes as required. Control units shall be furnished with control cables or rods with plates to prevent over extension.

2.08 FLEXIBLE METAL HOSE

- A. Manufacturers: MetraFlex, Proco, Engineered Flexible Products.
- B. Water: Flexible connectors shall be of the braided stainless steel type. Flexible hose section to be 321 stainless steel, close pitch, annular corrugated hose with a braided outer covering of type 304 stainless steel. End connections to be ANSI Class 150 carbon steel plate flanges. Overall length to allow for a minimum of 3/8" intermittent flexing or per Manufacturer's recommendations for additional motion. For potable water service, connectors shall be UL classified in accordance with ANSI/NSF 61-1977 standards.
- C. Refrigeration: Refrigeration connectors shall be constructed of bronze hose and braided outer covering (2-1/2" – 4" to be of stainless steel hose and braded construction). End connections shall be female copper tube designed for sweat connections. Connectors shall be cleaned, degreased, and bagged to protect from contamination. Connectors shall be tested and approved by Underwriters Laboratories for refrigeration service. Overall length per Manufacturer's recommendations.

2.12 STRAINERS

- A. Manufacturers: Armstrong, Hoffman, Illinois, Keckley, Metraflex, Mueller Steam, or Sarco.
- B. **WATER SYSTEMS:**
 - 1. Y type: cast iron body; stainless steel screens; bolted or threaded screen retainer tapped for a blowoff valve; threaded body in sizes through 2 inch and rated at not less than 175 psi WOG; flanged body in sizes over 2 inch and rated at not less than 125 psi WOG at 240°F. Screen to be 20 mesh for line sizes 2 inch and less, 0.125 inch perforations for line sizes 2-1/2 inch through 4 inch, and 0.25 inch perforations for line sizes 5 inch and larger.
 - 2. Clamped Cover Basket type: Cast iron body with clamped cover; stainless steel screens; body tapped for a blowoff valve; 125 psig flanged body for 2 1/2" and larger; 0.125 inch perforations for line sizes 2-1/2 inch through 4 inch, and 0.25 inch perforations for line sizes 5 inch and larger.
 - 3. Basket Type: Cast steel body with bolted cover; stainless steel screens, body tapped for a blowoff valve; 150 psig flanged body; 0.125 inch perforations for line sizes 2-1/2 inch through 4" inch and 0.25 inch perforations for line sizes 5 inch and larger.
- C. **WATER SYSTEMS WITH DESIGN PRESSURES OVER 150 PSIG:**
 - 1. Y type: cast iron or cast steel body; stainless steel screens; bolted or threaded screen retainer tapped for a blowoff valve; threaded or socket weld body in sizes through 2 inch and rated at not less than 300 psi WOG at 150°F; flanged or butt weld body in sizes over

2 inch and rated at not less than 300 psi WOG at 150°F. Screen perforations to be 0.057 inch for line sizes 2 inch and less, 0.125 inch for line sizes 2-1/2 inch through 4 inch, and 0.25 inch for line sizes 5 inch and larger.

2.13 WATER FILTERS

- A. Manufacturers: Commercial Filters (Carborundum), Pall Trinity Micro Corporation, Dover Corp./Ronningen-Petter Division.
- B. Construct housing of carbon steel rated at 125 psig at 250°F. Finished product to bear the ASME unfired pressure vessel stamp. Use a gasketed clamped cover of cast iron or steel to provide filter access. Use threaded pipe connections for nominal pipe sizes 2 inch and smaller, flanged pipe connections for nominal pipe sizes 2-1/2 inch and larger; mechanical grooved pipe connections may be substituted for all sizes when allowed by Section 23 21 13. Include a floor mounting support or wall mounting brackets.
- C. Furnish three sets of disposable filter cartridges, two capable of removing 98% of all solids that are 5 microns or larger in size and one capable of removing 98% of all solids that are 75 microns or larger in size. Filter media to be suitable for temperatures to °F and differential pressures to psi. Provide a positive seal on each cartridge stack to minimize bypass.

2.14 CENTRIFUGAL SEPARATORS

- A. Manufacturers: Lakos
- B. Centrifugal vortex type separator constructed of carbon steel and furnished with flanged inlet and outlet, collection chamber that is openable for inspection or cleaning, flanged separator section to allow interior inspection or cleaning, flanged collection chamber outlet for removing collected material, a relief line from the venturi chamber to the collection chamber to improve solids collection, 1/2 inch gauge connections in the main inlet and outlet connections, and suitable for an operating pressure of not less than 125 psig. Assembly to be capable of removing 98% by weight of all particles 75 microns or larger and having a specific gravity of at least 1.8.
- C. Furnish with a purge assembly consisting of a motorized ball valve and a controller suitable for 120 volt operation and mounting independently near the valve. Ball valve to be suitable for 125 psig operation at 100°F. Controller to allow setting of purge time between 15 seconds and 30 minutes with frequencies between one minute and 16 hours. Include controls to allow automatic operation, manual operation, or de-energizing the controller.

2.16 EXPANSION TANKS DIAPHRAGM TYPE

- A. Manufacturers: Bell and Gossett type B, Taco, Wessels, Armstrong Pumps, or Amtrol.
- B. Steel construction, tested and stamped in accordance with Section 8D of the ANSI/ASME Code and furnished with the National Board Form U-1, rated for not less than 125 psig working pressure, precharged with air to the initial fill pressure indicated on the drawings, butyl diaphragm suitable for fluid temperatures to 220°F, and furnished with a tank drain connection, system connection, mounting saddles for horizontal installation or base for vertical installation, prime coated, size/capacity as indicated on the drawings. Tank and bladder construction must allow field replacement of the bladder on its failure.

2.17 AIR SEPARATORS

- A. Manufacturers: Bell and Gossett, Taco, Amtrol, Spirotherm.
- B. 1-1/2 inch and smaller: Cast iron construction, suitable for in-line installation, top and bottom connections for use with expansion tanks specified above, rated at not less than 125 psig at 220°F.
- C. 2 inch and larger: Welded steel construction, ASME constructed and stamped for a working pressure not less than 125 psig at 220°F, threaded or flanged connections for 2 inch size, flanged for all sizes over 2 inch, suitable for use with expansion tanks specified above, drain connection at the bottom of unit, vent/tank connection at the top of unit, suitable for the system flow rates as indicated on the drawings. Include a galvanized or stainless steel strainer with provisions in the unit shell for strainer removal.

Provide a blow down connection located so that the inside surface of the strainer can be cleaned by draining the system fluid through the blow down connection.

2.18 AIR VENTS

- A. **MANUAL KEY TYPE VENTS:**
 - 1. Bell and Gossett Model 4V; Eaton/Dole Model 9, 9B, or 14A.
 - 2. Bronze body with nonferrous internal parts, screwdriver operated, designed to relieve air from the system when vent is opened, rated at not less than 125 psig at 220°F.
- B. **MANUAL BALL VALVE VENTS:**
 - 1. Provide 1/4" ball valves for manual venting of air handling unit coils and where indicated elsewhere on drawings and details. Reference specifications section 23 05 00.
- C. **AUTOMATIC VENTS:**
 - 1. Amtrol/Thrush Model 720, Bell and Gossett Model 107, Watson McDaniel Model 813W.
 - 2. Cast iron body with nonferrous internal parts, designed to vent air automatically with float principle without allowing air to enter the system, rated at not less than 125 psig at 220°F.

2.19 SUCTION DIFFUSERS

- A. Manufacturers: Amtrol/Thrush, Armstrong Pumps, Bell and Gossett, Taco.
- B. Designed to replace the suction line strainer and the long entrance pipe at a pump suction; constructed with a strainer blow down connection, provisions for a Section supplied support foot, and bolted flange for strainer removal and cleaning; rated at not less than 125 psi working pressure at not less than 250°F.
- C. **CLOSED SYSTEMS:**
 - 1. Body constructed of cast iron, ductile iron or carbon steel; cast iron, steel, or stainless steel straightening vanes; steel, galvanized steel or stainless steel strainer; brass or bronze fine mesh startup strainer, strainer blow down connection, inlet pressure gauge connection, provisions for a field supplied support foot, and bolted flange for strainer removal and cleaning; rated at not less than 125 psi working pressure at not less than 250°F.
- D. **OPEN SYSTEMS:**
 - 1. Body constructed of cast iron, ductile iron or carbon steel; cast iron, steel or stainless steel straightening vanes; galvanized steel or stainless steel strainer; strainer blow down connection, inlet pressure gauge connection, provisions for a field supplied support foot, and bolted flange for strainer removal and cleaning; rated at not less than 125 psi working pressure at not less than 250°F.

2.22 DIFFERENTIAL PRESSURE GAUGE

- A. Barton 247A, Midwest 809, or approved equal.
- B. Bellows type differential pressure meter kit that includes a six inch diameter gauge with a 270° arc having an accuracy of $\pm 1\%$ of full scale or better and suitable for the differential pressures of the flow meters supplied for this project, over range protection on the meter, color coded hoses not less than ten feet in length with brass connectors suitable for connection to the low and high pressure connections on the balance valves, inline strainers, instrument valving so meter can be vented and drained, pressure and temperature rating at least equal to that of the valves. Provide meter and all accessories in a durable case with carrying handle.

2.23 WATER METERS

- A. Badger Meter Model 35, Carlon Meter Co., Neptune, Hersey. Bronze body, 3/4" NPT ends, positive displacement disc type meter with built-in strainer, magnetic drive and thermoplastic disc/register gearing. Meters shall meet ANSI/AWWA Standard C700. Sealed register shall be odometer type totalization display having 10,000,000 gallon capacity. Register shall also have 360 degree sweep hand with 10 gallon range and 0.1 per gallon increments. Meters shall be suitable for 150 psig pressure at 80 degrees F. Include electronic head suitable to send pulses to DDC as a binary input point.

2.26 BUFFER TANK

- A. Hot Water Buffer Tank
 - 1. System efficiency buffer tank shall be V-SEB as manufactured by Cemline Corporation or equal. Tank shall be ASME Code constructed and stamped in accordance with Section VIII of the ASME Code. Tank shall be registered with the National Board of Boiler and Pressure Valve Inspectors and a certificate of shop inspection shall be furnished. ASME working pressure shall be 125 psi. Material of construction shall be carbon steel. Vessels above 42" in diameter shall be furnished with a 12" x 16" manhole. Tank shall be furnished with an air vent, a field installed insulated jacket and thermometer. Tank shall be fabricated to provide air separations.
 - 2. Submittal shall include information on primary flow inlet and outlet as well as secondary flow inlet and outlet connections.

PART 3 - EXECUTION

3.01 THERMOMETERS

- A. All thermometers shall be adjusted by the contractor such that they are easily read from the floor or nearest platform. Each thermometer shall be placed so that a good sample of air or water is taken.
- B. STEM TYPE:
 - 1. Install in piping systems as indicated on the drawings and/or details using a separable socket in each location. Locate at elbows or tees in accessible locations for close visual observation.
- C. DIAL TYPE FOR AIR TEMPERATURE MEASUREMENT:
 - 1. Install in ductwork where detailed or specified. Support capillary inside duct so it measures a uniform sample of air. Mount readout so it is readily visible on a portion of ductwork that is not externally insulated or on a sheet metal angle support secured to a nearby structural element.

3.02 THERMOMETER SOCKETS

- A. Install at each point where a thermometer or temperature control sensing element is located in a pipeline.

3.03 TEST WELLS

- A. Install in piping systems as indicated on the drawings and/or details wherever provisions are needed for inserting a thermometer at a later date.

3.04 PRESSURE/TEMPERATURE (P/T) TEST PLUGS

- A. Install in piping systems as indicated on the drawings and/or details. Do not insulate over test plugs.

3.05 PRESSURE GAUGES

- A. Install in locations where indicated on the drawings and/or details, including any gauge piping, with scale range appropriate to the system operating pressures.
- B. PRESSURE SNUBBERS:
 - 1. Install in gauge piping for all gauges used on circulating pumps.
- C. COIL SYPHONS:
 - 1. Install in gauge piping for all gauges used on steam services.
- D. GAUGE VALVES
 - 1. Install at each gauge location as close to the main as possible and at each location where a gauge tapping is indicated.
 - 2. Provide a pressure piping header for circulating pumps that permits measuring the pressure ahead of the strainer, pump suction, and pump discharge.

3.07 PUMP CONNECTORS

- A. Install where indicated on the drawings or details.
- B. Install per Manufacturer's instructions and provide and adjust over extension rods or cables.

3.08 FLEXIBLE METAL HOSE

- A. Install where indicated on the drawings or details.
- B. Install per the Manufacturer's instructions.

3.12 STRAINERS

- A. Install all strainers where indicated on the project details, allowing sufficient space for the screens to be removed. Rotate screen retainer where required by the installation so blow down can remove accumulated dirt from the strainer body.
- B. WATER SYSTEMS:
 - 1. Install a ball valve for blow down in the tapped screen retainer; valve to be the same size as the tapping.

3.13 WATER FILTERS

- A. Install water filter in a bypass arrangement around system pump where indicated on the drawings. Allow sufficient clearance at the top of the unit for filter removal and replacement. Anchor filter support stand to a housekeeping pad or support using wall brackets attached to building structure. Install a shutoff valve upstream and downstream of the filter. Install a pressure gauge with gauge valves, piped so the pressure differential across the filter can be read.
- B. Install the 75 micron filters after the piping system has been cleaned and flushed. Install one set of 5 micron filters when the 75 micron filters need replacing. Give the other set of 5 micron filters to the Owner.

3.14 CENTRIFUGAL SEPARATORS

- A. Install centrifugal separator in a bypass or full flow arrangement around secondary chilled water system pumps where indicated on the drawings. Allow sufficient clearance at the top of the unit for head removal and cleaning. Support stand with angle iron and other structural support members. Install a shutoff valve upstream and downstream of the separator. Install a pressure gauge with gauge valves, piped so the pressure differential across the separator can be read. Install the motorized drain valve in the collection chamber outlet downstream of a manual shutoff valve; extend piping to the adjacent floor drain. Controller will be installed under the temperature control specification section.

3.16 EXPANSION TANK

- A. Install tanks where indicated on the drawings, providing a concrete base, fabricating steel supports or hanging from building structure to suit the application. Install all specified tank accessories.
- B. DIAPHRAGM TANKS:
 - 1. Verify proper air charge; recharge as necessary. Install an isolation valve in the piping connecting the tank to the system. In the piping between the tank and the isolation valve, install a pressure gauge and a drain valve with a hose adapter. Install a drain valve with hose adapter in the drain connection of the tank. Make sure that all drains are accessible and a hose can be attached.

3.17 AIR SEPARATORS

- A. Mount in hot and/or chilled water lines as indicated on the drawings/details. Install ball valve with hose adapter in bottom blow down connection.
- B. Open the drain valve and blow down the strainer after system cleaning and again after 30 days of

operation.

- C. High capacity automatic air elimination valve be installed on top of the air separator. It shall be float activated type, designed to prevent entrance of air in negative pressure situation. Pipe the outlet port using soft copper tubing clipped in place to near a floor drain. Provide a full size ball valve on the inlet side to the vent for maintenance purposes.

3.18 AIR VENTS

- A. **MANUAL KEY TYPE VENTS:**
 - 1. Install at all high points where air may collect and not be carried by the system fluid. Use a soft Type L copper "pigtail" so the vent can be positioned for venting and collecting any water that might escape.
- B. **MANUAL BALL VALVE VENTS:**
 - 1. Install on air handling coils and where indicated elsewhere as shown on drawings and details.
- C. **AUTOMATIC VENTS:**
 - 1. Install on the top of air separators on systems using diaphragm type expansion tanks. Install at other locations as indicated on the drawings or details. All locations to have a ball valve installed upstream of the vent for maintenance purposes.

3.19 SUCTION DIFFUSERS

- A. Install at each pump suction connection for end suction pumps where shown. Provide sufficient space for removal of the startup strainer. Install a capped drain valve in the blow down connection. Install support below the suction diffuser so the weight of the suction piping does not rest on the pump suction connection. When inertia bases are provided, the support shall bear on the inertia base and not the mechanical room floor.
- B. Install a pressure gauge across the suction diffuser, valved so that a single gauge can be used to read the inlet pressure and the outlet pressure across the suction diffuser and strainer. Use gauge valves as specified with the gauges. This gauge can be the same one used to read pressures across the pump. Select gauge range appropriate to the system pressures.
- C. Open the drain valve and blow down the strainer after system cleaning and again after 30 days of operation. If the unit is furnished with a fine mesh startup strainer, remove this strainer after the system has been flushed and cleaned.
- D. On applications involving open systems, such as but not limited to cooling towers, remove the fine mesh startup strainer prior to pump operation if the suction diffuser includes such a strainer.

3.22 DIFFERENTIAL PRESSURE GAUGE

- A. Handle as a loose and detachable part as outlined in the General Requirements.

3.23 WATER METERS

- A. Install water meters on makeup water line to hot water and chilled water systems ahead of water pressure reducing valve.

END OF SECTION

SECTION 23 05 14

VARIABLE FREQUENCY DRIVES

PART 1 - GENERAL

1.01 SCOPE

- A. This section includes variable frequency drives, bypass starters, and line reactors. Included are the following topics:

PART 1 - GENERAL

Scope
Related Work
Reference Standards
Operating and Maintenance Instructions
Equipment Startup and Owner Training
Warranty

PART 2 - PRODUCTS

Manufacturers
Design and Construction
Performance Requirements
Control Features
Protection Features
Diagnostics
Quality Assurance Tests
Bypass Equipment
Line Reactors
Output Line Filter

PART 3 - EXECUTION

Variable Frequency Drives (VFD)

1.02 RELATED WORK

- A. The contractor shall provide work, services, equipment, accessories, and materials shown or described by the applicable sections of any part of any section or division of contract document.

1.03 REFERENCE STANDARDS

- A. ANSI/IEEE 519 Guide for Harmonic Control and Reactive Compensation of Static Power Converters.

1.04 OPERATING AND MAINTENANCE INSTRUCTIONS

- A. Instructions to include recommended maintenance procedures, maintenance schedules, recommended spare parts list, and vendor name for those parts.

1.05 EQUIPMENT STARTUP AND OWNER TRAINING

- A. Provide the services of a factory trained and certified technician to approve the installation; start-up, test, and adjust for proper operation; and instruct and train the Owner's representative in the operation and maintenance of the unit(s). Upon completion of the equipment startup, submit a complete manufacturer's field report, including startup and test log, signed by the factory trained technician. Coordinate with the Temperature Control Contractor and the Balancing Contractor. The startup shall be coordinated with Division 26 and shall be completed within ten (10) working days from the startup date as set by the Owner.

1.06 WARRANTY

- A. The warranty shall be for a period of twenty-four (24) months from the date of project Substantial Completion. Further, the warranty shall include all parts, labor, travel time, administrative costs, overhead, travel expenses, technical support and any and all other costs to provide the warranty service.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. ABB, Franklin Control Systems, Toshiba, Danfoss, GE Fuji, Yaskawa, Eaton/Cutler Hammer, Mitsubishi, Allen Bradley.

2.02 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, micro processor-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 conduit.
- H. The unit enclosure shall be NEMA 12 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. Fused disconnect switch or circuit breaker 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.
 - 4. Manual bypass selector switch to select power through drive or bypass.
 - 5. EMI Filter.
- J. Provide a manual bypass circuit and bypass starter to transfer from variable frequency drive operation to bypass operation.
- K. Provide partitioning within drive enclosure to separate and isolate bypass section from variable frequency drive section and to house bypass wiring, contactors, relays, and manual bypass circuit so that devices within the converter/inverter compartment are able to be serviced without electrical danger to the service technician.

2.03 PERFORMANCE REQUIREMENTS

- A. Units shall be suitable for input power of electrical system as scheduled on the drawings $\pm 10\%$, 3 phase, 60 Hertz nominal.

- B. Provide minimum 3% line reactor in each AC phase on the input side to reduce harmonic voltage distortion. Limit line noise, as measured at the point of common coupling, to a voltage factor of 5% or less as defined in IEEE-519, latest edition. If the distortion is greater than that allowed by IEEE-519, latest edition, the line reactor shall be changed in size to ensure compliance. The supplier of the VFD shall provide distortion calculations to be used for setup and analysis.
- C. 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.
- D. 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.
- E. Additional performance capabilities to include the following:
 - 1. Ride through a momentary power outage of 15 cycles, Start into a rotating load without damage to drive components or motor, capable of automatic restart into a rotating load after a preset, adjustable time delay following a power outage Input power factor: Min 0.95 throughout the speed range Minimum efficiency: 95% at 100% speed, 85% at 50% speed

2.04 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. Refer to Division 23.
- 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. Manual transfer bypass circuit
 - 7. Field adjustment of minimum and maximum output frequency
 - 8. 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".
 - 9. Illuminated display keypad.
 - 10. External Fault indicator
 - 11. One (1) input for a N.O. dry contact type input for a 2-wire remote start/stop
 - 12. 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 and bypass starter operation when external fault is present.
 - 13. 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.
 - 14. PID control loop capable of VFD control from an external device connected to a VFD analog input.

2.05 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;

Instantaneous overcurrent and/or over voltage of output; Power line overvoltage and undervoltage protection; Phase loss;
Single and three phase short circuiting; Ground faults; Control circuit malfunction;
Over temperature; and 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 and bypass starter are not both energized and driving motor simultaneously.

2.06 DIAGNOSTICS

- A. Provide an English character display (no error codes) with indicators for the following:
1. Phase Loss
 2. Ground Fault
 3. Over Current
 4. Over Voltage
 5. Under Voltage
 6. Over Temperature
 7. Overload
 8. DC Buss Status

2.07 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;
 3. Demonstrate adequate protection during switching from variable frequency drive operation to bypass starter operation and back again;
 4. Measure and record voltage distortion factor and line notch depth at the point of common coupling. Provide the recorded value as part of the startup report.

2.08 BYPASS EQUIPMENT

- A. Bypass Starters:
1. The bypass starters for 208 volt motors, 20 HP and less; and 480 volt motors, 40 HP and less, shall be across-the-line magnetic starter type.
 2. The bypass starters for 208 volt motors, 25 HP and more; and 480 volt motors, 50 HP and more, shall be solid state reduced voltage starting type.
- B. Bypass Configuration:
1. Provide one main fused disconnect switch or circuit breaker to isolate both the drive and bypass circuit. Bypass configuration shall consist of one input drive contactor or disconnect, one output drive contactor and one output bypass contactor. The two output contactors shall be mechanically and electrically interlocked.

- C. Provide motor overload protection in the bypass circuit.
- D. Provide bypass equipment in a NEMA 12 enclosure.

2.09 LINE REACTORS

- A. Furnish and factory install line reactors to comply with the specified limits on electrical line noise.
- B. Line reactors shall be designed for operation on the input side of the VFD.
- C. 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.
- D. Line reactor shall be suitable for the voltage of the system $\pm 10\%$, 3 phase, 60 Hertz.
- E. Line reactor ampere rating shall be sized in accordance with the variable frequency drive manufacturer's recommendations with the minimum size equal to the NEC Table 430-150 full load ampere rating of the connected motor.
- F. Line reactor shall be a three phase inductor, 3% impedance, iron core, 600V, Class H insulation, 115 degree C rise, copper windings with screw type terminal blocks.

2.10 OUTPUT LINE FILTER

- A. Provide a three phase DV/DT output filter for any 460VAC drive with output line length of over 120 feet or as specified.

PART 3 EXECUTION

3.01 VARIABLE FREQUENCY DRIVES (VFD)

- A. Division 23 shall provide and Division 26 shall install where indicated on drawings and in accordance with approved submittals and manufacturer's published recommendations.
- B. Input wiring shall be installed in a separate conduit system, output wiring shall be installed in a separate conduit system and control wiring shall be installed in a separate conduit system. Do not mix input power, output power, or control wiring in a common conduit.
- C. Control signal for drive shall be provided under Division 23.
- D. Temperature Control Contractor shall furnish and install the required temperature control wiring in metal conduit and in accordance with Division 26 specifications.

END OF SECTION

SECTION 23 05 13

COMMON MOTORS AND ELECTRICAL REQUIREMENTS FOR HVAC 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. Rooftop unit and equipment Manufacturer's internal starters are specified elsewhere. Hermetically sealed motors are specified elsewhere. Included are the following topics:

PART 1 - GENERAL
Scope
Related Work
Reference Standards
Submittals
Operating and Maintenance Instructions
Electrical Coordination
Product Criteria
Motors
Equipment Short Circuit Rating
PART 2 - PRODUCTS
Three Phase, Single Speed Motors
Single Phase, Single Speed Motors
Motors on Variable Frequency Drives
PART 3 - EXECUTION
Motors
Electrical Work

1.02 RELATED WORK

- A. The Contractor shall provide work, services, equipment, accessories, and materials shown or described by the applicable sections of any part of any section or division of the contract documents.

1.03 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

1.04 SUBMITTALS

- A. Starters and disconnects equipment submittals shall include:
1. Motor manufacturer, horsepower, voltage, phase, hertz, rpm, full load efficiency.
- B. Project wiring diagrams prepared by the contractor specifically for this work.

1.05 OPERATING AND MAINTENANCE INSTRUCTIONS

- A. Include manufacturer's instructions in the manuals with the specific equipment to which they apply. Also include the following information if not previously documented on shop drawings: full load power factor, service factor, NEMA design designation, insulation class, and frame type.

1.06 ELECTRICAL COORDINATION

- A. Starters, overload relay heater coils, disconnect switches and fuses, relays, wire, conduit, pushbuttons, pilot lights, and other devices required for the control of motors or electrical equipment are provided by the Mechanical Contractor, except as specifically noted on Mechanical or Electrical drawings or specifications to be provided by Electrical Contractor.

- B. Electrical and Mechanical drawings and/or specifications show number and horsepower rating of motors furnished by this Contractor, together with their actuating devices. Should any discrepancy in size, horsepower rating, electrical characteristics or means of control be found for any motor or other electrical equipment, Contractor is to notify the architect/engineer of such discrepancy, resolve the conflict, and provide the work at no additional cost to the project.
- 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. Furnish complete sets of wiring diagrams for Owner's bound maintenance manual.

1.07 PRODUCT CRITERIA

- A. Motors, starters, disconnects, and switches used as disconnects shall 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, starters and disconnects rated for conditions in which they will be required to perform; i.e., general purpose, splash-proof, 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.

1.08 MOTORS

- A. Motors shall be premium efficiency, manufactured in accordance with NEMA standards. All motors shall meet the minimum efficiency as set forth in the local and state codes. Provide motors having proper current characteristics, as indicated (in the Motor-Starter Schedule and) on the drawings and further verified with the Electrical Contractor. Notify the Architect and correct any discrepancies before ordering these motors, starters, disconnects and controls, without additional cost to the project.

1.09 EQUIPMENT SHORT CIRCUIT CURRENT RATING

- A. Mechanical equipment, packages systems, control panels, motor starters, motor controllers, variable frequency drives and similar equipment shall carry a Short Circuit Current Rating (SCCR) equal to or greater than available fault current delivered from electrical system. Include visible factory nameplate for such equipment indicating SCCR of equipment in accordance with UL 1995 and UL 508A.
- B. The electrical system shall be rated for 65kA, short circuit current rating unless confirmed in the field to be less.

PART 2 - PRODUCTS

2.01 THREE PHASE, SINGLE SPEED MOTORS

- A. Provide NEMA rated, three phase, 60 hertz motors for all motors 1/2 HP and larger unless specifically indicated. Refer to the Division 23 and Division 26 drawings for required voltage.
- B. Provide NEMA general purpose, continuous duty, Design B, normal starting torque; T-frame or U-frame motors with Class B or better insulation unless the manufacturer of the equipment on which the motor is being used has different requirements. Provide open drip-proof motors unless totally enclosed fan-cooled, totally enclosed non-ventilated, explosion-proof, or encapsulated motors are specified in the equipment sections.
- C. Use grease lubricated anti-friction ball bearings with housings equipped with plugged/capped provision for relubrication, rated for minimum AFBMA 9, L-10 life of 20,000 hours. Calculate bearing load with NEMA minimum V-belt pulley with belt center line at the end of NEMA standard shaft extension. Stamp bearing sizes on nameplate.

- D. Motors to have a service factor not less than 1.15.

2.02 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 shall be not less than 1.35. They shall be capacitor start, capacitor run type having two capacitors in parallel with run capacitor remaining in circuit at operating speeds.

2.03 MOTORS USED ON VARIABLE FREQUENCY DRIVES

- A. In addition to the requirements specified above, the motor must be suitable for use with the drive specified including, but not limited to, motor cooling.
- B. Motor shall comply with NEMA MG1, Part 31 specification.
- C. Equip motors with Aegis SGR shaft grounding brush. Provide factory mounted where available, otherwise field supply to suit. Refer to website www.est-aegis.com.

PART 3 - EXECUTION

3.01 MOTORS

- 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. Couplings used for direct driven equipment shall be equal to Woods Dura-Flex.
- B. When motor will be flexibly coupled to the driven device, mount coupling to the shafts in accordance with the coupling manufacturer's recommendations. Using a dial indicator, check angular misalignment of the two shafts; adjust motor position as necessary so that the angular misalignment of the shafts does not exceed 0.002 inches per inch diameter of the coupling hub. Using the dial indicator, check the shaft for run-out to assure concentricity of the shafts; adjust as necessary so that run-out does not exceed 0.002 inch.
- C. When motor will be connected to the driven device by a belt drive, mount sheaves on the appropriate shafts in accordance with the manufacturer's instructions. Use a straight edge to check alignment of the sheaves; reposition sheaves as necessary so that the straight edge contacts both sheave faces squarely. After sheaves are aligned, loosen the adjustable motor base so that the belt(s) can be added and tighten the base so that the belt tension is in accordance with the drive manufacturer's recommendations. Frequently recheck belt tension and adjust if necessary during the first day of operation and again after 80 hours of operation.
- D. Verify the proper rotation of each three phase motor as it is being wired or before the motor is energized for any reason.
- E. Lubricate all motors requiring lubrication. Record lubrication material used and the frequency of use. Include this information in the maintenance manuals.

3.02 ELECTRICAL WORK

- A. All line voltage power wiring to HVAC equipment, factory mounted control panels, to motor control centers, to and from disconnect switches, and to individually mounted starters, and from starters to motors, shall be furnished by the Electrical Contractor. This Contractor shall turn over all individually mounted variable frequency drives, starters, and disconnect switches furnished under this Contract to the Electrical Contractor for installation by him.

- B. All line, or low voltage, wiring required for temperature control of thermostats, pressure electric switches, zone switches, starter interlocks, start/stop pushbuttons, etc., shall be provided by Section 23 09 14.
- C. All other line, or low voltage, wiring which is not indicated on the drawings, or specified, but necessary to complete the installation, shall be done by this Division.
- D. All wiring shall be installed in conduit in accordance with Electrical Specifications or Codes governing wiring in plenum ceilings. Concealed low voltage wiring shall also be installed in conduit if required by the Electrical Specifications or Codes. No exposed wiring shall be installed in finished areas. Exposed wiring shall be installed in wire mold or conduit in unfinished areas in an inconspicuous manner. Install all wiring and wiring devices neatly parallel or perpendicular to building lines.
- E. Furnish wiring diagrams to Electrical Contractor for all electrical equipment furnished under this Contract. Each diagram must be in accordance with actual installation. Furnish complete sets of wiring diagrams for Owner's bound maintenance manual.
- F. Any changes in this Contract after the bid opening to the number and sizes of motors and starters due to substitution of equipment will become this Contractor's responsibility to inform and coordinate these changes with all affected Contractors.
- G. Mount smoke detectors provided by electrical contractor in accordance with NFPA 90A and NFPA 72. Provide access doors to provide access to tube. Assist Electrical Contractor in identifying exact location of detector in accordance with NFPA 90A and NFPA 72.

END OF SECTION

SECTION 23 05 12
DISCONNECT SWITCHES

PART 1 - GENERAL

1.01 SCOPE

- A. The work under this section includes disconnect switches, fuses and enclosures. Included are the following topics:

PART 1 - GENERAL
Scope
Related Work
Submittals
Operation and Maintenance Data
PART 2 - PRODUCTS
Disconnect Switches
Fuses
PART 3 - EXECUTION
Installation

1.02 RELATED WORK

- A. Applicable provisions of Division 01 govern work under this Section.

1.03 SUBMITTALS

- A. Include outline drawings with dimensions, and equipment ratings for voltage, ampacity, horsepower, and short circuit.

1.04 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 DISCONNECT SWITCHES

- A. Fusible Switch Assemblies: NEMA Type Heavy Duty; quick make, quick break, load interrupter, enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position. Fuse Clips: designed to accommodate Class R cartridge type fuses.
- B. Enclosure: NEMA Type 1 or as indicated on Drawings.
- C. Provide manufacturer's equipment ground kit in all disconnect switches.

2.02 FUSES

- A. Fuses 600 Amperes and Less: Dual element, time delay, 600 volt, UL Class LPJ-SP. Interrupting Rating: 200,000 rms amperes.
- B. Fuses 601 Amperes and Larger: Time delay, 600 volt, UL Class L. Interrupting Rating: 200,000 rms amperes.
- C. Provide three (3) spares of each size and type fuse. Provide enclosure for spare fuse.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install disconnect switches where indicated on Drawings.
- B. Install per NEC and manufacturer's instructions.

END OF SECTION

SECTION 23 05 11

MOTOR STARTERS

PART 1 - GENERAL

1.01 SCOPE

- A. The work under this section includes manual motor starters, magnetic motor starters, combination magnetic motor starters and motor control centers. Included are the following topics:

PART 1 - GENERAL

Scope
Related Work
Coordination With Other Trades
References
Submittals
Operation and Maintenance Data
Delivery, Storage, and Handling
Spare Parts

PART 2 - PRODUCTS

Manual Motor Starters
Magnetic Motor Starters
Starter Overcurrent Protection and Disconnecting Means
Fuses

PART 3 - EXECUTION

Installation

1.02 RELATED WORK

- A. Applicable provisions of Division 01 shall govern work under this Section.

1.03 COORDINATION WITH OTHER TRADES

- A. Motors: In general, all electric motors required for this installation will be supplied with equipment, apparatus and/or appliances covered under other sections of the specifications.
- B. For the sake of consistency and conformity of manufacturer, design and construction, all motors shall conform to the following description unless otherwise noted or required.
1. Motors 1/3 HP and smaller shall be wound for operation on single phase, 60 Hz. service unless otherwise noted.
 2. Motors 1/2 HP and above shall be wound for operation on 3 phase, 60 Hz service unless otherwise noted.
 3. Refer to drawings in each case in order to verify voltage characteristics required.
- C. The starters for motors of Division 23 shall be furnished by Division 23 and installed by the Division 26 unless noted otherwise. (See Motor Schedule on Drawings.)
- D. The Electrical Trade Division 26 shall set and connect all specified starting equipment, install all power conduits and wiring and shall furnish and make all connections from starting equipment to motors as required to leave the apparatus in running condition.
- E. Wiring Connections:
Division 26 shall furnish branch circuits for all motors to the starting equipment and then to the motors, complete with all control wiring for automatic and remote control where required or noted. Conduits to motors shall terminate in the conduit fittings on the motors, the final connection being made with flexible, PVC-coated metal conduit.
- F. Division 26 shall provide all necessary labor and material to completely connect all electrical motors and controls (where required) in connection with the building utility equipment, including fans, pumps, etc.

- G. Division 23 shall provide all conduits and wiring required for control work from the holding coil circuit of the starter, including the furnishing and installation of control devices such as auxiliary contacts, control relays, time delay relays, pilot lights, selector switches, alternators, etc.
- H. Power Branch Circuits by Division 26:
Wire sizes for branch circuits not specifically called for on drawings or in specifications shall be based on 125 percent of the full load current of the motor unless the voltage drop of motor branch circuits exceeds 1-1/2 percent from the distribution panel to the motor; in which case, voltage drop shall govern wire sizes. A power factor of 80 percent shall be used for motors in such calculations.

1.04 REFERENCES

ANSI/NEMA ICS 6	Enclosures for Industrial Controls and Systems
ANSI/UL 198E	Class R Fuses
NEMA AB 1	Molded Case Circuit Breakers
NEMA ICS 2	Industrial Control Devices, Controllers, and Assemblies
NEMA KS 1	Enclosed Switches
NEMA PB 1	Panelboards
NEMA PB 1.1	Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.

1.05 SUBMITTALS

- A. Provide product data on motor starters and combination motor starters, relays, pilot devices, and switching and overcurrent protective devices.

1.06 OPERATION AND MAINTENANCE DATA

- A. All operations and maintenance data shall comply with the submission and content requirements specified under Section GENERAL REQUIREMENTS 01.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- B. Handle in accordance with Manufacturer's written instructions. Lift only with lugs provided for the purpose. Handle carefully to avoid damage to motor control center components, enclosure, and finish.

1.08 SPARE PARTS

- A. Keys: Furnish two (2) each to Owner.
- B. Provide three (3) spares of each size and type fuse used. Provide enclosure for spare fuses.
- C. Fuse Pullers: Furnish one fuse puller to Owner.

PART 2 - PRODUCTS

2.01 MANUAL MOTOR STARTERS

- A. Manual Motor Starter: NEMA ICS 2; size to suit motor HP. AC general-purpose Class A manually operated full voltage controller for induction motors rated in horsepower, with overload protection, red pilot light and toggle operator.
- B. Enclosure: NEMA Type 1.
- C. Provide manufacturer's equipment ground kit in all starter enclosures.

2.02 MAGNETIC MOTOR STARTERS

- A. Magnetic Motor Starters: NEMA ICS 2; AC general purpose Class A magnetic controller for induction motors rated in horsepower; size 0 minimum.
- B. Full Voltage Starting: Non-reversing type.
- C. Coil Operating Voltage: 120 volts, 60 Hz.
- D. Overload Protection: Electronic.
- E. Enclosure: NEMA Type 1
- F. Provide manufacturer's equipment ground kit in all starter enclosures.
- G. Auxiliary Contacts: NEMA ICS 2; two field convertible contacts in addition to seal-in contact.
- H. Selector Switches: NEMA ICS 2; HAND/OFF/AUTO, in front cover.
- I. Indicating Lights: NEMA ICS 2; LED Push-to-test type. RUN: red in front cover.
- J. Relays: NEMA ICS 2; Provide on-time delay (0-60 sec) relays as indicated on the Drawings.
- K. Provide phase loss protection relay with each motor starter, with contacts to de-energize each motor starter.
- L. Control Power Transformers: Each magnetic starter shall have a fused primary and a fused 120Vsecondary control transformer, sized for the load, 100 vA minimum. Additionally, the X2 terminal of the control transformer shall be grounded.
- M. Combination Motor Starters: Combine motor starters with fusible switch disconnect in common enclosure.

2.03 STARTER OVERCURRENT PROTECTION AND DISCONNECTING MEANS

- A. Fusible Switch Assemblies: NEMA KS 1; quick make, quick break, load interrupter enclosed knife switch with externally operable handle. Provide interlock to prevent opening front cover with switch in ON position. Handle lockable in OFF position. Fuse Clips: Designed to accommodate Class R fuses.

2.04 FUSES

- A. Fuses 600 Amperes and Less: Dual element, time delay, 600 volt, UL Class RK 5. Interrupting Rating: 200,000 rms amperes.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install motor control equipment in accordance with manufacturer's instructions.
- B. Select and install heater elements in motor starters to match installed motor characteristics.
- C. Motor Data: Provide neatly typed label inside each motor starter enclosure door identifying motor served, nameplate horsepower, full load amperes, code letter, service factor, and voltage/phase rating.

END OF SECTION

SECTION 23 05 00

COMMON WORK RESULTS FOR HVAC

PART 1 – GENERAL

1.01 PROJECT DESCRIPTION

- A. Each bidder must review existing equipment and conditions at the jobsite prior to submitting their bid. Provide a price to include all associated parts, labor and support for this turnkey project, including, but not limited to, the following:
1. Removal of existing boiler plant
 2. Existing expansion tank, air separator and chemical feeder are to be reused
 3. Installation of new boiler plant
 4. Installation of snow melting system for both ramps leading to the underground parking
 5. Replacement of all existing mechanically grooved pipe couplings on the hot water system.
 6. Balancing of entire hot water system
 7. Providing new controls for the new boiler plant that is to be tied into the existing Kain Energy Corporation DDC system. New controls must have the ability to be tied into any BACnet certified controls system.
 8. Drain entire hot water system, fill, flush, vent, and provide suitable chemical treatment to protect piping system and inhibit corrosion. System shall be flushed until clean as approved by Owner. City is currently treating system with Global Water Technology product CL-5620. Contractor shall use this product when filling the system for the final time. The local contact for Global Water Technology is Jacob Walt and can be contacted at jwalt@gwt-inc.com
 9. Provide all electrical work for equipment to be removed and added.
 10. Contractor shall remove and dispose of all old equipment, ductwork, and piping as shown on drawings in a lawful manner.
 11. Provide minimum of two (2) year parts and labor warranty for the entire project.
 12. The Contractor shall be licensed in the State of Wisconsin and pull all required permits. Fees for New Berlin permits will be waived.
 13. The contractor shall provide a total of four preventative maintenance visits per the manufacturer's instructions at no charge to the owner. There shall be two for heating equipment, one during the first heating season after substantial completion and one during the following years heating season. There shall be two for cooling equipment, one during the first cooling season after substantial completion and one during the following years cooling season. Date of the substantial completion of the project shall be signed off by the building owner and contractor.
 14. The contractor shall meet with building owner and establish a construction schedule to meet building owners phasing and building access requirements

1.02 SCOPE

- A. 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. Included are the following topics:

PART 1 - GENERAL
Project Description
Scope
Related Work
Reference
Reference Standards
Quality Assurance
Definitions
Drawings and Specifications
Manufacturer's Instructions
Accessibility and Clearances for Equipment

- Visit to the Site
- Codes and Permits
- Continuity of Existing Services
- Protection of Finished Surfaces
- Finish Painting
- Sleeves and Openings
- Sealing and Firestopping
- Equipment Furnished By Others
- Provisions for Future
- Submittals
- Substitutions
- Operating and Maintenance Instructions
- System Start Up
- Training of Owner Personnel
- Record Drawings
- Warranty
- Change Orders
- Alternate Bids

PART 2 - PRODUCTS

- Access Panels and Doors
- Identification
- Sealing and Firestopping

PART 3 - EXECUTION

- Demolition
- Excavation and Backfill
- Concrete Work
- Cutting, Patching, and Demolition
- Plumbing Work
- Steel Supports, Curbs and Bases
- Suspended Ceiling Removal
- Access Panels
- Building Access
- Equipment Access
- Coordination
- Materials and Workmanship
- Identification
- Lubrication
- Sleeves
- Sealing and Firestopping
- Clean up
- Temporary Heat
- Tests for Acceptance
- Natural Gas Service

1.03 RELATED WORK

- A. This Contractor shall provide work, services, equipment, accessories, and materials shown or described by the applicable sections of any part of any section or division of the contract documents.

1.04 REFERENCE

- A. Applicable provisions of Division 01 govern work under this section.

1.05 REFERENCE STANDARDS

- A. Abbreviations of standards organizations referenced in other sections are as follows:

AABC	Associated Air Balance Council
ABMA	American Boiler Manufacturers Association
ADC	Air Diffusion Council
AGA	American Gas Association
AMCA	Air Movement and Control Association

ANSI	American National Standards Institute
ARI	Air Conditioning and Refrigeration Institute
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
AWWA	American Water Works Association
AWS	American Welding Society
CGA	Compressed Gas Association
CTI	Cooling Tower Institute
EPA	Environmental Protection Agency
GAMA	Gas Appliance Manufacturers Association
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
NEBB	National Environmental Balancing Bureau
NEC	National Electric Code
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association. Inc.
UL	Underwriters Laboratories Inc.
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

1.06 QUALITY ASSURANCE

- A. Refer to Division 01, General Conditions, Equals and Substitutions.
- B. Where equipment, manufacturers 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.

1.07 DEFINITIONS

- A. Reviewed: To give limited, or conditional, or qualified permission to use material, equipment, components or methods which are in strict compliance with the contract requirements. It does not mean unqualified acceptance or waiver of the original requirements.
- B. Equal: To possess the same general performance qualities, capabilities and characteristics, to fulfill the intended utilitarian function without any significant decrease in quality, durability or longevity.
- C. Install: To place, fix in position, secure, anchor, etc., including necessary appurtenances and labor so the equipment or installation will function as specified and intended. This includes all required start up functions as described herein after in subsequent mechanical sections of this specification or as required by the manufacturer.
- D. Furnish: To purchase or obtain equipment or components and deliver to job site, ready for installation. This includes all required manufacturer's warranties and/or guarantees as hereafter described.
- E. Provide: To furnish and install, as defined above. This includes all required warranties and guarantees.

1.08 DRAWINGS AND SPECIFICATIONS

- A. The civil, electrical, mechanical and plumbing drawings and specifications are hereby incorporated into and become a part of this contract document for work under this Division. This Contractor shall examine all drawings and specifications contained therein. The submission of this bid shall indicate such knowledge. This Section is responsible for work of Division 23 which is specified or shown on plans of other Divisions.
- B. Mechanical drawings are diagrammatic. They are intended to show the approximate locations of equipment ductwork, and piping. Dimensions stated on the drawings shall take precedence over scaled dimensions. All dimensions, whether stated or scaled, shall be verified in the field.
- C. The exact location for apparatus, fixtures, equipment ductwork, and piping shall be obtained from actual field measurements and from the Architect or their representative as required, and the work shall be laid out accordingly. If the Contractor should fail to ascertain such locations before proceeding with their work, and if this work does not conform to the intended design, this Contractor shall revise their work, at no additional cost, as directed by the Architect. The Architect reserves the right to make minor changes in the locations of piping and equipment, up to the time of roughing-in and installation, without additional charge to coordinate field conditions.
- D. The drawings may have legends, floor plans, roof plans, details, schedules, etc. If something is shown or noted on any drawing, the contractor shall include it. Drawings and specifications are intended to supplement one another. Any materials or labor called for in one but not the other shall be provided as if both mentioned in the specifications and shown on the drawings. Labor and/or materials neither shown nor specified but obviously necessary for the completion and proper functioning of the system shall be provided by this Contractor without additional cost.
- E. Any conflict in the contract documents shall be deemed to have been estimated the more expensive way of doing the work, unless the Contractor asks and receives a decision in writing as to which shall govern, prior to submitting their bid.
- F. The design of the HVAC systems are based first upon the equipment listed on schedules, then upon the manufacturer listed first in the specifications. Where any other equipment manufacturer, whether listed in the specifications or an approved substitution is used, this Contractor will be responsible for any changes required to the system or to the building due to physical limitations of the equipment, and they shall pay for all structural, mechanical and electrical construction and design changes required by the equipment. This Contractor shall inform the **Architect Engineer** and all Contractors, in writing within five (5) days of award of contract, of any changes before they begin their respective work. No equipment shall be ordered prior to final review of submittal drawings from the **Architect Engineer**. This Contractor shall bear all financial risks for rejected equipment ordered prior to final review of submittal drawings from the **Architect Engineer**.
- G. Verify measurements at the building, check levels and grades, and be responsible for grading, fitting, joining or adjusting of work to suit existing conditions. Drawings do not indicate all necessary offsets, transitions, etc., necessary to install the work. The drawings are based on the best information available but may not accurately represent the actual conditions. This Contractor shall confirm these conditions and modify the work as necessary to comply with the intent of the design without additional charges.
- H. This Contractor assumes all risks and costs of pre-fabrication of ductwork and piping, etc. prior to a detailed dimensional survey of the project.
- I. Contractor shall submit a final drawing showing their layout of the mechanical to owner for approval before any new constructions happens in the mechanical room. Drawing shall show final locations of all pumps and starters with code and manufacture's clearances for service and maintenance. All elevations of all overhead pipes and valves shall be marked, heights shall be based from the bottom of pipe with insulation included.

1.09 MANUFACTURER'S INSTRUCTIONS

- A. All equipment furnished under this contract shall be installed in strict accordance with the

Manufacturer's installation instructions, whether or not the specific details of such installation are shown on the drawings or specified herein.

- B. If drawings are in conflict with Manufacturer's installation instructions, the Manufacturer's installation instructions shall govern.
- C. Provide all duct, pipe, drain, valve, vent, breeching, flex connections, vibration isolation, controls, etc. to equipment in accordance with Manufacturer's installation instructions. Provide all hangers, supports, bases, etc. as recommended by the equipment Manufacturer.

1.10 ACCESSIBILITY AND CLEARANCES FOR EQUIPMENT

- A. Contractor to maintain all minimum code and manufacturer required clearances to all equipment and apparatus.
- B. Maintain aisle and pathways to all equipment and equipment of other trades.
- C. The design of the HVAC systems are based first upon the equipment listed on schedules, then upon the manufacturer listed first in the specifications. The drawings depict clear access and pathways to the designed equipment. Where any other equipment manufacturer, whether listed in the specifications or an approved substitution is used, this Contractor will be responsible to maintain the clear access, pathways, and aisles as intended, including the equipment of all other trades.

1.11 VISIT TO THE SITE

- A. Before submitting the proposal for their work, the Contractor shall visit the site and shall satisfy themselves as to the nature and location of their work and the general and local conditions. They shall have full knowledge of conditions relative to transportation, handling and storage of materials, availability of electrical power and all other facilities in the area which will have a bearing on the performance of their work and the contract for which they submit their proposal. Pay special attention to existing items to be revised and relocated.
- B. Failure by the Contractor to acquaint themselves with all the available information shall not relieve them from any responsibility for performing their work properly.
- C. 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.
- D. Submission of a bid will be considered an acknowledgement on the part of the bidder of their visitation to the site.
- E. 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.

1.12 CODES AND PERMITS

- A. Install all work in full accordance with codes, rules and regulations of municipal, county, state, public utility and all other authorities having jurisdiction over the premises. This shall include all requirements of the city and state building codes, the regulations of the city and state building codes, the regulations of the Industrial Relations Board and the requirements of the National Board of Fire Underwriters, as interpreted by the local inspection division. All of these codes, rules and regulations are hereby incorporated into this specification.
- B. The Contractor shall secure and pay for all permits, tests, and certificates of inspection incidental to their work and required by the foregoing authorities.

1.13 CONTINUITY OF EXISTING SERVICES

- A. Do not interrupt or change existing services without prior written approval from the Owner. When interruption is required, coordinate the down time with the Owner to minimize disruption to their activities. Unless specifically stated, all work involved in interrupting or changing existing services is to be done during normal working hours.

1.14 PROTECTION OF FINISHED SURFACES

- A. Furnish one can of touch up paint for each different color factory finish which is to be the final finished surface of the product. Deliver touch up paint with other "loose and detachable parts" to Owner.

1.15 FINISH PAINTING

- A. Finish painting of piping, grilles, ductwork, steel, etc., unless otherwise specified hereinafter, shall be done by the General Contractor. If this Contractor should damage any finish painting, the necessary repainting shall be done at this Contractor's expense.

1.16 SLEEVES AND OPENINGS

- A. All sleeves and openings are the responsibility of the Contractor whose work penetrates the opening.

1.17 SEALING AND FIRESTOPPING

- A. Sealing and firestopping of sleeves/openings between ductwork, piping, etc. and the sleeve, structural or partition 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. These individuals hired shall normally and routinely be employed in the sealing and fireproofing occupation.

1.19 PROVISIONS FOR FUTURE

- A. A capped 1" gas line with shut off valve is to be provided in the boiler room for future gas loads.

1.20 SUBMITTALS

- A. Provide Owner with one copy of electronic PDF file for each submittal/shop drawing. Owner shall receive all submittals/shop drawings for review prior to fabrication or installation. All submittals/shop drawings are subject to Owner approval.
- B. This Contractor shall review all the submittal drawings for complete compliance to the Bid Documents before submission. The contractor shall highlight and explain any deviations from the drawings or specifications.
- C. Submit drawings with dimensions, capacities and information as soon as available from manufacturers. Each tier Contractor (including the prime) will be responsible for information on the drawings and must approve drawings before submitting them. The Contractor shall stamp the submittal drawings with their own Review for Approval stamp, or submit a separate statement indicating that the enclosed submittal drawings have been reviewed in accordance with the specifications. The submittal drawings shall not be reviewed without the Contractor's review statement. Review of drawings by the Architect, or their representatives, does not relieve the Contractor from the responsibility of complying with the requirements of the drawings and specifications. Show location of all controls.
- D. All submittal drawings, product data and samples submitted by the Contractor shall illustrate details of work, equipment, materials, products, systems, designs or workmanship that the Contractor intends to use in order to comply with the design concept established in Contract Documents. Review of these submittals by the Architect or its representative is only for the limited purpose of checking for conformity with the design concept of the work as established in the Contract Documents, and is not intended to determine the accuracy of other matters that may be contained in such submittals including, but not limited to, dimensions, quantities, performance of equipment

and systems designed by the Contractor, Contractor-furnished engineering and design, construction means, methods, techniques, sequences, procedures or safety precautions, the correctness of which as set forth in the Contract Documents or submittal shall be the sole responsibility of the Contractor. The Architect shall undertake its review with reasonable promptness so as to reduce delay. The Architect's review of a specific item shall not indicate approval of an assembly of which the item is a component or in which it functions.

- E. Submittals and shop drawings will not be checked to determine quantities. Each manufacturer will provide complete highlighted and product specific information pertaining to all products indicated on the drawings, including quantities, all motors, starters, electrical characteristics, accessories, etc. Submit pump curves, fan curves, sound data (NC and RC ratings), and pressure drops with submittals drawings. Any submittals drawings submitted that do not highlight or include the required information may be rejected outright, with no explanation.
- F. 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.
- G. Before submitting electrically powered equipment, verify that the electrical power and control requirements for the equipment are in agreement with the motor starter schedule on the electrical and HVAC drawings.
- H. Include wiring diagrams of electrically powered equipment.
- I. See each specification section for required submittals.

1.21 SUBSTITUTIONS

- A. The contract for the work, if awarded, will be on the basis of materials and equipment specified or described in the bidding documents, and those or equal or substitute or materials and equipment subsequently approved by the Owner prior to the submittal of bids and identified by addendum. No item of material or equipment will be considered by Owner as an or equal or substitute unless written requests for approval has been submitted by the bidder and has been received by the Owner at least 10 days prior to the date of receipt of bids in the case of a proposed substitute. The burden of proof on the merit of the proposed item is upon the bidder. The Owner's decision of approval or disapproval of a proposed item will be final. If the Owner approves any such proposed items, such approval will be set forth as an addendum issued to all perspective bidders. Bidder shall not rely upon approvals made in any other manner. All prices that Bidder sets forth in this bid shall be based on the presumption that the contractor will furnish the materials and equipment specified or described in the bidding documents as supplemented by any addenda.

1.22 OPERATING AND MAINTENANCE INSTRUCTIONS

- A. Refer to Division 01, General Requirements, Operating and Maintenance Instructions.
- 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:
 - 1. Copies of all approved submittal drawings.
 - 2. Manufacturer's wiring diagrams for electrically powered equipment.
 - 3. Records of tests performed to certify compliance with system requirements (especially Test and Balance Reports)
 - 4. Certificates of inspection by regulatory agencies
 - 5. Temperature control record drawings and typewritten control sequences
 - 6. Parts and spare parts lists for manufactured equipment
 - 7. Valve schedules
 - 8. Lubrication instructions, including list/frequency of lubrication done during construction
 - 9. Warranties
 - 10. Additional information as indicated in the technical specification sections

11. Equipment installation manuals
12. Maintenance Manuals
13. Owner's instruction manuals

1.23 SYSTEM START-UP

- A. Following the completion of all start-ups for all Mechanical Systems and assembly of all start up reports, balance reports and O&M Manuals a final start up procedure shall occur.
 1. Mechanical Contractor, Balancing Contractor, Controls Contractor, Engineer and Owner shall spend up to 8 hours on site. Engineer shall direct the contractors to start and stop and change set points on miscellaneous equipment to test their operations and determine if systems are set up properly. Also up to 10% of all components will be double checked for balancing, and any other devices be retested, in their presence, for verification of report data with no additional cost.
 2. Mechanical Contractor, Balancing Contractor, Controls Contractor, Engineer and Owner shall continue to return to the site to double check items that were not acceptable on the previously visits until Engineer, Architect and Owner accept the systems

1.24 TRAINING OF OWNER PERSONNEL

- A. Instruct Owner personnel in the proper operation and maintenance of systems and equipment provided as part of this project; video record all training sessions. Include not less than 2 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. Provide an additional 4 hours of training on the temperature control systems.

1.25 RECORD DRAWINGS

- A. In addition to the data indicated in the General Requirements, provide temperature control record drawings on originals prepared by the installing contractor/subcontractor. Include copies of these record drawings with the Operating and Maintenance manuals.

1.26 WARRANTY

- A. This Division shall warrant all of their work to be free from defects in workmanship or materials for a period of two (2) years from date of final acceptance and shall replace or repair any device, equipment, piping, electrical components, or controls in which defects develop within that time without cost to the project.
- B. In the case of replacement or repair due to failure within the warranty period, the warranty on that portion of the work shall be extended for a period of two (2) years from the date of such replacement or repair.
- C. Copies of all warranties must be included in the Operation and Maintenance Manuals.

1.27 CHANGE ORDERS

- A. No Change Order will be permitted unless a request for the Change Order is submitted in writing to the Owner prior to the performance of the work or the incurring of costs, which form the basis of the Change Order. No Change Order will be permitted unless approved by the Owner in writing as provided for hereunder.
- B. For Lump Sum Change Orders not covered by previously agreed unit pricing, the Contractor shall submit detailed pricing spreadsheets and backup costs on any change order over \$500. The spreadsheet shall list each applicable line item in the same manner as "Means".
- C. Time sheets for T&M change orders must be verified (signed) by the Contractor to qualify for payment.

1.28 ALTERNATE BIDS

- A. Alternate Bid No 1, this contractor shall provide a cost to remove of two existing air cooled condensing units and fan coil units that have been abandoned along with all associated ductwork and piping.
- B. Alternate Bid No 2, this contractor shall provide a cost to replace the existing VAV control valves on a per valve basis. Evidence of leaking has been seen on some of the valves, the contractor shall provide the owner with a picture of each valve showing the condition of the valve. Owner shall decide if the valve is to be replaced. For contractors' reference, of the 40 control valves, 36 are 3/4", 2 are 1", and 2 are 1 1/4" pipe size.
- C. Alternate Bid No 3, this contractor shall provide a cost to replace insulation that is damaged or missing on a per linear foot basis. This number shall cover only exiting hot water piping that is 1 1/2" or smaller in diameter.
- D. Alternate Bid No 4, this contractor shall provide a cost to provide a 20 extended warranty on all mechanically grooved pipe coupling and gaskets. This warranty shall cover all parts and labor for any failed coupling or gasket.

PART 2 - PRODUCTS

2.01 IDENTIFICATION

- A. **SNAP-ON PIPE MARKERS:**
Cylindrical self-coiling plastic sheet that snaps over piping insulation and is held tightly in place without the use of adhesive, tape or straps. Not less than 1 inch high letters/numbers and flow direction arrows for piping marking. W. H. Brady, Seton, or equal. Markers are to indicated direction of flow, water system name, and pipe size.
- 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. **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.
- D. **COUPLING TAGS:**
Laminate sticker with black letters on a white background. Not less than 1 inch high letters/numbers indicating coupling tag and size. Tag shall be legible from below. Provide the owner with a schedule that indicates the coupling tag, date of installation, room number, pipe size, piping system, coupling manufacturer and model number.

2.03 SEALING AND FIRESTOPPING

- A. **FIRE AND/OR SMOKE RATED PENETRATIONS:**
 - 1. Manufacturers: 3M, Hilti, Rectorseal, STI/SpecSeal, Tremco, or approved equal.
 - 2. All firestopping systems shall be provided by the same manufacturer.
 - 3. Submittals: Contractor shall submit product data for each firestop system. Submittals shall include product characteristics, performance and limitation criteria, test data, MSDS sheets, installation details and procedures for each method of installation applicable to this project. For non-standard conditions where no UL tested system exists, submit manufacturer's drawings for UL system with known performance on which an engineering judgment can be based upon.
 - 4. Product: Fire stop systems shall be UL listed or tested by an independent testing laboratory approved by the Department of Commerce.
 - 5. Use a product that has a rating not less than the rating of the wall or floor being penetrated. Reference architectural drawings for identification of fire and/or smoke rated walls and floors.
 - 6. Contractor shall use firestop putty, caulk sealant, intumescent wrapstrips, intumescent

firestop collars, firestop blocks, firestop mortar or a combination of these products to provide a UL listed system for each application required for this project. Provide mineral wool backing where specified in manufacturer's application detail.

B. NON-RATED PENETRATIONS:

1. Pipe Penetrations:

At pipe penetrations of non-rated interior partitions, floors and exterior walls above grade, use urethane caulk in annular space between pipe insulation and sleeve. For nonrated 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 necessary demolition of mechanical systems necessary to install new work and as indicated on the drawings. 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 to minimize disruption to the existing building occupants.
- B. All pipes, wiring and associated conduit, insulation, refrigerant piping, ductwork, and similar items demolished, abandoned, or deactivated are to be removed from the site by the Contractor and disposed in a lawful manner. All piping and ductwork specialties are to be removed from the site by the Contractor unless they are dismantled and removed or stored by the Owner. All designated equipment is to be turned over to the Owner 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.

3.03 CONCRETE WORK

- A. All cast-in-place concrete will be performed by this Contractor unless otherwise noted by others on drawings or in this Section of the Work. Provide all layout drawings, anchor bolts, metal shapes, and/or templates required to be cast into concrete or used to form concrete for support of mechanical equipment.
- B. Concrete pump bases, set directly on structural slabs, shall be doweled and bonded with Weld-Crete directly to the slab.
- C. In general, housekeeping concrete pads shall be 4" high and 6" larger than unit footprint.

3.04 CUTTING, PATCHING, AND DEMOLITION

- A. Refer to Division 01, General Requirements, Cutting and Patching.
- B. This Contractor shall provide and patch all duct and pipe openings in the new and existing building unless this work is specifically mentioned to be done by another Contractor.
- C. This Division shall provide all lintels, unless indicated to be provided by others on other drawings.
- D. This Contractor will inform the General Contractor of all duct opening sizes and locations in walls, ceilings, roof and partitions. Make arrangements with various other Contractors for all special sleeves, framing, spacing and chases. This Contractor shall provide all openings for piping in new construction.
- E. This Contractor shall cut duct openings, if sizes and locations were not provided to the General Contractor within 48 hours after request for this information, and if construction proceeds without openings.

- F. Beams, joists or structural supports may not be cut under any conditions without specific approval of the Architect.
- G. No chopping or breaking out of new or existing construction is permitted. Openings shall be neatly saw cut or cored drilled.
- H. The Heating, Ventilating and Air Conditioning Contractor shall coordinate all roof openings with the General Contractor before the structural steel is erected.
 - 1. The mechanical drawings specify a particular manufacturer for all roof-mounted equipment, and the structural drawings indicate supports and other design considerations which are based on the use of the specified equipment. This Section is responsible to coordinate the exact requirements and additional structure and cost to suit the provided equipment.
- I. All equipment, piping, and ductwork shall be properly cross-braced to avoid swaying action.
- J. Roof patching shall be done by a qualified roofing subcontractor.
- K. Penetrations
 - 1. Wherever pipes or ducts penetrate smoke partitions or fire rated floors or walls, fill opening around pipes or ducts with U.S.G. Thermofiber Felt and Firecode Gypsum Cement, Dow Corning Fire Stop Sealant, or equivalent material, equal to the rating of the assembly penetrated. The drawings may not indicate all required fire, smoke, and smoke fire dampers. This contractor is responsible for providing fire and smoke dampers at all penetrations of smoke and fire rated partitions whether or not indicated on drawings. Refer to the Architectural drawings and confirm final locations of such smoke and fire rated partitions.
 - 2. Wherever ducts pass through roofs from packaged rooftop units or other roof openings, the annular roof openings shall be packed with glass fiber and sealed on both sides with a nonhardening material such as "Tremco" acoustical sealant. The annular roof openings shall be cleanly cut and not over 3/8" oversize.
 - 3. Provide each duct opening in walls, floors and ceilings with an outside dimension 1" larger than the outside dimension of uninsulated ductwork. If the wall or floor is fire rated, duct opening shall be sealed to maintain fire rating and per NFPA 90A.
- L. Demolition
 - 1. This Section shall provide demolition and disposal of materials that are shown on the plans and where not shown are required to install the new work.

3.05 PLUMBING WORK

- A. Section 23 shall locate and coordinate final drain and cold water supply provisions with Section 22.
- B. Section 22 shall provide the following:
 - 1. Floor drains
 - 2. Hub drains
 - 3. Site drains
 - 4. Cold water supply terminated near requirements
 - 5. Backflow protection for water supply
- C. Section 23 shall provide the following:
 - 1. Drain piping to floor and hub drains. Install all cooling coil drain pans at sufficient height to properly drain through water traps
 - 2. Final cold water supply connections
 - 3. Air gap connection to plumbing drains

3.06 STEEL SUPPORTS, CURBS AND BASES

- A. The General Contractor shall furnish the main supporting steel for the heating and air conditioning equipment, ductwork and piping, and roof openings as shown on the structural drawings. Any other required supporting steel not shown on structural drawings shall be furnished by Section 23. All

equipment and apparatus suspended from joists shall be supported within 3" of joist panel points or this section shall provide joist stiffeners as detailed on the structural drawings.

- B. Provide concrete bases, footings, piers, platforms, curbs, pipe frames, steel grillage, etc., for all equipment as shown, or as required, unless otherwise noted on the drawings or in the specifications. Be responsible for location and size and any changes required by substitution of equipment or use of equipment listed in specification but not scheduled.
- C. Provide alignment, foundation template drawings, anchor bolts and Embeco non-shrink/non-metallic grouting for all bases in accordance with manufacturer's instructions.
- D. Concrete pump bases, set directly on structural slabs, shall be doweled and bonded with Weld-Crete directly to the slab.

3.07 SUSPENDED CEILING REMOVAL

- A. This Contractor to remove and reinstall all suspended ceilings required to complete work as shown on Bid Documents in existing buildings, store in area as directed by Owner and reinstall unless this work is specifically mentioned to be done by another Contractor. Any damaged ceiling tiles or support shall be replaced by this Contractor to exactly match the existing.

3.08 ACCESS PANELS

- A. Locate access panels at all concealed devices requiring accessibility for operation or maintenance. Notify Plastering and/or Drywall Contractor and Acoustical Tile Contractor of proper locations for access panels. Mark the location of all dampers located above acoustical tile ceilings as inconspicuously as possible.
- B. Provide fire rated access panels in all ductwork requiring fire rated enclosures.
- C. Furnish access panels to proper Contractors for their accurate installation.

3.09 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 they shall be provided by this Section. This Section shall 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, ductwork, and accessories to permit access to equipment for maintenance and service. 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.
- B. Provide color coded thumb tacks or screws, depending on the surface, for use in accessible ceilings which do not require access panels.

3.11 COORDINATION

- A. The building to remain operational during the construction phase of the project. This contractor is to coordinate the shutdown of areas of the building to allow construction to occur without interfering with then operational needs in the building. This contractor shall give the owner a minimum of a three week notice of a shutdown in order to relocate building staff.
- B. If interferences or conflicts occur because of improper allowance for these clearances by this Section, the responsible Section of the Work shall, at his own expense, revise his work as directed by the Owner to permit the completion of the work in accordance with the corresponding drawings and specifications.

3.12 MATERIALS AND WORKMANSHIP

- A. All work shall be performed in a practical and workmanlike manner by mechanics skilled in their respective field.
- B. Unless specified or indicated on the drawings, all materials shall be new and the best of their kind.

3.13 IDENTIFICATION

- A. Identify equipment and controls with engraved name plates.
- B. Provide snap-on pipe markers as specified in Part 2 – Products to identify piping not less than once every 10 feet, not less than once in each room, adjacent to each access door or panel, and on both side of the partition where exposed piping passes through walls, floors or roofs. Place flow directional arrows at each pipe identification location. Pipe markers are to be installed on all existing piping mains in addition to all new piping.
- C. Provide labels on valves stating function and system served.

3.14 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.
- B. Lubrication points that are hard to reach shall have extended fittings to point of easy access, and shall be clearly marked.

3.15 SLEEVES

- A. **PIPE SLEEVES:**
Provide galvanized sheet metal sleeves for pipe penetrations through interior and exterior walls to provide a backing for sealant or firestopping. Patch wall around sleeve to match adjacent wall construction and finish. Grout area around sleeve in masonry construction. In finished spaces where pipe penetration through wall is exposed to view, sheet metal sleeve shall be installed flush with face of wall. In finished areas, sleeves shall be flush with rough floor. In existing poured concrete walls where penetration is core drilled, pipe sleeve is not required.
 - 1. Pipe sleeves in new poured concrete construction shall be schedule 40 steel pipe, (sized to allow insulated pipe to run through sleeve) cast in place.
 - 2. Pipe sleeves are not required in interior nonrated drywall, plaster, or wood partitions.
 - 3. In mechanical rooms, piping floor penetrations, fire rated and non-fire rated, top of sleeve shall extend 2 inches above the adjacent finished floor. In existing floor penetrations, core drill sleeve opening large enough to insert schedule 40 sleeve and grout area around sleeve with hydraulic setting, non-shrink grout. If the pipe penetrating the sleeve is supported by a pipe clamp resting on the sleeve, weld a collar or struts to the sleeve that will transfer weight to existing floor structure.

3.16 SEALING AND FIRESTOPPING

- A. **FIRE AND/OR SMOKE RATED PENETRATIONS:**
Install approved product in accordance with the manufacturer's instructions where pipes penetrate a fire/smoke rated surface. When pipe is insulated, use a product which maintains the integrity of the insulation and vapor barrier.
 - 1. Where firestop mortar is used to infill large fire-rated floor openings that could be required to support weight, provide permanent structural forming. Firestop mortar alone is not adequate to support any substantial weight.
- B. **NON-RATED PARTITIONS:**

1. In exterior wall openings below grade, assemble rubber links of mechanical seal to the proper size for the pipe and tighten in place, in accordance with manufacturer's instructions.
2. 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.
3. Exposed duct penetrations through non-rated partitions (walls, floors, and ceilings) shall require painted sheet metal escutcheons or angles with mitered corners on both sides of wall with fiberglass or mineral wool insulation fill for spaces that include laboratories, clean rooms, animal rooms, kitchens, cart wash rooms, janitor closets, cart wash rooms, toilet rooms, mechanical rooms, conference rooms, private consultation rooms, and where noted on drawings elsewhere.

3.17 CLEANUP

- A. Daily during construction, and at the completion of the construction period, the Contractor shall remove all debris and excess material caused by his work from the job site. At the completion of his work, the Contractor shall leave all areas broom clean.
- B. All materials installed shall be thoroughly cleaned. Surfaces to be painted shall be wiped, scraped, or wire-brushed as necessary to clean smooth painting surface, free from oil, rust and dirt.
- C. All materials and equipment that are furnished with a factory prime coat of paint, which are damaged in transit, during storage, or from exposure to weather, shall be prime painted and final painted by this Contractor and warranted for twenty four (24) months.

3.19 TESTS FOR ACCEPTANCE

- A. The following requirements are supplementary to tests specified for individual equipment or systems in mechanical work sections.
- B. Provide labor, materials and instruments and bear other costs in connection with all tests.
- C. Give written notice in ample time to all concerned of date when tests will be conducted.
- D. Concealed or insulated work shall remain uncovered until required tests have been completed, but if construction schedule requires it, arrange for prior tests on parts of system as approved by the Architect.
- E. Acceptance Tests
 1. After mechanical work has been completed, the Contractor shall subject all mechanical systems to acceptance tests under normal operating conditions for periods as directed by the Architect.
 2. All equipment, fans and motors shall run at their required speed without showing undue vibration, objectionable noise or sparking. No bearing or journal of any part of electric motors shall heat to a temperature of more than 40 degrees Centigrade above the surrounding air. Fan motor sizes, on forward curve fans, shall not overload at rated RPM when operating at 90% of design static pressure.
 3. When the utility lines including, but not limited to, electric, gas, steam, condensate, hot water, chilled water, and refrigerant, are appropriately connected to the appliances/equipment, each appliance/piece of equipment shall be tested for proper and safe operation.
 4. The following checks shall be made:
 - a. Confirm that all necessary valves, switches, etc., whether specifically mentioned in the specifications and/or drawings or not, but understood to be required for complete and correct operation of equipment, are included.
 - b. Confirm direction of fan (and pump) rotation and correct operation/wiring of motor(s).
 - c. Confirm proper operation of air conditioning unit compressors and heating section. Verify CFM and leaving air temperatures per specifications.
 - d. Confirm proper operation of outside air dampers (where required).

- e. If leaving air temperature is not according to specifications, determine cause and provide suitable corrections.
 - f. Overall condition and operation of pumps, boilers, rooftop A.C. units, unit heater, duct heaters, etc.
 - g. Confirm and document minimum fresh air intake rates.
 - h. Balance individual air handling units and adjust dampers, registers, diffusers, etc., so that they deliver air quantities indicated for each outlet, and inlet, or as required. Provide, in duplicate, to the Architect Construction Department a complete Air Balance Report showing the amount of air at each supply, exhaust opening, static pressure, etc. All testing procedures shall be per NEBB or AABC procedural standards for testing, adjusting and balancing of environmental system through an approved Certified Agency and technician complete with summary reports. Reports must be stamped by a registered professional engineer who is registered in the state where the project is located.
- F. Testing of Piping
 - 1. All piping systems shall be subject to a test before piping is concealed, covered, or insulated.
 - 2. Before testing pipe systems, remove or otherwise protect from damage the components which are not designed to withstand the pressures used in testing piping.
- G. Water Systems Test
 - 1. Subject water lines and mains, before connecting equipment, to hydrostatic pressure of one and one-half times the operating pressure or 125 PSIG, whichever is larger. Do not exceed maximum pressures of equipment; verify before conducting tests. Maintain this pressure without pumping for at least four hours. Conduct tests of systems in manner as approved, so that no pipe or joint will be left untested.
 - 2. If panel radiation is part of project, maximum test pressure shall not exceed 75 psig.
- H. Gas Supply Test
 - 1. After installation of gas distribution system test gas piping with air at air pressure of 60 PSIG or greater. Maintain this pressure without additional pressurization for at least 2 hours without showing any drop in pressure. Repeat test as directed until system is proven gas tight. After connecting equipment when turning on gas supply to new gas lines, check for leakage with meter. Purge gas lines. Follow instructions of NFPA Manual 54.
- I. Adjustments, Repairs and Retests
 - 1. Make adjustments, repairs, alterations, as required to meet specified test results.
 - 2. Correct defects disclosed by tests or inspection, and replace defective parts.
 - 3. In replacing defective parts use only new materials, and in the case of pipe, replace with same length as defective piece.
 - 4. Caulking of screwed joints or opening of welds will not be permitted.
 - 5. Repeat tests after defects have been corrected and parts replaced, as directed by the Architect and until pronounced satisfactory.
- J. Responsibility of Damage
 - 1. The Contractor shall bear cost of repairs, and restoration of the work of other Contractors damaged by the tests or cutting that had to be done in connection with the tests.

3.20 NATURAL GAS SERVICE

- A. This Contractor shall prepare all required documentation, in concert with the Owner, to establish gas service to the building. Arrange with the local utility for the timely installation of this gas service or upgrading of existing service.
- B. All charges for the gas service, as shown on the plans, including upgrade of existing services and new connection from the main in the street or other location to the gas meter, shall be paid by this Contractor, including setting of the gas meter and all work performed by the gas company.

- C. Provide concrete pad for the gas meter as required.

END OF SECTION

SECTION 23 83 18

HYDRONIC RADIANT SNOW AND ICE MELTING SYSTEMS

PART 1 - GENERAL

1.01 SCOPE

- A. The work of this Section includes specifications for cross linked polyethylene tubing, piping headers, accessories, and control components for pavement snow and ice melting systems used outside the building.

PART 1 - GENERAL

Scope
Related Work
Summary
Reference Standards
System Description
Submittals
Quality Assurance
Delivery, Storage, and Handling
Warranty
Owner's Instructions

PART 2 - PRODUCTS

Hydronic Radiant Floor Heating System
Product Substitutions
Hydronic Radiant Floor Heating System Materials
Accessories

PART 3 - EXECUTION

Manufacturer's Instructions
Examination
Installation
Field Quality Control
Adjusting
Cleaning
Demonstration
Protection

1.02 RELATED WORK

- A. The Contractor shall provide work, services, equipment, accessories, and materials shown or described by the applicable Sections and Plans of any part of any Section or Division of the Contract Documents.

1.03 SUMMARY

- A. Section Includes: Radiant floor heating systems for various floor constructions and control strategies, using PEX-AL-PEX.

1.04 REFERENCES STANDARDS

- A. General: Standards listed by reference, including revisions by issuing authority, form a part of this specification section to the extent indicated. Standards listed are identified by issuing authority, authority abbreviation, designation number, title or other designation established by issuing authority. Standards subsequently referenced herein are referred to by issuing authority abbreviation and standard designation.
- B. ASTM International
1. ASTM E814 Standard Test Method for Fire Tests of Through-Penetration Fire Stops

2. ASTM F1281 Standard Specification for Crosslinked Polyethylene/Aluminum/Crosslinked Polyethylene (PEX-AL-PEX) Pressure Pipe
- C. International Conference of Building Officials (ICBO) Evaluation Services
 1. Evaluation Report No. 5298
- D. International Code Council (ICC)
 1. International Mechanical Code
- E. Plastics Pipe Institute (PPI)
 1. Technical Report TR-3 Policies and Procedures for Developing Recommended Hydrostatic Design Stresses for Thermoplastic Pipe Materials
 2. Technical Report TR-4 Recommended Hydrostatic Strengths and Design Stresses for Thermoplastic Piping and Fitting Compounds
- F. Southern Building Code Congress International, Inc. (SBCCI)
 1. SBCCI PST and ESI 9829
- G. International Conference of Building Officials (ICBO)
 1. Uniform Mechanical Code.
- H. Manufacturer's Design and Installation Information

1.05 SYSTEM DESCRIPTION

- A. Design Requirements:
 1. Standard Grade hydrostatic pressure ratings from Plastics Pipe Institute in accordance with TR-3 as listed in TR-4. The following four standard grade hydrostatic ratings are required.
 - a. 200 degrees F (93 degrees C) at 100 psi (689 kPa)
 - b. 180 degrees F (82 degrees C) at 125 psi (862 kPa)
 - c. 140 degrees F (71 degrees C) at 160 psi (1102 kPa)
 - d. 73 degrees F (23 degrees C) at 200 psi (1379 kPa)
- B. Performance Requirements: Provide hydronic radiant floor heating system that is manufactured, fabricated and installed to comply with regulatory agencies and authorities with jurisdiction, and maintain performance criteria stated by the PEX tubing manufacturer without defects, damage or failure.

1.06 SUBMITTALS

- A. GENERAL: Submit listed submittals in accordance with Conditions of the Contract and Division 1 Submittal Procedures Section.
- B. PRODUCT DATA: Submit manufacturer's product submittal data and installation instructions.
- C. SHOP DRAWINGS
 1. Provide installation drawings indicating tubing layout, manifold locations, zoning requirements and manifold schedules with details required for installation of the system.
 2. Provide mechanical schematic indicating heat source, mechanical piping and accessories from heat source to manifolds, circulators, water tempering and zone controls. Indicate supply water temperatures and flow rates to manifolds.
- D. QUALITY ASSURANCE/CONTROL SUBMITTALS: Submit the following:
 1. Test Reports: Upon request, submit test reports from recognized testing laboratories.
 2. Documentation: Submit the following.
 - a. Manufacturer's certificate indicating products comply with specified requirements.
 - b. Manufacturer's detailed room-by-room heat-loss analysis for the structure.
- E. CLOSEOUT SUBMITTALS: Submit the following.

1. Warranty documents specified herein.
2. Operation and maintenance data.
3. Field reports specified herein.
4. Final as-built tubing layout drawing.

1.07 QUALITY ASSURANCE

- A. Installer Qualifications: Use an installer with demonstrated experience on projects of similar size and complexity and possessing documentation proving successful completion of radiant floor heating training by the PEX tubing manufacturer.
- B. Regulatory Requirements and Approvals: Provide radiant floor heating system that complies with the following requirements:
 1. International Mechanical Code (IMC)
 - a. ICBO Evaluation Service Evaluation Report No. 5298
 2. Building Officials and Code Administrators International (BOCA)
 - a. BOCA National Building Code
 3. Southern Building Code Congress International (SBCCI)
 - a. SBCCI PST and ESI 9829
 4. Uniform Mechanical Code (UMC)
- C. Certifications: Provide letters of certification as follows.
 1. Installer is trained by the PEX tubing manufacturer to install the radiant floor heating system.
 2. Installer uses skilled workers holding a trade qualification license or equivalent, or apprentices under the supervision of a licensed tradesperson.

1.08 DELIVERY, STORAGE & HANDLING

- A. General: Comply with Division 01 Product Requirement Section.
- B. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- C. Storage and Protection: Store materials protected from exposure to harmful environmental conditions and at temperature and humidity conditions recommended by the manufacturer.
 1. Store PEX-AL-PEX tubing in cartons or under cover to avoid dirt or foreign material from entering the tubing.
 2. Do not expose PEX-AL-PEX tubing to direct sunlight for more than 30 days. If construction delays are encountered, cover the tubing that is exposed to direct sunlight.

1.09 WARRANTY

- A. Project Warranty: Refer to Conditions of the Contract 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 not a limitation of, other rights owner may have under contract documents.
 1. Warranty shall transfer to subsequent owners.
 2. Warranty Period for PEX-AL-PEX Tubing: 30-year non-prorated warranty against failure due to defect in material or workmanship, beginning with date of substantial completion.
 3. Warranty Period for Manifolds and Fittings: 5 year non-prorated warranty against failure due to defect in material or workmanship, beginning with date of substantial completion.
 4. Warranty Period for Controls and Electrical Components: 2 year non-prorated warranty against failure due to defect in material or workmanship, beginning with date of substantial completion.

1.10 OWNER'S INSTRUCTIONS

- A. Instruct owner's personnel about operation and maintenance of installed system. Provide manufacturer's installation, operation and maintenance instructions for installed components within the system.

PART 2 - PRODUCTS

2.01 HYDRONIC RADIANT FLOOR HEATING SYSTEM

- A. Manufacturer: Roth, Uponor, Inc., or Rahau.

2.02 PRODUCT SUBSTITUTIONS

- A. All products, components, etc., specified herein shall be manufactured by and/or available from the PEX tubing manufacturer.

2.03 HYDRONIC RADIANT FLOOR HEATING SYSTEM MATERIALS

- A. TUBING
 1. Material: Cross linked polyethylene with sandwiched aluminum layer(PEX-AL-PEX).
 2. Material Standard: Manufactured in accordance with ASTM F1281 and tested for compliance by an independent third-party agency.
 3. Pressure Ratings: Standard Grade hydrostatic design and pressure ratings as issued by the Plastics Pipe Institute (PPI), a division of the Society of the Plastics Industry (SPI).
 4. Minimum Bend Radius.
 - a. 5/8 inch has a minimum radius of 4.0 inches.
 5. Tubing shall not allow the diffusion of oxygen molecules through the tubing wall.
 6. Nominal Inside Diameter: Provide tubing with nominal inside diameter in accordance with ASTM F1281 as indicated.
 - a. 5/8 inch (15.88mm)
- B. Manifolds (commercial, valved copper)
 1. For system compatibility, use minimum 2-inch valved copper manifolds manufactured from Type L copper material, provided by the respective PEX tubing manufacturer.
 2. Use manifolds with an isolation valve or a combination isolation / balancing valve on each outlet.
 3. Provide manifolds with an isolation valve or a combination isolation/balancing valve on each outlet.
 4. The manifolds support the use of 5/8 inch tubing.
 5. Manifold end cap shall provide tapping for 1/8 inch FNPT and 1/2 inch FNPT for vent and drain.
 6. Install supply and return piping to the manifold in a reverse-return configuration to ensure self-balancing.
- C. Fittings
 1. Provide fittings offered by the PEX tubing manufacturer.
 2. Compression Fittings
 - a. Fitting assembly manufactured from UNS C3600 series brass material.
 - b. The fitting assembly consists of a barbed insert, a compression ring and a compression nut. The barbed insert is manufactured with an o-ring to facilitate air pressure testing.
- D. Supply and Return Piping to the Manifolds (above ground piping).
 1. Properly size supply and return distribution piping for the given volume and velocities required at system design.
 2. Use suitable distribution piping material (i.e., type L copper or black iron piping) for all supply fluid temperatures in systems with ferrous components.
 3. Do not expose PEX tubing to direct sunlight or install near overhead fluorescent lighting. If PEX tubing is exposed, install suitable pipe insulation around the exposed tubing.

4. Use fittings compatible with piping material. Fittings must transition from distribution piping to system manifolds.
- E. Manifold Cabinet
1. Provide a surface (recessed) mount manifold cabinet constructed of 18 gauge steel with gray primer coating, open top or bottom to allow entry of tubing headers, side knockouts for supply/return and keyed front locking door. Provide adjustable leveling feet for surface mount cabinets.
- F. Supply Fluid Temperature Control (automatic control strategy)
1. Provide this control strategy for snow melt systems to accomplish full automatic control of idle and snow melt operations.
 2. Design the control strategy and install the components to meet or exceed the system performance requirements as stated in the system design.
 3. The tubing manufacturer shall provide and this Section shall install the fluid temperature controls and sensors for the hydronic snow and ice melting system.
 4. Temper the supply fluid temperature to the snow and ice melt panel by means of a modulating control valve controlled by the panel.
 5. The controls shall provide the ability to reset the fluid temperature as it relates to outdoor temperature. Install the outdoor temperature sensor on the north face of the building out of direct sunlight.
 6. Run time shall be programmed between 30 minutes to 17 hours to infinity. The control operates in snow melt mode as long as there is moisture present on the sensor.
 7. The snow and ice detector shall monitor for the presence of moisture on the sensor (snow melt mode) and slab temperature.
 8. The controls shall have the ability to idle the snow melt slab at a given temperature and automatically accelerate to a higher slab temperature during snow melting mode.
 - a. The control shall automatically switch from snow melt mode to idle mode once the snow and ice detector indicates the lack of moisture on the sensor.
 9. When there is a call for snow melt:
 - a. Activate the system hot water flow.
 - b. Activate slab water temperature control valve.

2.04 ACCESSORIES

- A. Provide accessories associated with the installation of the radiant floor heating system as required by the PEX tubing manufacturer.

PART 3 - EXECUTION

3.01 MANUFACTURER'S INSTRUCTIONS

- A. Comply with manufacturer's product data, including product technical bulletins, installation instructions and design drawings.

3.02 EXAMINATION

- A. Site Verification of Conditions
1. Verify that site conditions are acceptable for installation of the radiant floor heating system.
 2. Do not proceed with installation of the radiant floor heating system until unacceptable conditions are corrected.

3.03 INSTALLATION

- A. SLAB-ON-GRADE CONSTRUCTION
1. Fasten the tubing to flat wire mesh or reinforcing bar in accordance with the PEX tubing manufacturer's installation recommendations.

2. Install vertical edge insulation along the perimeter of the slab and down to a minimum of 12 inches below the slab depth.
 3. The submitted snow melt shop drawing shall indicate the tubing on center distances and loop lengths. ON center distances will not exceed 12 inches.
 4. Do not install tubing closer than 6 inches from the edge of the heated slab.
 5. Install the tubing at a consistent depth below the surface elevation as determined by the snow melting manufacturer. Tubing installation will ensure sufficient clearance for all control joint cuts.
 6. Expansion joints
 - a. In areas where tubing must cross metal expansion joints that occur in the concrete, the tubing shall pass below the metal expansion joints.
 7. Metal or plastic bend supports will be used to support the tubing when departing from the slab in a 90 degree bend.
- B. GLYCOL/WATER SOLUTION
1. PEX tubing manufacturer shall recommend premixed glycol/water solution.
 - a. Mix the glycol/water solution to proper concentration levels to protect the system from freezing during operation shutdown.
 - b. System circulators shall operate continuously for a minimum of 30 days after the system is filled to ensure the glycol and water does not separate in a static system.
 2. Do not use ethylene glycol due to toxicity issues. Use only PEX manufacturer approved inhibited propylene glycol for hydronic snow and ice melting systems.

3.04 FIELD QUALITY CONTROL

- A. SITE TESTS
1. To ensure system integrity, pressure test the system before covering tubing in concrete or when other trades are working in the vicinity of the tubing.
 2. Test all electrical controls in accordance with respective installation manuals.

3.05 ADJUSTING

- A. BALANCING ACROSS THE MANIFOLD
1. Balance all loops across each manifold for equal flow resistance based on actual loop lengths and total manifold flow.
- B. Balancing between manifolds is accomplished with a flow control device installed on the return piping leg from each manifold when direct return piping is used for the supply and return mains.
- C. Adjust system controls after the system has stabilized to ensure proper operation in accordance with the system design.

3.06 CLEANING

- A. Remove temporary coverings and protection of adjacent work areas.
- B. Repair or replace damaged installed products.
- C. Clean installed products in accordance with manufacturer's instructions prior to owner's acceptance.
- D. Remove construction debris from project site and legally dispose of debris.

3.07 DEMONSTRATION

- A. Demonstrate operation of the snow and ice melting system to Owner's Personnel.
- B. Advise the owner's representative about the type and concentration of glycol/water solution if used in the snow and ice melting system.

1. The owner monitors the solution effectiveness through an established maintenance program as outlined by the glycol manufacturer.

3.08 PROTECTION

- A. Protect installed work from damage caused by subsequent construction activity on the site.

END OF SECTION

SECTION 23 57 00

HEAT EXCHANGERS FOR HVAC

PART 1 - GENERAL

1.01 SCOPE

- A. This section contains information for all steam to water heat exchangers for this project. Included are the following topics:

PART 1 - GENERAL

Scope

Related Work

Reference Standards

Quality Assurance

Submittals

PART 2 - PRODUCTS

Plate and Frame Heat Exchangers

PART 3 - EXECUTION

Examination

Installation

1.02 RELATED WORK

- A. The contractor shall provide work, services, equipment, accessories, and materials shown or described by the applicable sections of any part of any section or division of the contract documents.

1.03 REFERENCE STANDARDS

ASME	Boiler and Pressure Vessel Code, Section VIII, Division 01
ASTM A167	Plate Material

1.04 QUALITY ASSURANCE

ASME Compliance: Fabricate and stamp heat exchangers to comply with ASME Boiler and Pressure Vessel Code, Section VIII, Division 01.

1.05 SUBMITTALS

- A. Refer to Division 01, General Conditions, Submittals.
- B. Product Data for each heat exchanger, including rated capacities, pressure drop, weights, and installation and startup instructions.

PART 2 - PRODUCTS

2.03 PLATE AND FRAME HEAT EXCHANGERS

- A. Manufacturers: Taco, ITT Bell & Gossett, Alfa-Laval Thermal Inc., Baltimore Aircoil Co., or APV.
- B. Provide plate and frame heat exchanger with removable gasketed plates, ASTM A167, 304 stainless steel nozzles and threaded piping connections suitable for potable water systems and compatible with hot water heating system chemical treatment.
- C. Furnish units with epoxy coated structural steel frame work as required to adequately support assembled plates.

- D. Fouling margin shall be 10% minimum.
- E. Unit shall be constructed and stamped in accordance with latest ASME Code. Each unit shall be registered with National Board of Boiler and Pressure Vessel Inspectors.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine elements and surfaces to receive work for compliance with installation tolerances and for structural rigidity, strength, anchors, and other conditions affecting performance of the heat exchanger. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. The steam to water heat exchanger shall have adequate condensate return line equipped with proper trap for steam system. Exchanger shall be equipped with proper vacuum breaker as required.
- B. Install heat exchangers according to manufacturer's written instructions.
- C. Install heat exchangers plumb and level; anchor with supports.
- D. Maintain manufacturer's recommended clearances for service and maintenance. Install piping connections maintaining clearances for service and maintenance of heat exchangers.
- E. Install flanged connections at heat exchangers.
- F. Install shutoff valves at heat exchanger inlet and outlet connections. Refer to piping details and diagrams on the drawings.

END OF SECTION

SECTION 23 52 12

PRIMARY HEATING EQUIPMENT

PART 1 - GENERAL

1.01 SCOPE

- A. This section includes specifications for hot water and steam heating equipment. Included are the following topics:

PART 1 - GENERAL

Scope

Related Work

Reference Standards

Submittals

Warranty

PART 2 - PRODUCTS

Sealed Combustion Boiler

PART 3 - EXECUTION

Installation

Boilers

1.02 RELATED WORK

- A. The contractor shall provide work, services, equipment, accessories, and materials shown or described by the applicable sections of any part of any section or division of the contract documents.

1.03 REFERENCE STANDARDS

ASME	CSD-1 Control and Safety Devices for Automatically Fired Boilers
ASME	Boiler and Pressure Vessel Code I - Rules of Construction of Power Boilers
ASME	Boiler and Pressure Vessel Code VIII - Rules for Construction of Pressure Vessels
ASME	Boiler and Pressure Vessel Code IX - Welding and Brazing Qualifications
ASME	Boiler and Pressure Vessel Code IV - Rules for Construction of Heating Boilers
UL 296	Oil Burners
UL 795	Commercial Industrial Gas Heating Equipment
NFPA 70	Electrical wiring and devices
National Electric Code	

1.04 SUBMITTALS

- A. Include data concerning dimensions, capacities, and material of construction, ratings, weights, manufacturer's installation requirements and performance limitations.
- B. Submit manufacturer's installation instructions including required clearance to combustible materials.

1.05 WARRANTY

- A. Sealed combustion boiler, non-condensing, modular helical heat exchanger/combustion chamber design that will be self-supporting. Heat exchanger shall be warranted against leakage for 5 years and thermal shock for 20 years. The burner shall have a 10 year warranty. All other parts shall have a 2 year warranty.

PART 2 - PRODUCTS

2.01 SEALED COMBUSTION BOILER

- A. Manufactures:
The boiler to be utilized by the contractor as part of this installation will be a Thermal Solutions model EVS1500, or a product which is substantially similar in the reasonable discretion of the owner. In considering a substitute product the contractor acknowledges that the owner has multiple facilities which utilize Thermal Solutions' EVS models and that the compatibility of that equipment for operational similarity of component parts will be weighted substantially by the owner in making this determination of similarity.
- B. Provide units with capacity and operating characteristics indicated on schedules.
- C. Boiler ASME stamped for 160 psig and designed per ASME section IV. Furnish a relief valve in compliance with ASME section IV, and set at 50 psig. Provide condensate drain to discharge any combustion chamber condensate buildup during cold starts.
- D. Boiler efficiency per ANSI Z21.13a as calculated by dividing the scheduled output by input and operation in the non-condensing mode with inlet temperatures as low as 130 F.
- E. Natural gas-fired burners, forced draft power type with a positive pressure at the boiler discharge. Stainless steel burner mixer. Maximum Nox-emissions under 20 PPM.
- F. Provide units with fuel trains and operating controls conforming to the latest UL or equivalent agency approval, CSD-1 requirements. Boiler/burner package shall be factory assembled, wired, mounted, and factory fire tested. Burner shall be fully modulating between 35% and 100% capacity.
- G. Combustion air intake capable of accepting either free mechanical room air, or direct outside air through a sealed intake pipe of the length and diameter shown on drawings. Provide inlet/outlet combustion vent temperature fittings with direct outside air application.
- H. Venting shall be AL29-4C or per manufacturer's instructions. Combustion air piping shall be PVC or per manufacturer's instructions.
- I. Baked enamel finish boiler sheet metal jacket with removal panels for maintenance access.
- J. Inlet and outlet temperature gauge to monitor inlet and outlet water temperatures. Gauges to have 6" face.
- K. Provide each boiler with a low water flow switch or a low water cutout and auxiliary low water cutoff, both operationally testable, manually reset on loss of low-water and auto-rest on loss of power in accordance with ASME Section IV and CSD-1.
- L. Provide each boiler with dual over temperature protection, including manual reset, in accordance with ASME Section IV and CSD-1. The operating limit shall prevent the temperature from reaching the manual reset limit.
- M. Provide remote fault alarm contact for flame sensor and high temperature limit failure.
- N. Provide single point wiring for controls and fan.
- O. Furnished boiler shall be compatible for firing controlled directly from DDC (through manufacturer's safety and limit controls). Cooperate and coordinate with the controls contractor to interface the boilers.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install units as shown on plans, as detailed, and according to manufacturer's installation instructions.
- B. Contractor shall review condition of existing housekeeping pad with Owner. If deemed to be in good condition, set unit on existing concrete housekeeping pad. If existing pad deemed unsuitable by Owner, the Owner shall remove and replace existing concrete pad with new, and shall have up to 10 days to replace concrete pad.
- C. Install all items shipped loose by equipment manufacturer under supervision of equipment manufacturer's field service personnel.
- D. Insulate combustion air pipe with 2" rigid fiber glass insulation and foil scrim jacket.

3.02 BOILERS

- A. After piping system has been flushed, boil out boilers using chemical and procedure as recommended by boiler manufacturer. Perform boil-out under supervision of boiler manufacturer's representative.
- B. Manufacturer shall verify in writing that boilers have been cleaned according to their recommendations and are ready for operation. Manufacturer shall provide initial startup with report and two (2) years parts and labor warranty. Provide startup report in electronic pdf format to Owner/Engineer.
- C. Isolate boilers from piping system during boil out.
- D. Pipe vents from gas train to atmosphere. Size of each vent shall not be less than connection size to device.
- E. Pipe boiler drains to nearest floor drains.
- F. Pressure gauge ranges to be 1.5 to 3 times the relief valve setting.
- G. Install gas pressure gauges at downstream of gas pressure regulators.
- H. If remote control panels are used, install all interconnecting wiring and pneumatic tubing if used between panels and units.
- I. Provide a push button boiler shutdown switch located inside boiler room next to all the exit doors in accordance with ASME CSD-1. All boiler power circuits shall be routed through the switch(s) to drop power to all boilers. Upon initiation of switch, all boilers shall have their power interrupted and a DDC Interface alarm initiated.

END OF SECTION

SECTION 23 25 00

HVAC WATER TREATMENT

PART 1 - GENERAL

1.01 SCOPE

- A. This section includes specifications for chemical treatment of all water, steam, and condensate systems. Included are the following topics:

PART 1 - GENERAL

Scope
Related Work
Submittal Drawings
Operation and Maintenance Data
Design Criteria
Maintenance Service

PART 2 - PRODUCTS

Manufacturers
System Cleaner
Algaecides
Glycol
Closed Water System Treatment
Treatment Equipment

PART 3 - EXECUTION

Preparation
Cleaning Sequence
Glycol Water Systems
Closed Water Systems

1.02 RELATED WORK

- A. The contractor shall provide work, services, equipment, accessories, and materials shown or described by the applicable sections of any part of any section or division of the contract documents.

1.03 SUBMITTAL DRAWINGS

- A. Required for all equipment and chemicals specified including data concerning dimensions, capacities, materials of construction, weights, operating sequence, composite wiring diagrams and appropriate identification. Chemical data is to include the description of the chemical, its composition, its function, and the associated Material Safety Data Sheet.

1.04 OPERATION AND MAINTENANCE DATA

- A. Provide for the services of the manufacturer's trained representative to approve the installation and instruct the Owner in the operation of each system.
- B. Include data on chemical feed pumps, agitators, and other equipment including spare parts lists, procedures, and treatment programs. Include step by step instructions on test procedures including target concentrations.

1.05 DESIGN CRITERIA

- A. Recommend a periodic test procedure and chemical treatment program for each system.
- B. Treat the following systems:
1. Chilled water
 2. Hot water
 3. Reclaim water
 4. Glycol water

- 5. Condenser water
 - 6. Steam boiler water
 - 7. Steam condensate
 - 8. Fuel oil
- C. Provide the initial chemical treatment for all systems based on a complete system fluid analysis prior to the equipment installation. The initial chemical treatment supply of chemicals for each system shall be adequate for the start-up and testing period, for the time the systems are being operated by the Contractor for temporary heating and cooling, and for one year after start-up of the system.
 - D. The chemicals used in the condenser water treatment system shall use only liquid chemicals and shall contain no phosphates or chromates.
 - E. Provide electrical devices, motors, wiring and conduit in accordance with the applicable sections of the Electrical Specifications.

1.06 MAINTENANCE SERVICE

- A. Furnish service and maintenance of treatment systems for one year from date of substantial completion.
- B. Provide monthly technical service visits to perform field inspections and make water analysis on site. Detail findings in writing on proper practices, chemical treating requirements, and corrective actions needed. Submit two copies of field service report after each visit.
- C. Provide laboratory and technical assistance services for the warranty period.
- D. Include one hour of training for Owner, instructing them on installation, care, maintenance, testing, and operation of the treatment systems. Arrange training at startup of systems.
- E. Provide site inspection of equipment during scheduled shutdown to evaluate success of the treatment program. Make recommendations in writing based on these inspections.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Dearborn Div. - W. R. Grace & Co., Industrial Water Management Co., Mitco Water Labs, Mogul Corporation, Nalco Chemical Co., Western Water Management, Griswald.

2.02 SYSTEM CLEANER

- A. Blend of organic alkaline penetrates 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. System cleaner on glycol systems must be checked to verify that it is compatible with the glycol solution.

2.03 SYSTEM INHIBITOR

- A. Scale and corrosion inhibitor consisting of boron nitrite, benzol thiazol, benzotriazole, mercapto-benzo-thiazole, and tolyltrizole silicates.

2.04 ALGAEICIDES

- A. Chlorine release agents such as sodium hypochlorite or calcium hypochlorite, or micro biocides such as quaternary ammonia compounds, tributyl tin oxide, methylene bis (thiocyanate), or isothiazolones, all in a liquid format.

2.05 GLYCOL

- A. Inhibited ethylene glycol based material specifically designed for use in closed heat transfer systems. Dow Chemical Dowtherm SR-1, Union Carbide UCARTHERM, or approved equal.

2.06 CLOSED WATER SYSTEM TREATMENT

- A. Sequestering agent to reduce deposits and adjust pH: polyphosphate.
- B. Corrosion inhibitors: boron-nitrite, sodium nitrite and borax, sodium tolyltriazole, low molecular weight polymers, phosphonates, sodium molybdate, or sulphites.
- C. Conductivity enhancers: phosphates or phosphonates.

2.10 TREATMENT EQUIPMENT

- A. BYPASS FEEDER:
 - 1. 5 gallon minimum capacity, 125 psig working pressure, either a screw type cover or a valved funnel opening to feed chemical into the system, prime coat of paint.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Prior to cleaning, verify that systems are operational, filled, started, and vented. Use water meter to record capacity in each system.
- B. Place terminal control valves in the full open position.

3.02 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. For steam systems, fill boilers only, using the water and cleaner solution.
 - 2. Use neutralizer agents on recommendation of the system cleaner supplier and approval of the Architect/Engineer.
 - 3. Flush open systems with clean water for one hour minimum. Drain completely and refill.
 - 4. Remove, clean, and replace strainer screens.
 - 5. Inspect, remove sludge, and flush low points with clean water after cleaning process is completed. Include disassembly of components as required.
- 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. 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. Circulate for 6 hours at design temperature, vent air at all high points, and 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.
- C. CHILLED WATER 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. Circulate for 48 hours, and then drain system as quickly as possible. Refill with clean water, circulate for 24 hours, then drain. Refill with clean water and repeat until 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.

- D. GLYCOL WATER SYSTEMS:
1. Clean and flush as indicated above for hot water heating systems. Verify complete drainage by measuring amount of water used for the initial fill versus the amount actually drained to assure complete removal of the cleaning solution. Remove all traces of chloride from the system; test to verify this removal and submit test results.
- E. STEAM SYSTEMS:
1. Apply heat, slowly raising boiler temperature to 160°F for 12 hours minimum. Cool, then drain as quickly as possible. Refill with clean water, drain, refill and check for sludge. Repeat until system is free of sludge. Apply heat to produce steam for piping system and maintain for 8 hours minimum. Bypass traps and waste condensate.
 2. For clean steam system, flush as indicated above followed by passivation in accordance with ASTM A380. Flush with reverse osmosis water followed by four hours with clean steam and wasting all condensate. The clean steam generator is to be valved out of the system except when clean steam is generated.

3.03 GLYCOL WATER SYSTEMS

- A. The chilled water, heat recovery, and computer room unit systems are glycol water systems. All glycol furnished by this contractor.
- B. Completely flush all traces of cleaning chemicals before adding the glycol water mixture to the system. Verify this by chemical test.
- C. Premix the glycol water solution in the polyethylene drum to a concentration of 40% by volume. Use city water to make the solution. Use an electric motorized pump (see Section 23 21 23) to fill system from the mixing tank. Circulate fluid for several hours, vent all high points where air may collect, add more solution to the system if needed, and test the system for inhibitor level, low temperature protection and proper concentration of glycol; include copy of test report in the Operating and Maintenance manuals.

3.04 CLOSED WATER SYSTEMS

- A. Install a separate bypass type feeder at the pumps for each closed hot water heating and chilled water cooling system. Provide a separate set of supply and return lines from each pump in the system and install ball valves in each of these lines. Locate the system connection that supplies the feeder upstream of the discharge shutoff valve for the pump. Locate the system connection that returns treatment back to the system at a convenient point downstream of the pump discharge shutoff valve. Provide a drain valve at the bottom of the feeder.
- B. Install a water meter upstream of the pressure reducing valve in the makeup line to each closed system. Locate the meter on the domestic water side of the pressure reducing valve and in such a manner that the meter can be easily read.

END OF SECTION

SECTION 23 21 23

PUMPS

PART 1 - GENERAL

1.01 SCOPE

- A. This section includes specifications for water, condensate, and oil pumps used for HVAC applications. Included are the following topics:

PART 1 - GENERAL

Scope

Related Work

Submittals

Design Criteria

PART 2 - PRODUCTS

Base Mounted Centrifugal Pumps

Inline Centrifugal Pumps

Glycol Fill Pump

PART 3 - EXECUTION

Installation

Base Mounted Pumps

Glycol Fill Pump

1.02 RELATED WORK

- A. The contractor shall provide work, services, equipment, accessories, and materials shown or described by the applicable sections of any part of any section or division of the contract documents.

1.03 SUBMITTAL DRAWINGS

- A. Include data concerning dimensions, capacities, materials of construction, ratings, weights, pump curves with net positive suction head requirements, manufacturer's installation requirements, manufacturer's performance limitations, and appropriate identification.
- B. Pump curves shall identify design point of operation.

1.04 DESIGN CRITERIA

- A. Pump sizes, capacities, pressures and operating characteristics shall be as scheduled.
- B. Pumps shall meet or exceed operating efficiencies scheduled.
- C. Provide all pumps with motors, impellers, drive assemblies, bearings, OSHA coupling guard, and other accessories specified. Statically and dynamically balance all rotating parts. Provide flanged connections on all pumps unless specified otherwise. Service or repair of base mounted pumps shall not require breaking piping connections for removal of motor.
- D. Where a pump is specified for parallel operation, the scheduled conditions are for that pump with both pumps operating; i.e., total system flow rate is twice that scheduled for a single pump. When only one of the parallel pumps is operating, the operating point of that pump must fall within the manufacturer's recommended operating range without motor overload.
- E. Provide pump with a motor sized for non-overloading over the entire pump curve. Motors to be 1750 rpm unless specified otherwise.
- F. 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.
- G. Test all pumps, clean and paint before shipment. The manufacturer shall certify all pump ratings.

- H. All pumps to operate without excessive noise or vibration. Field align pump couplings after pumps are set and bases grouted.
- I. After completion of balancing, provide replacement of impellers, or trim impellers to provide specified flow at actual pumping head, as installed.
- J. Furnish one spare seal and casing gasket for each pump to owner.

PART 2 - PRODUCTS

2.01 BASE MOUNTED CENTRIFUGAL PUMPS

- A. MANUFACTURERS:
 - 1. Bell and Gossett, Allis Chalmers, Taco or Armstrong.
- B. TYPE:
 - 1. Horizontal shaft, single stage, single or double suction, split casing, 175 psig working pressure at operating temperature of 225°F continuous, 250°F intermittent.
- C. CASING:
 - 1. Cast iron with suction and discharge gauge ports, renewable bronze wear rings, vent and drain plugs, flanged suction and discharge connections.
- D. IMPELLER:
 - 1. Bronze, hydraulically and dynamically balanced, keyed and locked to pump shaft, and protected by a replaceable bronze shaft sleeve.
- E. BEARINGS:
 - 1. Oil or grease lubricated ball or roller bearings.
- F. SHAFT:
 - 1. Alloy steel with copper, bronze, or stainless steel shaft sleeve.
- G. SEAL:
 - 1. Carbon rotating against a stationary ceramic seat, 225°F maximum continuous operating temperature.
- H. DRIVE:
 - 1. The pump shall be flexibly coupled to a NEMA standard T frame motor. The coupler shall be suitable for across the line starting as well as variable speed conditions associated with variable frequency drives. The coupling shall be equal to a Woods Dura-Flex coupler. Woods Sure Flex and similar couplings are not acceptable. To correct misalignment occurring during shipping, handling, and piping, the installing contractor shall align the pump after system fill and prior to initial startup.
 - 2. Provide an OSHA compliant drive guard.
- I. BASEPLATE:
 - 1. Cast iron or fabricated steel with integral drain rim.

2.02 INLINE CENTRIFUGAL PUMPS

- A. MANUFACTURERS:
 - 1. Bell and Gossett, Armstrong or Taco.
- B. TYPE:
 - 1. Single stage, direct connected, resiliently mounted motor for in-line mounting, oil lubricated, 175 psig maximum working pressure at operating temperature of 225°F continuous, 250°F intermittent.
- C. CASING:
 - 1. Cast iron or stainless steel; flanged suction and discharge connection; with plugged taps for vent, drain, suction and discharge gauges.

- D. IMPELLER:
 - 1. Brass or bronze, keyed to the shaft, single suction enclosed type, hydraulically and dynamically balanced.
- E. BEARINGS:
 - 1. Two, oil lubricated bronze sleeves or ball bearings capable of being greased.
- F. SHAFT:
 - 1. Stainless steel or carbon steel with stainless steel or bronze sleeve, integral thrust collar.
- G. SEAL:
 - 1. Mechanical type, carbon rotating against a stationary ceramic seat, 225°F maximum continuous operating temperature.
- H. DRIVE:
 - 1. Flexible coupling.

2.07 GLYCOL FILL PUMP

- A. Provide one Axiom model DMF300 mixing tank and electric fill pump assembly per snow melt system. The mixing tank shall be constructed of corrosion resistant material, with 17 gallon capacity and mounted. Pump shall have a fill pressure up to 45 psig. Provide electrical cord for standard 120 volt outlet.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install all pumps in strict accordance with manufacturer's instructions. Access/service space around pumps shall not be less than minimum space recommended by pump manufacturer.
- B. Support piping adjacent to pump such that no weight is carried on pump casings.
- C. Decrease from line size at pump connections with suction diffusers, long radius reducing elbows or concentric reducers/increasers in the vertical piping, and eccentric reducers/increasers for horizontal piping. Install eccentric reducers/increasers with the top of the pipe level. Refer to plan details.
- D. All valves and piping specialties must be full line size as indicated on the drawings
- E. Lubricate pumps before startup.
- F. Install a full line size spring loaded check valve and balancing valve in the pump discharge piping. At contractor's option, combination shut-off, check, balancing valve may be substituted instead of separate valves. Reference Section 23 05 23.

3.02 BASE MOUNTED PUMPS

- A. Set base mounted pumps on concrete bases, or concrete inertia base, level and bolt down prior to grouting. Fill the entire base with non-shrinking grout when required by the manufacturer's installation instructions.
- B. Align all flexible coupled base-mounted pumps in accordance with the manufacturer's instructions after system fill and prior to initial startup.
- C. Provide supports for elbows on pump suction and discharge piping 4" and over.
- D. Provide air vent and drain valve on horizontal pump casings.
- E. Provide drains for bases and seals, piped to and discharging into floor drains.

END OF SECTION

SECTION 26 00 01

ELECTRICAL GENERAL REQUIREMENTS

PROJECT DESCRIPTION: Electrical work associated with the City of New Berlin - Public Safety Building HVAC System Upgrades and Snow Melt

PART 1 - GENERAL

1.00 INDEX

DIVISION 26 ELECTRICAL		SUBMITTAL REQUIRED
26 00 01	Electrical General Requirements	NO
26 05 19	Wire & Cable 600 Volt and Below	YES
26 05 26	Grounding and Bonding	YES
26 05 29	Supporting Devices	NO
26 05 33	Raceways and Boxes	NO
26 05 53	Electrical Identification	YES
26 28 16	Safety Switches, Circuit Breakers, & Fuses	YES
26 36 23	Automatic Transfer Switches	YES

1.01 DESCRIPTION

- A. Work Includes:
1. Furnish all labor materials, tools, equipment, and services for all electrical work as indicated, in accord with provisions of Contract Documents.
 2. Completely coordinate with work of all other trades.
 3. Although such work is not specifically called out on drawing, the contractor shall furnish and install all miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation.
 4. See Division 01 for General Requirements.
- B. Drawings Use and Interpretation:
1. Drawings are diagrammatic and indicate general arrangement of systems and equipment, except when specifically dimensioned or detailed.
 2. For exact locations of building elements, refer to dimensioned architectural/structural drawings.
 3. Field measurements take precedence over dimensioned drawings.
 4. Intention is to show size, capacity, approximate location, direction and general relationship of one work phase to another, but not exact detail or arrangement.
 5. Field verify locations and arrangement of all existing systems and equipment.
 6. Omissions no later than ten (10) days before bid opening, the Contractor shall call the attention of the Owner to any materials or apparatus the Contractor believes to be inadequate and to any necessary items of work omitted.
 7. If any errors or omissions appear in Drawings, Specifications, or other documents, bidding Contractor shall notify Owner no later than ten (10) days prior to submitting bid. Should conflict occur in or between drawings and specifications, bidding contractor is deemed to have estimated more expensive way of doing work, unless he shall have asked for and obtained written decision (addendum) before submission of bid as to which method or materials will be required.
- C. Installation of all systems and equipment is subject to clarification as indicated in reviewed shop drawings and field coordination drawings.
- D. Dimensions indicated are limiting dimensions.
- E. Do not use equipment exceeding dimensions indicated or equipment or arrangements that reduce required clearances or exceed specified maximum dimensions.

- F. Description of systems: Furnish and install all materials to provide functioning systems in compliance with performance requirements specified, and any modifications required by reviewed shop drawings and field coordinated drawings.
- G. Definitions:
1. A/E: Owner and/or Engineer
 2. Provide: Furnish, install, wire and connect complete by Contractor.
 3. Contractor/EC: The person or group responsible for project construction under Divisions 26, 27 and 28.
 4. The word "ENERGIZE" means all material and labor necessary to apply voltage to a device or item of equipment to make same operational.
 5. The word "CODE" means all applicable codes.
 6. Unless noted otherwise, the terminology used throughout the Specifications shall be interpreted as defined in Article 100 of the NEC.

1.02 WEATHERPROOF EQUIPMENT

- A. Where weatherproof (WP) equipment is indicated, use NEMA 3R enclosures.
1. All exterior devices and equipment shall be weather-proof.

1.03 CORROSIVE ENVIRONMENTS

- A. In areas noted with corrosive atmosphere; use NEMA 12 code gage steel with rust-inhibiting primer and baked enamel finish or reinforced fiberglass enclosures.

1.04 QUALITY ASSURANCE

- A. Perform all work and install materials and equipment in full accordance with the latest applicable rules, regulations, requirements, and specifications of the following:
- State and Federal Laws
National Electrical Testing Association (NETA)
National Electrical Code (NEC 2017 Edition)
International Building code (IBC)
Life Safety Code (NFPA-101)
National Electrical Safety Code (NESC)
American National Standards Institute (ANSI)
National Electrical Manufacturers Association (NEMA)
Institute of Electrical and Electronic Engineers (IEEE)
Insulated Power Cable Engineers Association (ICEA)
The Occupational Safety and Health Act (OSHA)
American Society for Testing and Materials (ASTM)
Underwriters' Laboratory (UL)
Wisconsin Safety and Professional Services Code
Department of Natural Resources NR-101
Local laws, codes and ordinances
ADA Accessibility Guidelines
- B. Conflicts, if any that may exist between the above items, the more restrictive shall govern.
- C. The Electrical Contractor is charged with responsibility for full compliance with local interpretations of applicable Codes. After entering into contract, this Contractor will be held to complete all work as per the foregoing without extra compensation.

1.05 SUBMITTALS

- A. General:
1. The A/E's review of shop drawings or samples shall not relieve the EC of responsibility for any deviation from the contract documents. The EC shall include with the shop drawings an index sheet detailing all deviations from the contract documents, and will be held responsible for all deviations unless he has received written approval from the A/E for the

specific deviation, separate from general shop drawing approval. The A/E's review shall not relieve the EC from responsibility for errors or omissions in the shop drawings or samples.

- B. Shop Drawings:
1. As indicated in Divisions 26, 27 and 28.
 2. Provide scale layout of electrical rooms/spaces showing electrical equipment placement and clearances.
 3. The Contractor shall review the shop drawings and stamp with his approval prior to submitting shop drawings to A/E for review.
 4. Shop drawings shall be submitted electronically in an editable PDF format file. PDF file name shall contain specification number and product name. Provide one submittal (PDF file) for each specification section submitted. Each shop drawing submittal shall contain the following:
 - a. Cover Sheet
The submittals shall contain a cover sheet, which shall include the following information:
 - 1) Submittal Date
 - 2) Specification Section(s)
 - 3) Manufacturer's Representative (Contact Name, address, and telephone number)
 - 4) Electrical Contractor (Contact Name, address, and telephone number)
 - 5) Project Name, Project City, Project State, and Project Address.
 - b. Equipment List
A complete equipment list of all components, including the following: Quantity, Manufacturer, Part Number, and Description. If the supplier uses different part numbers from those of the actual manufacturer, the actual manufacturer and part numbers as they appear - marked on the shipping box/packages, shall also be identified on this list.
 - c. Product Data:
Manufacturer's product data sheets and equipment description of all system components. These data sheets shall be highlighted or suitably marked, so that included items and options are indicated. On data sheets that include multiple products, products that are not used shall be crossed out.
 - 1) Product Data Sheets shall be organized, in order, corresponding to the FIRST occurrence of the corresponding item on the equipment list.
- C. Samples:
1. As indicated in Divisions 26, 27 and 28.
- D. Project Information:
1. As indicated in Divisions 26, 27 and 28.
- E. Approval Documents:
1. Prepare and submit all drawings, calculations, and professional seals as required to Federal, State and local authorities having jurisdiction.

1.06 PROTECTION

- A. Provide covering and shielding for all equipment to protect from damage.
- B. Protect nameplates on motors and similar equipment, to prevent defacing.
- C. Repair, restore or replace damaged, corroded and rejected items.

1.07 JOB CONDITIONS

- A. Cause as little interference or interruption of existing utilities and services as possible. Schedule work which will cause interference or interruption in advance with Owner, authorities having jurisdiction and all affected trades.

- B. Examine Contract Documents to determine how other work will affect execution of electrical work.
- C. Determine and verify locations of all existing utilities on or near site.
- D. Make arrangements for and pay for necessary permits, licenses, and inspections. Customer to pay We Energies directly for their relocation of utility equipment per design and drawing. City of New Berlin Permit fees are waived.
- E. Record drawings:
 - 1. Keep a complete set of all electrical drawings in job site office for showing actual installation of electrical systems and equipment.
 - 2. Use this set of drawings for no other purpose.
 - 3. Where any material, equipment, or system components are installed differently from that shown, indicate differences clearly and neatly using ink or indelible pencil.
 - 4. At project completion, submit record set of drawings (See Division 01).

1.08 QUALIFICATIONS

- A. Where specified in various Sections of this DIVISION, final wiring terminations to all equipment and testing of the completed system shall be done by a factory authorized representative. The representative shall be part of a fully equipped service organization capable of furnishing adequate maintenance to the entire system, including factory replacement parts.

1.09 COORDINATION

- A. Obtain and review shop drawings, product data, and manufacturer's instructions for equipment furnished under other sections.
- B. Determine connection locations and requirements.
- C. Sequence rough-in of electrical connections to coordinate with installation schedule for equipment.
- D. Sequence electrical connections to coordinate with start-up schedule for equipment.
- E. Coordination: Coordinate construction activities included under various Sections of these Specifications to assure efficient and orderly installation of each part of the Work. Coordinate construction operations included under different Sections of the Specifications that are dependent upon each other for proper installation, connection and operation.
 - 1. Where installation of one part of the Work is dependent on installation of other components, either before or after its own installation, schedule construction activities in the sequence required to obtain the best results.
 - 2. Where availability of space is limited, coordinate installation of different components to assure maximum accessibility for required maintenance, service and repair.
 - 3. Make adequate provisions to accommodate items scheduled for later installation.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Acceptable Manufacturers:
 - 1. Individual items:
 - a. Base: As noted
 - b. Optional: As noted
 - 2. Other manufacturers desiring approval comply with Instruction to Bidders
- B. Use only prime quality, new materials, apparatus and equipment.
- C. Use U/L labeled electrical materials where listing has been established for materials or devices in question.
 - 1. Manufactured items and fabricated assemblies of electrically operating equipment: U/L

approval or U/L reexamination listing.

- D. Structural steel for supports: ASTM A36.
 - 1. Galvanize members or "H" green steel frame installed in areas of high humidity or condensation.
 - 2. Furnish other members with shop coat of rust inhibiting primer.
 - 3. Shop fabricate for field assembly using bolts.
 - 4. Minimize field welding.
 - 5. Retouch primer and galvanizing after field welding.
- E. Rain hoods and counter flashing not exposed to view:
 - 1. Stainless steel: Minimum 20 GA (0.91 mm).
 - 2. Sheet copper: Minimum 24 OZ.
- F. Rain hoods and counter flashings exposed to view: As specified in Division 07.
- G. Access doors, panels and frames:
 - 1. Style and type required for material in which installed.
 - 2. All materials, equipment and other electrical apparatus subject to replacement, inspection or maintenance shall be readily accessible. The Electrical Contractor shall provide metal access panels of required size and type to meet the requirements for access to equipment located in walls, above ceilings or furred in spaces. Exception: Wherever accessible acoustical tile ceilings are employed.
 - 3. Non-secure area access panels:
 - a. Size: Minimum 12 x 12 IN (300 x 300 mm), or larger as required.
 - b. Minimum 14 GA (1.9 mm) sheet metal, cadmium plated or galvanized after fabrication.
 - c. Key lock, keyed alike, for panels in public areas.
 - d. Prime painted.
 - e. U/L labeled in fire rated construction.
 - f. Base manufacturer: J L Industries.
 - g. Optional: Ventfab; American Warming; Potter-Roemer and Milcor Inc.
 - h. Other manufacturers desiring approval comply with Instructions to Bidders.

2.02 FIRESTOPPING

- A. Firestop all penetrations of fire rated walls, floors and assemblies.
- B. Use materials and methods as specified in Division 07.

2.03 TEMPORARY ELECTRICAL SERVICE

- A. General:
 - 1. Existing Electrical service and owner furnished portable generator may be used for temporary power. Temporary electric facilities are intended to provide services for lighting and single phase portable fractional horsepower motorized equipment. Cost of power consumed shall be paid by the Owner unless otherwise indicated.

PART 3 - EXECUTION

3.01 GENERAL

- A. Use only thorough, highly skilled, and experienced workmen.
 - 1. Divisions 26, 27, 28 equipment shall be installed in a neat and workmanlike manner.
- B. When changes in location of any work are required, obtain approval of Owner before making change.
 - 1. Make changes at no extra cost.

- C. Do not change indicated sizes without written approval of Owner.
- D. Provide all necessary offsets and crossovers in conduits, raceways, cable trays and ducts.
- E. Install exposed conduits parallel to walls and ceilings and vertically plumb, unless otherwise indicated.
- F. Where electrical items penetrate fire and/or smoke rated walls, ceilings and floors, comply with Division 07.

3.02 CUTTING AND PATCHING

- A. Perform or pay for all cutting, fitting, repairing, patching and finishing of work of other sections where it is necessary to disturb such work to permit installation of electrical work.
 - 1. Repair or replace existing or new work disturbed.
- B. Avoid cutting, where possible, by setting sleeves or frames, and by requesting openings in advance.
- C. Before cutting obtain approval of Owner.
 - 1. Use only approved methods.
 - 2. Cut all holes neatly and as small as possible to admit work.
 - 3. Do not weaken walls or floors; locate holes in concrete to miss structural sections.
- D. Locate openings and sleeves to permit neat installation of conduits and equipment.
- E. Do not remove or damage fireproofing materials.
 - 1. Install hangers, inserts, supports, and anchors prior to installation of fireproofing.
 - 2. Repair or replace fireproofing removed or damaged, at no extra cost, in accordance with special conditions.

3.03 INSTALLATION OF EQUIPMENT

- A. Install all equipment in accord with manufacturer's recommendations.
- B. Provide all necessary anchoring devices and supports.
 - 1. Use structural supports suitable for equipment.
 - 2. Check loadings and dimensions of equipment with shop drawings.
 - 3. Do not cut, or weld to, building structural members.
- C. Verify that equipment will fit support layouts indicated.
 - 1. Where substitute equipment is used, revise indicated supports to fit at no additional cost.
- D. Arrange for necessary openings to allow entry of equipment.
 - 1. Where equipment cannot be installed as structure is being erected, provide and arrange for building-in of boxes, sleeves or other devices to allow later installation.
- E. Make all penetrations through roofs prior to installation of roofing. For penetrations required after installation of roofing:
 - 1. In built up roofing (BUR), provide all curbs, cants and base flashings.
 - 2. In elastic sheet roofing (ESR), arrange and pay for flashing work by authorized roofer.
- F. Install rain hoods and metal counter flashings as indicated and to make all penetrations of electrical work through walls and roofs water and weather tight.
 - 1. Furnish all clamps, waterproofing material and labor necessary.
 - 2. Where metal flashings are applied over concrete, paint concrete with 1/8 IN (3 mm) of mastic cement first.
 - 3. Set flashing in mastic cement, watertight.

- G. Provide equipment guards at all belts, couplings, moving machinery and equipment provided under this Division in accord with OSHA.
 - 1. Use suitable structural frames with 12 GA (2.7 mm), 3/4 IN (18 mm) maximum opening galvanized mesh, or expanded metal mesh.
 - 2. Attach to equipment by removable clips and bolts with wing nuts, or other approved connectors.
- H. Install equipment to permit easy access for normal maintenance.
 - 1. Maintain easy access to switches, motors, drives, pull boxes, receptacles, etc.
 - 2. Relocate items which interfere with access.
- I. Provide concrete foundations or pads for all floor mounted electrical equipment, as indicated or as follows:
 - 1. Where drawings do not show special foundations, install 4 IN high concrete pads.
 - 2. Use 3,000 PSI (14 Kg/s/mm) concrete.
 - 3. Reinforce with 6 x 6 IN W2.9 x W2.9, 10 GA (3.4 mm) mesh, with short dowels into floor at 12 IN OC around perimeter.
 - 4. Chamfer top edges 3/4 IN (18 mm).
 - 5. Make all faces smooth.
 - 6. Set anchor bolts for equipment. Consult with user.
- J. Where equipment components are installed prior to final installation (back boxes, panel tubs, fixture frames), these components shall be properly protected from construction debris (paint, dirt, plaster, etc.)
- K. Provide Seismic Tested Equipment:
 - 1. Provide all supporting devices and bracing as required for the installation of electrical equipment and materials. All supports and installation procedures are to conform to the latest requirements of the ASCE Chapter 13 Code for electrical equipment. In addition to providing all supports, anchors, etc., provide all required seismic bracing, supports, anchors, etc. necessary for compliance with applicable codes for structures located within project seismic zones, for the following equipment but not limited to: life safety equipment, battery racks, transformer, cable trays and equipment over 100 lbs.
 - 2. The manufacturer of the electrical equipment may certify the equipment based on a detailed computer analysis of the entire assembly structure and its components. Guidelines for the installation consistent with these requirements shall be provided by the equipment manufacturer and based upon testing of representative equipment. The equipment manufacturer shall document the requirements necessary for proper seismic mounting of the equipment.
 - 3. The following minimum mounting and installation guidelines shall be met, unless specifically modified by the above referenced standards.
 - a. The Contractor shall provide equipment anchorage details, coordinated with the equipment mounting provision, prepared and stamped by a licensed civil engineer in the state. Mounting recommendations shall be provided by the manufacturer based upon approved shake table tests used to verify the seismic design of the equipment.
 - b. The equipment manufacturer shall certify that the equipment can withstand, that is, function following the seismic event, including both vertical and lateral required response spectra as specified in above codes.
 - c. The equipment manufacturer shall document the requirements necessary for proper seismic mounting of the equipment. Seismic qualification shall be considered achieved when the capability of the equipment, meets or exceeds the specified response spectra.
- L. In wet and damp locations, use steel channel supports to stand cabinets and panelboards one inch off wall.

3.04 PAINTING

- A. See Division 09.

- B. By Electrical Contractor:
 - 1. Touch up or completely paint all factory painted Electrical System components which have become rusted, scratched, or otherwise damaged during construction (which are not painted under Division 09) to match the original finish or pay for restoration of such items as may be stipulated by the AE.
 - 2. Building surfaces/finishes previously painted by the General Contractor and damaged by the Electrical Contractor shall be repainted/refinished by the General Contractor at the Electrical Contractor's expense.

3.05 REMODELING

- A. Where relocation of existing equipment and piping systems is necessary in areas providing uninterruptible services, schedule work for minimal down time during slack period.
 - 1. Anticipate scheduling work during premium time and include cost in proposal.
- B. Do not cut into existing services without first verifying with Owner that service has been correctly identified.
 - 1. Perform work that interrupts any service this include cutting into existing lines for new connection during premium time to cause least interference to normal operation of building.
 - 2. Inform building engineering staff in advance of any shut off that will occur and give estimate of duration.
 - 3. Begin work only after engineering staff is fully informed and has agreed to schedule of shut offs. All power interruptions to be scheduled at least 7 working days in advance.
- C. Fabricate and install interconnecting portions of these systems prior to shut down for final connections.
- D. Maintain all existing services and equipment unless indicated to be removed.
- E. Demolition:
 - 1. Remove all equipment indicated.
 - 2. Relocate items indicated after thorough cleaning.
 - 3. Remove all existing wiring serving abandoned circuits back to originating source.
 - 4. Remove all non-embedded conduit serving abandoned circuits back to originating source.
- F. Existing material and equipment removed from existing construction and not shown or required to be reused shall become the property of the Owner, if they so elect. The Contractor shall present the equipment and materials removed to the Owner's designated Representative and he shall select the equipment and materials which he elects to retain. Material and equipment not retained shall become the property of the Contractor and shall be promptly removed from the site.
- G. Existing conduit and wire of proper sizes may be spliced and extended from appropriate points, but do not reuse after removal.
- H. Removed devices and equipment in good condition may be reused to extent available in lieu of new devices and equipment shown of same type at Contractors option.
 - 1. Thoroughly clean items before reinstallation.
 - 2. Verify items are compatible with new system(s).

3.06 FIELD QUALITY CONTROL

- A. Perform indicated tests to demonstrate workmanship, operation, and performance.
 - 1. Conduct tests in presence of Owner and, if required inspectors or agencies having jurisdiction.
 - 2. Arrange date of tests in advance with Owner, manufacturer and installer.
 - 3. Give all inspectors minimum of 72 hours' notice.
 - 4. Furnish or arrange for use of electrical energy, steam, water, diesel fuel, or gas required for tests.
 - 5. Furnish all lubricating materials required for test.
 - 6. Provide written report on all tests.

- B. Repair or replace equipment and systems found inoperative or defective and retest.
 - 1. If equipment or system fails retest, replace it with products conforming to Contract Documents.
 - 2. Continue remedial measures and retests until satisfactory results are obtained.
- C. Test equipment and systems as indicated for each item, unless otherwise recommended by manufacturer.

3.07 FINAL PERFORMANCE TEST

- A. At completion of installation, test for: operation, panel load balance, short circuits, and ground.
 - 1. Provide written report on final performance test.

3.08 ADJUST AND CLEAN

- A. Inspect all equipment and put in good working order.
- B. Clean all exposed and concealed items.
- C. Where new work occurs in existing areas where no other work has been done, clean area and restore to original condition.

3.09 PUTTING SYSTEMS IN OPERATION - START UP

- A. Prior to energizing any equipment whether installed by this section or not:
 - 1. First make a thorough inspection of it to make sure it has been unpacked correctly and all packing materials and supports have been removed.
 - 2. Be responsible for assisting the equipment startup personnel to assure correct equipment connections and rotation.
 - 3. Provide a 72 hour notice.
- B. Prior to final acceptance, at time agreed to by Owner, put all systems in to satisfactory operation.
- C. Operate all systems in good working order for period of 5 working days.

3.10 DEVICE MOUNTING SCHEDULE

- A. Dimensions are to center of item unless otherwise indicated. Coordinate outlet locations with all architectural millwork and/or casework elevations.
- B. Mounting heights as indicated below:

Exit light (over door trim, center in space)	90 IN
Safety switch	54 IN
Panelboard (to top)	72 IN
Motor starter	54 IN
Push button motor control station	48 IN
Door push button	48 IN
- C. Relocate signs as required to resolve conflicts.

3.11 CONNECTIONS TO EQUIPMENT FURNISHED BY OTHERS

- A. Included in Division 26 are electrical connections to equipment provided by others. Refer to final shop drawings for equipment provided by other divisions for exact location of electrical outlets and the connections required. Provide energization to the equipment furnished by other Divisions only at the request of the providing party.
- B. Assume that once the equipment has been started up, that it shall be shut off unless it is requested that it be left on by the providing party. Only start up and turn on equipment if requested so by the party providing said equipment. If required, power shall not be activated to the equipment until

qualified starting personnel are on site. After making a permanent power connection, the breaker shall be left in an off position and a "hold" tag or some other device be utilized to keep the power turned off to the equipment.

3.12 TRAINING

- A. Electrical Contractor shall be responsible for owner training as specified in other sections of this specification. Provide competent personnel to meet the Owner or his representative to fully explain and familiarize the Owner with the operation of all equipment and systems installed under Divisions 26, 27 and 28.
- B. All training sessions shall be recorded electronically with (2) two copies sent on thumb drives for downloading for future use. If provided by the manufacturer of the equipment, provide Owner's manual, and training session in the same drive.
- C. Use the submitted Operation and Maintenance Manuals as referenced during training sessions. Provide two sets to the owner.

END OF SECTION

SECTION 26 36 23

AUTOMATIC TRANSFER SWITCHES

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Work Includes:
 - 1. Furnish all labor, materials, tools, equipment, and services for automatic transfer switches as indicated in accord with provisions of Contract Documents.
 - 2. Completely coordinate with work of all other trades.
 - 3. Although such work is not specifically indicated, furnish and install all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation.
 - 4. See Section 26 00 01 for General Electrical Requirements.
 - 5. See Division 1 for General Requirements.
- B. Related Equipment Specified Elsewhere:
 - 1. Automatic transfer switch for fire pump: See Section 21 30 00.
 - 2. Electrical Short Circuit Coordination and Arc Flash Studies: See Section 26 01 60.

1.02 REFERENCE STANDARDS

- A. The following references shall apply to the installation of equipment under this section.
 - 1. UL 1008 – Standard for Transfer Switch Equipment
 - 2. Wisconsin Administrative Code SPS 316 Edition
 - 3. NFPA 99 - Essential Electrical Systems for Health Care Facilities
 - 4. NFPA 70 - National Electrical Code
 - 5. NFPA 110 – Emergency and Standby Power Systems
 - 6. IEEE Standard 446 – IEEE Recommended Practice for Emergency and Standby Power Systems
 - 7. NEMA Standard ICS10-1993 – AC Automatic Transfer Switches

1.03 SUBMITTALS (GENERAL CONDITIONS)

- A. Shop Drawings:
 - 1. Identify automatic transfer switches by alphanumeric designation with switch rating, withstand rating, etc., marked.
- B. Project Data:
 - 1. Operating and maintenance data: See Division 01.
 - 2. Owner instruction reports: See Division 01.

1.04 WARRANTY

- A. Provide a five (5) year comprehensive warranty. Warranty to commence upon completion of factory startup.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Acceptable Manufacturers:
 - 1. Automatic transfer switches:
 - a. Base: Same as generator manufacture
 - 2. Other manufacturers desiring approval comply with Instruction To Bidders.

- B. Automatic Transfer Switches - General: Electrically operated mechanically held 277/480 volt, 3 phase AC, air-break type, with supervisory relays on each phase of normal source and supervisory frequency/voltage relay for emergency source. Breaker based type transfer switches are not acceptable.
1. UL 1008 listed for paragraph 30.3 emergency service.
 2. Adjust normal source supervisory relays to transfer load if voltage on any phase drops below 70 percent of normal and to restore load to normal source when normal source voltage on all phases is 90 percent or more.
 3. Obtain voltage for main contact operating solenoid from source to which load is being transferred.
 4. 3 or 4-wire as indicated.
 5. Make mechanical design of switch such that it will positively open alternate source before connection is made to normal source and vice-versa (Open Transition).
 6. Closed Transition Transfer switch.
 7. Design mechanical interlock so it cannot be readily disabled, disconnected, improperly adjusted, removed or otherwise made inoperative.
 8. Provide provision for visual inspection of switch blades and contacts.
 9. Silver-surface main contacts and protect by arcing contacts.
 10. Make all contacts and coils readily accessible for replacement from front of panel without major disassembly.
 11. Provide red and green indicating lights, identification nameplates, and test switch on front to simulate normal power failure at switch. Indicating lights shall be LED.
 12. Rate each individual switch as indicated.
 13. Provide engine starting contacts, remote automatic transfer switch control circuits and all other auxiliary contacts and accessory devices for functions to be performed.
 14. Provide with adjustable time delay on retransfer to normal, motor driven type 2 to 30 minutes, to avoid erratic operation caused by short time reestablishment of normal source.
 15. NEMA 1 enclosure.
 16. Provide RUN-OFF-AUTO generator control. A visual/ audible signal shall annunciate at generator annunciators when switch is not in AUTO position.
- C. Automatic transfer switches serving full load backup
1. Provide time delay on engine start, field adjustable from 0 to 10 SEC, and factory set at 1 SEC.
 2. Transfer to be made to generator automatically within 10 SEC maximum.
 3. ATS shall be service entrance rated.
- D. Automatic transfer switches shall be able to withstand the Available Short-Circuit Capacity as outlined in Section 26 01 60 - Electrical Systems Short-Circuit, Coordination and Arc Flash Studies.

2.02 CERTIFICATION DESCRIPTION

- A. All equipment included as part of the power and trip history metering shall be UL listed.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Locate switch on wall as indicated.
- B. Connect as indicated on riser diagram or as necessary and required for a complete, operating system. Include all control wiring line or low voltage. Comply with manufacturer's recommendations.
- C. Provide comprehensive site startup by the transfer switch manufacturer. Third party startup companies are not acceptable. Provide startup and commissioning documentation to Engineer and Owner upon completion.

3.02 FIELD ADJUSTMENTS

- A. The Contractor shall field adjust all timing and voltage settings of the transfer switch as necessary for proper operation of the switch, related loads and sources.

3.03 TESTING

- A. Maintenance and operational testing shall be per NFPA 110-8.3.
- B. Operational inspection and testing shall be per NFPA 110-8.4.

3.04 TRAINING

- A. All training provided for Owner shall comply with the format, general content requirements and submission guidelines specified under Section 01 91 01.

END OF SECTION

SECTION 26 28 16

SAFETY SWITCHES, CIRCUIT BREAKERS AND FUSES

PART 1 - GENERAL

1.01 DESCRIPTION

- A. General:
 - 1. Furnish all labor materials, tools, equipment and services for all safety switches, circuit breakers and fuses as indicated, in accord with provisions of Contract Documents.
 - 2. Completely coordinate with work of all other trades.
 - 3. Although such work is not specifically indicated, furnish and install all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation.
 - 4. See Section 26 00 01 for General Electrical Requirements.
 - 5. See Division 1 for General Requirements.

1.02 SUBMITTALS (SEE GENERAL CONDITIONS)

- A. Project Data:
 - 1. Operating and maintenance data: See Section 26 00 01.
 - 2. Maintenance materials: Spare fuses, 10 percent or minimum of 3 of each type and rating of installed fuses.

1.03 RELATED WORK

- A. Section 26 05 26 - Grounding and Bonding
- B. Section 26 01 60 - Electrical System Short Circuit, Coordination + Arc Flash Study

1.04 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Do not store exposed to weather.
- B. Protect against damage from work of other trades.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. General Electric
- B. Siemens
- C. Square D
- D. Eaton

2.02 DISCONNECT RATINGS

- A. UL listed short circuit rating:
 - 1. 200,000 RMS amps with Class R fuses.

2.03 SAFETY SWITCH CONSTRUCTION

- A. NEMA heavy duty Type HD.

- B. Dual cover interlock.
- C. Visible blades.
- D. Provisions for control circuit interlock.
- E. Pin type hinges.
- F. Tin plated copper current carrying parts.
- G. Quick make and break operator mechanism.
- H. Handle attached to box, not cover.
- I. Handle position indication, ON in up position and OFF in down position.
- J. Padlock provisions for up to three padlocks in OFF position.
- K. UL listed lugs for type and size of wire specified.
- L. Spring reinforced fuse clips for Type R fuses.
- M. Provisions for insulated or grounded neutral.

2.04 FUSES

- A. UL Class RK-5 fuses: dual-element time-delay and current-limiting rejection types fuses; UL Class RK-5 listed for 200,000 RMS AIC symmetrical, 0-600A; Bussman "Fusetron", 250 V FRN-RK and 600 V FRS-RK.
 - 1. Use for motor feeder and branch circuit devices where fuses are shown.
- B. UL Class RK-1 dual-element fuses: Dual-element time-delay and current-limiting rejection type fuses; UL Class RK-1 listed for 200,000 RMS AIC symmetrical, 0-600 A; Bussman "Low-Peak", 250 V LPN-RK and 600 V LPS-RK.
 - 1. Use for main feeder devices 600A and smaller where fuses are shown.
- C. UL Class RK-1 single-element fuses: Fast-acting current-limiting rejection type fuses; UL Class RK-1 listed for 200,000 RMS AIC symmetrical, 1/10-600A; Bussman "Limitron", 250 V KTN-RK and 600 V KTS-RK.
 - 1. Use where indicated.
- D. UL Class L fuses: Dual-element time-delay and current-limiting type fuses; UL Class L listed for 200,000 RMS AIC symmetrical; Bussman "Hi-Cap" 600 V, 601-6000 A, Type KRP-C.
 - 1. Use for main and main feeder devices over 600 A, where fuses are shown.
- E. Provide (3) spare fuses of each type and rating of installed fuse. Under Section 2.04 Fuses

2.05 ENCLOSED CIRCUIT BREAKER CONSTRUCTION

- A. Dual cover interlock.
- B. External trip indication.
- C. Provisions for control circuit interlock.
- D. Padlock provisions for up to three padlocks in OFF position.
- E. Handle attached box, not cover.
- F. Handle position indicate ON, OFF, or TRIPPED.

- G. Provisions for insulated or grounded neutral.
- H. All circuit breakers 1,200 Amp or higher shall be equipped with an Arc Flash Mitigation System.

2.06 LIGHTING AND POWER PANEL CIRCUIT BREAKERS

- A. Thermal and magnetic protection.
- B. Single-handle common trip, two and three poles (handle ties not acceptable).
- C. Bolt-on type.
- D. Quick make and break toggle action.
- E. Handle trip indication.
- F. Handle position indication, ON in up position, OFF in down position, and TRIPPING centered.
- G. UL listed for type and temperature rating of wire specified.
- H. UL listed short circuit rating (integrated equipment rating): as indicated on drawings. Series rating is not acceptable.
- I. UL listed for type and temperature rating of wire specified.
- J. All circuit breakers 1,200 Amp or higher shall be equipped with an Arc Flash Mitigation System.
- K. For loads greater than 300VA without a local disconnecting means shall have a fixed attached padlock attachment to lock circuit breaker in the open position.

2.07 EMERGENCY BRANCH CIRCUIT BREAKERS

- A. Circuit Breakers in the life safety branch shall be provided with the ability to optimize current, time and energy selectivity so a fault is cleared by the first circuit breaker upstream of the fault.

2.08 ENCLOSURES

- A. Indoor: NEMA 1 code gauge steel with rust inhibiting primer and baked enamel finish.
- B. Outdoor: NEMA 3R code gauge zinc coated steel with baked enamel finish or NEMA 4 when indicated on drawings.
- C. Corrosive Area: NEMA 12 code gage steel with rust-inhibiting primer and baked enamel finish or reinforced fiberglass.
- D. Hazardous Area: NEMA 7/9 cast, copper free, aluminum alloy.

2.09 NAMEPLATES

- A. In accordance with Section 26 05 53.
- B. Identify per equipment controlled.

PART 3 - EXECUTION

3.01 GENERAL

- A. Provide disconnect switches for loads as required by code. Review HVAC and Plumbing specifications to determine what equipment is furnished with disconnect switches. Install all disconnect switches whether furnished under this contract or not. It is the Electrical Contractor's responsibility to determine the need for a disconnect switch requirements for each specific load. The contractors shall include in their bid all disconnect switches required whether indicated on the drawings or not.

3.02 INSPECTION

- A. Examine area to receive disconnect to assure adequate clearance for installation.
- B. Start work only after unsatisfactory conditions are corrected.

3.03 INSTALLATION

- A. Install in accordance with manufacturer's written instructions, applicable requirements of NEC and NECA's "Standard of Installation," and in accordance with recognized industry practices.
- B. Locate disconnect switches as shown on drawings or as required by NEC.
- C. Install on equipment support where feasible, or anchor firmly to wall or structural surface.
- D. Provide control circuit interlock as required by NEC.
- E. Provide adhesive label on inside door of each switch indicating UL fuse class and size for replacement.

3.04 ADJUSTMENT

- A. Adjust covers and operating mechanism for free mechanical movement.
- B. Verify overcurrent protection to provide proper operation and compliance with NEC.
- C. Tighten wire and cable connections.
- D. Clean interior or enclosure.
- E. Touch up scratched or marred surfaces to match original finish.

END OF SECTION

SECTION 26 05 53
ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Work Includes:
1. Furnish all labor, materials, tools, equipment, and services for wiring all equipment furnished by others as indicated, in accord with provisions of Contract Documents.
 2. Completely coordinate with work of all other trades.
 3. Although such work is not specifically indicated, furnish and install all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation.
 4. See Section 26 00 01 for General Electrical Requirements.
 5. See Division 1 for General Requirements.
 6. Contractor to identify existing panel boards and transformers per this section.

1.02 SECTION INCLUDES

- A. Nameplates
- B. Stenciling
- C. Wire and Cable Markers

1.03 SUBMITTALS

- A. Submit shop drawings under provisions of Section 26 00 01.
- B. Include schedule for nameplates and stenciling.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Nameplates: Engraved three-layer laminated plastic, black letters on a white background. Emergency system shall use red letters on white background.
- B. Stenciling: Black paint. Emergency system stenciling shall use red paint.
- C. Wire and Cable Markers: Cloth markers, split sleeve or tubing type.
- D. Tape (phase identification only): Scotch #35 tape in appropriate colors for system voltage and phase.
- E. Adhesive type labels not permitted except for phase and wire identification.

PART 3 - EXECUTION

3.01 GENERAL

- A. Where mixed voltages are used in one building (e.g. 4160 volt, 480 volt, 208 volt) each switch, switchboard, junction box, equipment, etc., on each system must be labeled for voltage addition to other requirements listed herein.

- B. All branch circuit and power panels must be identified with the same symbol used in circuit directory in main distribution center.
- C. Wording of nameplates and embossed labels shall define the components actual use. Nomenclature used on the Drawings and in Specifications is for construction purposes only. Actual nomenclature shall be verified with the Owner. Identify voltage where other than 120 volts.

3.02 INSTALLATION

- A. Clean surfaces to receive nameplates or stenciling.
- B. Install nameplates parallel to equipment lines.
- C. Secure nameplates to equipment fronts using screws, or rivets. Secure nameplate to inside of recessed panelboards in finished locations.
- D. Embossed tape will not be permitted for any application.
- E. Stenciling may only be used on equipment fronts in unfinished areas or in areas designated by the Architect/Engineer.
- F. Secure nameplate to inside surface of door on panelboard that is recessed in finished locations.
- G. Identify underground conduits using underground warning tape. Install one tape per trench at 6 inches below finished grade.

3.03 WIRE IDENTIFICATION

- A. Provide wire markers on each conductor in panelboard gutters, pull boxes, outlet and junction boxes, and at load connection. Identify with branch circuit or feeder number for power and lighting circuits, and with control wire number as indicated on schematic and interconnection diagrams for control wiring.
- B. Verify label identification numbering systems with the Owner's representative.

3.04 FEEDER IDENTIFICATION

- A. Each feeder within each pulling pit, manhole and pull box will be identified utilizing permanently attached nameplates.
- B. Nameplates shall be engraved three-layer laminated plastic, black on white background for normal power, red on white background for emergency power. Firmly attach to cable with non-aging nylon tie-wraps.
- C. Nameplate shall identify voltage, system (i.e. normal, em-equip or em-life) and destination of feeder (i.e. buildings A, B, C and D, etc.).
- D. Temporary tags are to be utilized during construction and permanent tags to be installed near substantial completion of distribution system.

3.05 JUNCTION AND PULLBOX IDENTIFICATION

- A. Junction and pull boxes for systems shall be color coded. The following junction and pull boxes shall be identified utilizing spray-painted covers:
 - 1. In existing facilities, existing color scheme shall be used. Verify existing color scheme and submit for Owner approval.

3.06 DISCONNECT, SAFETY SWITCH AND STARTER IDENTIFICATION

- A. Each starter and disconnect furnished by this section or furnished by other sections but installed by this section shall have an engraved laminated label indicating which piece of equipment it controls.

- B. Identify panel and circuit number where power supply originates.
- C. Identify equipment connected to load side of switch.

3.07 CONTROL EQUIPMENT

- A. Control equipment of electrical systems shall have engraved labels indicating their functions. This shall include but not be limited to the following:
 - 1. All pushbuttons shall have labels that are engraved as to its function.
 - 2. All relay cabinets shall indicate what the relay cabinet's function is.
 - 3. All bypass relay enclosures.

3.08 NAMEPLATE ENGRAVING, STENCILING, AND LABELS

- A. Provide nameplates or stencils of minimum letter height as scheduled below.
- B. Panelboards, Switchboards and Motor Control Centers: 1 inch; identify equipment designation. 1/2 inch; identify voltage rating and source, and available short circuit current per the short circuit study and date when the study was performed. Labels indicating arc flash potential shall be provided.
- C. Individual Circuit Breakers, Switches, and Motor Starters in Panelboards, Switchboards, and Motor Control Centers: 1/4 inch; identify circuit and load served, including location.
- D. Individual Circuit Breakers, Enclosed Switches, and Motor Starters: 1/4 inch; identify load served.
- E. Transformers: 1 inch; identify equipment designation. 1/2 inch; identify primary and secondary voltages, primary source and disconnecting means location, if not within sight, and secondary load and location.
- F. Junction boxes: 1/2 inch; identify system source(s) and load(s) served.
- G. Electrical communication, signal and control systems: As indicated above for electrical power systems.

3.09 PANELBOARD DIRECTORIES

- A. Directories for panels must be covered with clear plastic, have a metal frame and shall be typewritten. Room number on directories shall be Owner's numbers, not Plan numbers unless Owner so specifies. Directory shall include panel name, available short circuit current per the short circuit study and date when the study was performed, circuit description including: breaker amp/pole size, description of devices served, and area served.
- B. Electrical contractor is responsible for tracing all existing loads and updating the new panelboard directories with accurate information. Note that some of the existing panelboard directory information is blank. Utilize room numbers shown on the plans.

3.10 EQUIPMENT CONNECTIONS

- A. All equipment with electrical power connections shall have an electrical identification label near the equipment connection.
- B. Identify panel and circuit number where power supply originates.
- C. Switchboards and panelboards shall be marked to indicate the device or equipment where power supply originates.

3.11 WIRING DEVICE IDENTIFICATION

- A. Wall switches, receptacles, occupancy sensors, wall dimmers, device plates and box covers, poke-through fittings, access floor boxes, junction boxes, photocells and time clocks shall be identified with circuit numbers and source. Identifications should be made inside of device covers, unless directed otherwise. Use machine-generated labels or neatly hand-written permanent marker on the inside only; marker shall not show through the faceplate.

END OF SECTION

SECTION 26 05 33
RACEWAYS AND BOXES

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Work Includes:
1. Furnish all labor, materials, tools, equipment and services for all raceways as indicated, in accord with provisions of Contract Documents.
 2. Completely coordinate with work of all other trades.
 3. Although such work is not specifically indicated, furnish and install all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation.
 4. See Section 26 00 01 for General Electrical Requirements.
 5. See Division 1 for General Requirements.

1.02 WORK INCLUDED

- A. Galvanized Rigid and Intermediate Metal Conduit and Fittings
- B. Aluminum Rigid Conduit and Fittings
- C. Electrical Metallic Tubing (EMT) and Fittings
- D. Flexible Metal Conduit and Fittings
- E. Liquidtight Flexible Metal Conduit and Fittings
- F. Rigid Nonmetallic Conduit and Fittings
- G. Electrical Nonmetallic Tubing (ENT) and Fittings
- H. PVC Coated Rigid Metal Conduit
- I. Conduit Supports
- J. Expansion Fittings
- K. Conduit Bodies
- L. Seals
- M. Outlet Boxes
- N. Pull and Junction Boxes
- O. Conduit Sizing, Arrangement and Support
- P. Underground Conduit
- Q. Conduit Installation
- R. Conduit Installation Schedule
- S. Connections and Fittings
- T. Supports, Sleeves and Seals

- U. Fire Stops and Penetration Seals
- V. Cutting and Patching
- W. Coordination of Box Locations
- X. Outlet Box Installation
- Y. Pull and Junction Box Installation
- Z. Pull and Junction Box Installation Requirements

1.03 RELATED WORK

Section 26 27 26 - Wiring Devices

1.04 SUBMITTALS

- A. Contractor shall prepare drawings indicating size and location of all anticipated floor sleeves for the installation of electrical conduits. Such drawings shall be made available to the General Contractor 10 days prior to any scheduled concrete work.

PART 2 - PRODUCTS

2.01 GALVANIZED RIGID AND INTERMEDIATE METAL CONDUIT AND FITTINGS

- A. Manufactured lengths, full weight, heavy wall, rigid steel conduit, protected inside and out by hot-dipped galvanized or electro-galvanized coating.
- B. Minimum conduit size shall be 1/2 inch.
- C. Connectors and Couplings: Threaded, liquidtight, insulated throat.

2.02 ALUMINUM RIGID CONDUIT

- A. Manufactured lengths, lightweight rigid aluminum conduit, corrosion resistant, manufactured of 6063 alloy in Temper Design T-1.
- B. Minimum conduit size shall be 1/2 inch.
- C. Connectors and Couplings: Threaded liquidtight, insulated throat made of same material as conduit.

2.03 ELECTRICAL METALLIC TUBING (EMT)

- A. Standard lengths and size.
- B. Minimum conduit size shall be 1/2 inch.
- C. Connectors and Couplings: Threaded, insulated throat, gland compression type, rain and concrete tight. No set screw, push on or indenter type permitted.

2.04 FLEXIBLE METAL CONDUIT AND FITTINGS

- A. Galvanized flexible steel.
- B. Standard conduit sizes.
- C. Minimum size 1/2" with the exception that 3/8" diameter may be used to serve individual lighting fixtures installed in a suspended accessible ceiling system.

- D. Connectors: Threaded, grounding type, insulated throat. Two-screw clamp type with locknuts, externally secured.

2.05 LIQUID-TIGHT FLEXIBLE METAL CONDUIT AND FITTINGS

- A. Galvanized flexible steel.
- B. Standard conduit sizes.
- C. Heavy wall PVC jacket.
- D. Connectors: Liquidtight, suitable for grounding, suitable for wet locations. Tapered threaded hub, nonmetallic material.

2.06 RIGID NONMETALLIC CONDUIT AND FITTINGS

- A. Standard lengths and sizes.
- B. Minimum size 1/2" with the exception that the minimum size conduit for underground site lighting circuits shall be 1".
- C. Schedule 40 or 80, rigid plastic (PVC) conduit, manufactured to NEMA TC-2 standards, UL listed, and as required by NEC.
- D. PVC conduit may not be used in plenum rated ceilings.
- E. Rated for 90°C cable.
- F. Connectors and Couplings: Schedule 40 or 80 to match conduit.

2.07 ELECTRICAL NONMETALLIC TUBING (ENT) AND FITTINGS

- A. ENT: Rigid, PVC, corrugated, meeting standards of NEMA TC 13-1983 or latest edition. ENT may be used for non-fire alarm low voltage cable only.

2.08 PVC COATED RIGID METAL CONDUIT

- A. Per NEMA Standards Publication No. RN 1 - 1980 and ANSI C80.1.
- B. PVC Externally Coated Conduit: Rigid heavy wall steel conduit with external 40 mil (0.1 mm) PVC coating. Conduit must be hot dipped galvanized inside and out including threads. The PVC coating bond to the galvanized steel conduit shall be stronger than the tensile strength of the coating itself.
- C. Minimum conduit diameter shall be 1/2 inch.
- D. Connector and Couplings: Full weight 40 mil PVC jacket, PVC gasketed for mating surfaces, insulated throat.
- E. The PVC coated galvanized rigid conduit must be ETL Verified to the Intertek ETL SEMKO High Temperature H₂O PVC Coating Adhesion Test Procedure for 200 hours. The PVC coated galvanized rigid conduit must bear the ETL Verified PVC-001 label to signify compliance to the adhesion performance standard.
- F. A PVC sleeve extending one pipe diameter or two inches, whichever is less, shall be formed at every female fitting opening except unions. The inside sleeve diameter shall be matched to the outside diameter of the conduit.
- G. A urethane coating shall be uniformly and consistently applied to the interior of all conduit and fittings. This internal coating shall be a nominal 2 mil thickness. Conduit or fittings having areas with thin or no coating shall be unacceptable.

- H. The PVC exterior and urethane interior coatings applied to the conduit shall afford sufficient flexibility to permit field bending without cracking or flaking at temperatures above 30°F (-1°C).

2.09 EXPANSION FITTINGS

- A. Copper bonding jumper: Crouse Hinds Type XJ.
- B. Expansion/Deflection Fittings: Copper bonding jumper Crouse-Hinds Type XD.
- C. PVC expansion fittings installed per manufacturer's recommendations. Heritage Plastic Group 59000 Series or approved equal.

2.10 CONDUIT BODIES

- A. Galvanized or cadmium plated with threaded hubs.
- B. PVC in corrosive areas.
- C. Removable cover, with gasket.
- D. Corrosion-resistant screws, 316 stainless steel.

2.11 WALL SEALS

- A. Provide link-seals as manufactured by the Thunderline Corporation where pipes pass through outside walls or roofs. The seal shall provide hydrostatic sealing, cathodic protection and pipe support, and shall be shipped pre-assembled. The seal material shall be made of synthetic rubber and steel bolts shall be phosphate plated.

2.12 EMPTY CONDUIT AND OUTLET BOXES

- A. Conduit: As specified in Section 26 00 01.
- B. Conduit Stub-outs: From outlet box to 6 IN above nearest lay-in type building main corridor ceiling, terminated with insulated bushing.
 - 1. Provide pulling wire or heavy nylon pulling cord for conduit more than 25 FT long.
 - 2. CCTV antenna stub-outs: 1/2 IN.
 - 3. Monitor outlets: Provide 1-1/2 IN conduit between input and output junction box.
- C. Outlet Box - General: With extension ring, of proper size and depth, with cover plate to match wiring device cover.
- D. CCTV Antenna Outlet Boxes: Standard flush switch box.
 - 1. Plate with 3/8 IN bushed opening.
 - 2. Provide duplex plate for antenna and control receptacle for outlets in patient rooms.
 - 3. In addition to stub-outs provide an empty two inch conduit riser from first floor to head end MATV equipment in penthouse. Run 2 IN conduit, through most centrally located electrical closet each floor. Provide a 4-11/16 IN x 4-11/16 IN x 2-1/3 IN junction box in conduit each floor.
- E. Remote Monitor Outlet Boxes: 4-11/16 IN x 4-11/16 IN x 2-1/8 IN box with blank plate.
 - 1. Provide 1-1/2 IN conduit between input and output junction box.
- F. Radio Page Antenna: Extend an empty 1 IN conduit from existing termination to new roof for Owner installed radio page antenna junction box at PBX room. Junction box, weatherproof, at roof to be provided by CPR 105.

2.13 OUTLET BOXES

- A. Acceptable Manufacturers:
 - 1. Galvanized boxes:
 - a. Base: Appleton Electric Co.; Steel City; and Racor.
 - 2. Corrosion resistant boxes and fittings:
 - a. Base: Crouse-Hinds; and Appleton Electric Co.
 - 3. PVC coated conduit fittings and boxes:
 - a. Base: Robroy Industries and Occidental Coating Co.
 - 4. PVC boxes F Series with ground lug.
 - a. Base: Heritage Plastic Group.
 - 5. Junction box and conduit supports:
 - a. Base: CADDY.
 - 6. Other manufacturers desiring approval comply with Instruction to Bidders.
- B. Lighting Outlet Boxes: Galvanized, 4 IN octagon.
 - 1. Use extension and plaster rings where required.
 - 2. Verify proper depth with partition thickness.
 - 3. Provide with proper fittings to support and attach lighting fixtures.
 - 4. Support outlet boxes for light fixtures and other ceiling-mounting devices in lay-in acoustical tile ceilings by bar hangers anchored to ceiling construction members which do not interfere with tile removal.
- C. Switch and Receptacle Boxes for Concealed Wiring: Galvanized.
 - 1. Provide bar hangers or CADDY quick mount for metal stud partitions.
 - 2. Narrow switch boxes (for hollow metal jambs): Racor 426.
 - 3. Between studs provide CADDY bar hanger assembly series BHA.
- D. Exposed switch and receptacle boxes: Corrosion resistant, cast, ferrous metal, with threaded hubs; Crouse-Hinds Type FS.
- E. Concealed gang-switch and junction boxes not dimensioned: 4 IN. square, galvanized.
 - 1. Provide CADDY quick mount support for metal stud partitions.
 - 2. Between studs provide CADDY bar hanger assembly series BHA.
- F. Boxes for 277 volt switches on opposite phases: Gang-switch type, with barriers between switches.
- G. Weatherproof receptacle boxes: Corrosion resistant cast ferrous metal type, with threaded hubs and neoprene gasket; Crouse-Hinds Type FS.
- H. Pull and junction boxes: Code-sized galvanized steel boxes provided with plain blank removable covers held in place with screws unless otherwise indicated.
 - 1. Where sizes are not indicated, use 4 IN square or NEC size.
- I. Inaccessible Ceiling Areas: Install outlet and junction boxes no more than 6 inches from ceiling access panel or from removable recessed luminaire.
- J. Install boxes to preserve fire resistance rating of partitions and other elements.
- K. Wall outlets shall comprise of 4" square box with a flush single gang raised cover and blank.

2.14 PULL AND JUNCTION BOXES

- A. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.
- B. Acceptable Manufacturers:
 - 1. For interior work, provide galvanized sheet metal boxes of code thickness with lapped and welded joints, 3/4" flanges and screw covers.
 - 2. For exterior work, provide galvanized sheet metal boxes of code thickness with lapped and welded joints, 3/4" flanges, bolted covers with full gaskets forming a completely raintight assembly, equal to Keystone 19000 series.

3. For exterior work in graded areas outside the building, provide heavy duty sidewalk junction boxes externally flanged for flush mounting. Covers shall be fully gasketed, watertight with grounding strap and secured with plated screws or bolts equal to Quazite Type PC. Covers shall have logo naming the type of system, electric, high voltage lighting, etc. Shall comply with NEC 314.
- C. Large Pull Boxes: Boxes larger than 100 cubic inches in volume or 12 inches in any dimension.
1. Interior Dry Locations: Use hinged enclosure.
 2. Other Locations: Use surface-mounted cast metal box.

PART 3 - EXECUTION

3.01 CONDUIT SIZING, ARRANGEMENT AND SUPPORTS

- A. Exposed interior conduits for electrical wiring may be electrical metallic tubing (EMT) above heights of 8'-0" AFF or from top of equipment; otherwise GRC shall be used unless protected from damage. Exceptions to the requirements stated above are as follows:
1. Conduits in poured concrete construction shall be PVC regardless of size.
 2. Conduits installed in corrosive areas shall be PVC conduit. Corrosive areas are such as waterparks and associated equipment rooms, the pool areas, pool equipment areas, chemical areas, damp areas, and/or as indicated on Drawings.
 3. Conduits installed within 1-1/2" under metal-corrugated sheet roof decking shall be IMC or GRC.
 4. Above ground exterior conduit shall be GRC.
- B. Cut joints shall be square, reamed smooth, and drawn up tight.
- C. Keep conduit plugged, clean, and dry during construction.
- D. Install No. 12 pull wire in empty conduit.
- E. Cap spare conduits.
- F. Provide riser clamps around all conduits 1-1/4" or larger that are routed between floors.
- G. Provide a watertight conduit system where installed in wet locations such as underground, or where embedded in concrete.
- H. Conform to specification Section 05 05 30 "Post-Installed Anchors in Concrete and Masonry (CMU)" for connections of hangers and supports to the structure.
- I. Branch circuit conduits under buildings slab shall be a minimum below floor slab gravel sub base.
- J. Feeder conduits under building slab shall be 30" below floor slab.

3.02 UNDERGROUND CONDUIT

- A. Exterior underground conduit shall be Schedule 40 PVC.
1. Underground conduit runs which enter or exit the building envelope shall utilize PVC coated rigid metal conduit from the point of penetration of the building envelope and the next 5' portion of the run in direct contact with the earth.
- B. Exterior underground conduit shall be buried at a depth of not less than 30 IN below grade.
- C. Provide conduits or ducts terminating below grade with means to prevent entry of dirt or moisture.
- D. Underground conduits shall slope 1/8" per foot for proper drainage. Conduits shall drain toward manholes and junction boxes, not the electrical equipment.
- E. Underground conduits under paved or driving areas shall be Schedule 80 PVC.

- F. Branch circuit conduits under buildings slab shall be a minimum below floor slab gravel sub-base.
- G. Feeder conduits under building slab shall be 30" below floor slab.
- H. Conduit shall be laid in a 6" sand bed and covered with another 6" of sand before backfilling with earth.
- I. Provide Brady Identoline detectable warning tape or equal 12" above all buried conduits and cables.
- J. Restore existing surface back to its original condition.

3.03 CONDUIT INSTALLATION

- A. Install all conduits concealed within finished areas of building.
- B. Exposed overhead conduits may be used in Switchgear Room, Mechanical Equipment Rooms, Electric Closets, and unfinished Storage and Equipment Rooms.
- C. Run exposed conduit in straight lines at right angles to or parallel with walls, beams or columns.
- D. Keep conduit away from waterlines or heating duct lines. Where crossings are unavoidable, leave minimum 6 IN clearances.
- E. Install no conduit in floor slabs, only under floor slab.
 - 1. Do not install conduit under pads for fans, pumps, boilers, or other machinery.
- F. Where corrosion protection is necessary and conduit is threaded in field, the threads shall be coated with an approved electrically conductive corrosion-resistant compound.
- G. Conduits installed within 1-1/2" under metal-corrugated sheet roof decking shall be rigid metal or intermediate metal conduit.
- H. Installation of the PVC Coated Metal Conduit System shall be performed in accordance with the Manufacturer's Installation Manual. To assure correct installation, the installer shall be certified by Manufacturer to install coated conduit.
- I. Conduits in corrosive areas such as pool equipment, pool areas, and damp areas shall be PVC.
- J. Maintain 12 inch clearance between conduit and surfaces with temperatures exceeding 104 degrees F.

3.04 CONDUIT INSTALLATION SCHEDULE

- A. Support all conduit systems from building structure or structure with approved hangers or supports.
 - 1. Do not support from piping, ducts or support systems for piping or ducts.
 - 2. Do not install to prevent ready removal of piping, ducts or ceiling tiles.
 - 3. Do not support from ceiling or ceiling support systems.
- B. Do not install more than the equivalent of three 90° bends (270 degrees total) in any conduit run.
 - 1. Where more bends are necessary, install junction box or pullbox.
 - 2. Make all bends in 1/2 IN and 3/4 IN conduit (1 IN EMT) with a conduit bender.
 - 3. Use machine bends for larger sizes.
 - 4. See Section 27 05 28 Communication Conduit System for communication conduit requirements.
- C. Make joints in threaded conduit watertight with white nonlead compound applied to male threads only.
 - 1. Cut square, ream smooth, and properly thread field joints to receive couplings.
 - 2. Do not use running threads.

- D. Fit all conduit ends at switch and outlet boxes with approved tight bond with box when screwed tightly in place.
- E. Remove moisture and debris from conduit before wire is drawn into place. Tightly plug ends of conduit with tapered wood plugs inserts until wire is pulled.
- F. Neatly seal openings around conduits, etc., where they pass through fire rated construction or exterior walls or roof.

3.05 CONNECTIONS AND FITTINGS

- A. Above lay-in tile ceilings, make connections to lay-in type fixtures with 3/8 or 1/2 IN x 6 FT long flexible steel conduit.
 - 1. Include no. 14 branch and grounding conductors or as indicated in NEC 210.19(A) Exception No. 1.
 - 2. Arrange conduit and box systems for easy removal of lay-in ceiling.
- B. Connect switch legs for narrow switches in hollow metal jamb posts using 1/2 IN flexible steel conduit.
- C. Make motor and equipment connections with flexible steel conduit not exceeding 24 IN length.
 - 1. Use PVC coated type with liquid tight connectors in damp locations.
 - 2. Damp locations include: dishwashing, mechanical equipment pumps on or below grade and exterior applications.
- D. Install electrical fittings in accordance with the manufacturer's written instructions and with recognized industry practices to ensure that fittings serve intended purposes.
- E. Rigidly secure connectors at cabinets and boxes with galvanized lock nut and bushing.
- F. Seal conduits that run through different temperature or atmospheric conditions to prevent condensations or moisture from entering electrical equipment and devices.
- G. Install wall entrance seal where conduits or direct burial conductors pass through foundation walls below grade.
- H. Install conduit expansion fittings complete with bonding jumper in following locations:
 - 1. Conduit runs which cross a structural expansion joint.
 - 2. Conduit runs where movement perpendicular to axis of conduit may be encountered.
- I. Locate conduit bodies so as to assure accessibility of electrical wiring.
- J. Install fittings designed for use with flexible liquid-tight conduit to ensure continuity of ground throughout the fittings and conduit and prevent entrance of moisture.
- K. Above ground PVC conduit shall have expansion fittings on straight runs, between, where allowed by Engineer, securely mounted items such as but not limited to junction boxes, cabinets, elbows or other conduit terminations, or as required by the current NEC 352.44 maximum spacing 25'-0". Install per manufacturer's recommendations for the current temperature at the time of installation.

3.06 SUPPORTS, SLEEVES AND SEALS

- A. Conduit Hangers - General: Threaded rods, with straps or clamp conduit holder. For corrosive areas use stainless steel 316 threaded rods, nuts and anchors.
 - 1. Do not use perforated strap hangers or wire.
 - 2. Use trapeze assemblies for multiple conduits.
 - a. Trapeze assembly to consist of threaded rod hangers, Unistrut P1000 strut and Caddy SCH conduit clips.
 - 3. Provide sufficient hangers for support of electrical work and equipment to limit load on single hanger to 25 LB, max.; space not over 8 FT on center.

4. Hangers in metal roof deck: Do not extend above tops of ribs, or otherwise interfere with vapor barrier, insulation or roofing.
 5. For PVC conduit provide non-metallic straps, chemical and corrosion resistant, UV inhibited, spaced per N.E.C. section 352.30. 316 stainless steel bolts and anchors shall be used.
- B. Hangers for joint between precast units: Fehr Bros., T-Hanger; Heckman Building Prod., No. 480; and Dayton Sure-Grip, F-68.
1. Space minimum 4 IN from walls and minimum 2 IN apart.
- C. Hanger fasteners: Provide inserts or fasteners to attach hangers to structure.
1. Do not use drilled or explosive driven inserts in precast-prestressed concrete construction.
 2. Drilled or explosive driven inserts may not extend more than 1 IN into post-tensioned concrete construction.
 3. Attachment to metal roof deck may be by means of prepunched tabs, prepunched holes, or with screws in sides of ribs or toggle bolts in bottom of ribs.
 4. Do not use concrete nails in masonry walls.
- D. Support for conduit in GWB walls:
1. Vertical support:
 - a. If conduit is to be fastened to wall stud, provide conduit support clip mounted to stud.
 - b. If conduit is to be supported between studs provide bar hanger and bar hanger conduit clips.
 2. Horizontal support:
 - a. Provide conduit clips to secure conduit to studs when passing through studs horizontally.
 - b. Space clips as indicated for support.
 3. Do not use wire as means of anchor or support.
- E. Sleeves: Rigid steel conduit in plenum areas, and PVC in non-plenum and corrosive areas, sized to accommodate work passing through.
- F. Sealer for sleeves and openings around conduit: UL listed for assembly. See Division 07. Install per manufacturer's recommendations.
- G. All penetrations of floor slab at mechanical rooms above grade shall be sealed off and waterproofed.

3.07 FIRE STOPS AND PENETRATION SEALS

- A. All penetrations through fire rated floors and walls due to the electrical installation shall be sealed with CHASE-FOAM PR-855 Fire Resistant foam Sealant, to prevent the spread of smoke, fire, toxic gas or water through the penetration either: before, during, or after a fire. The fire rating of the penetration seal shall be at least that of the floor or wall into which it is installed, so that the original fire rating of the floor or wall is maintained as required by Article 300-21 of the National Electrical Code. Equivalent foam sealant manufactured by Dow Corning approved.
- B. The sealant shall remain soft and pliable to allow for the removal and/or addition of cables without the necessity of drilling holes. It shall adhere to itself perfectly to allow any and all repairs to be made with the same material. It shall permit the vibration, expansion and/or contraction of anything going through the penetration without the seal cracking or crumbling.
- C. When damming materials are to be left in place after the seal is complete then all such materials shall be nonflammable.
- D. When sealant is injected into a penetration, the foam shall expand to surround all the items within the penetration and maintain pressure against the walls of the penetration. The foam shall cure within five minutes and be fire resistant at that time. No heat shall be required to further expand the foam to block the passage of fire and smoke or water.

- E. All wall or floor penetration openings shall be as small as possible.
- F. The foam sealant shall meet all fire test and hose stream test requirements of ASTM E119-73 and shall be UL Classified as a Wall Opening Protective Device.

3.08 CUTTING AND PATCHING

- A. Provisions for openings, holes, and clearances through walls, floors, ceiling, and partitions shall be made in advance of construction.
- B. Provide cutting, patching and painting necessary for the installation of electrical systems.
- C. Install 22 ga. galvanized iron steel pipe sleeves, 1 IN larger in diameter than the conduit to be routed through concrete or masonry construction. Sleeves shall extend 2" above and below the floor slab penetrated.

3.09 COORDINATION OF BOX LOCATIONS

- A. Provide electrical boxes as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections, and code compliance.
- B. Electrical box locations shown on Contract Drawings are approximate unless dimensioned. Verify location of floor boxes and outlets in offices and work areas prior to rough-in.
- C. No outlet shall be located where it will be obstructed by other equipment, piping, lockers, benches, counters, etc.
- D. 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.
- E. 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.
- F. 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.
- G. Locate and install boxes to allow access to them. Where installation is inaccessible, coordinate locations and provide 18 inch (450 mm) by 24 inch (600 mm) access doors.
- H. Locate and install to maintain headroom and to present a neat appearance.
- I. Install boxes to preserve fire resistance rating of partitions and other elements, using approved materials and methods.
- J. Boxes installed in corrosive areas shall be PVC type to match conduit. Corrosive areas are pool areas, pool equipment areas, chemical areas and/or as indicated on drawings.

3.10 OUTLET BOX INSTALLATION

- A. Do not install boxes back-to-back in walls. Provide minimum 6 inch separation, except provide minimum 24 inch separation in acoustic-rated walls.
- B. Recessed outlet boxes in masonry, drywall, concrete, or tile construction shall be masonry type; minimum 4 inch square with 4 inch square-cut device covers. Locate boxes in masonry unit corner only. Coordinate masonry cutting to achieve neat openings for boxes.
- C. Provide knockout closures for unused openings.
- D. Support boxes independently of conduit.

- E. Use multiple-gang boxes where more than one device are mounted together; do not use sectional boxes. Provide barriers to separate wiring of different voltage systems.
- F. Install boxes in wall without damaging wall insulation.
- G. Coordinate mounting heights and locations of outlets mounted above counters, benches, and backsplashes.
- H. Ceiling outlets shall be 4 inch octagon, minimum 2-1/8 inch deep except that concrete boxes and plates will be approved where applicable. Position outlets to locate luminaires as shown on reflected ceiling plans. All ceiling outlets shall be equipped with 3.8 inch fixture studs.
- I. In inaccessible ceiling areas, position outlets and junction boxes within 6 inches of recessed luminaire, to be accessible through luminaire ceiling opening.
- J. Provide recessed outlet boxes in finished areas; secure boxes to interior wall and partition studs, accurately positioning to allow for surface finish thickness. Use stamped steel stud bridges for flush outlets in hollow stud wall, and adjustable steel channel fasteners for flush ceiling outlet boxes.
- K. Align wall-mounted outlet boxes for switches, thermostats, and similar devices.
- L. Provide cast outlet boxes in exterior locations exposed to the weather and wet locations.
- M. Surface wall outlets shall be 4 inch square with raised covers for one and two gang requirements. For three gang or larger requirements, use gang boxes with non-overlapping covers.
- N. All boxes on a common wall with common mounting heights shall be mounted so faceplates are level and square to each other. Adjustments required after installation shall be made without additional compensation.
- O. Boxes that are shown on hollow-core, precast concrete shall be flush mounted into the spancrete unless shown otherwise on drawings. Coordinate opening to be in hollow core. Provide opening.

3.11 PULL AND JUNCTION BOX INSTALLATION

- A. Locate pull boxes and junction boxes above accessible ceilings or in unfinished areas.
- B. Support pull and junction boxes independent of conduit.

3.12 PULL AND JUNCTION BOX INSTALLATION REQUIREMENTS

- A. Provide junction boxes as shown on drawings and otherwise where required, sized according to number of conductors in box or type of service to be provided. Minimum junction box size 4" square and 2-1/8" deep. Provide screw covers for junction boxes.
- B. Use minimum 16 gauge steel for pull boxes and provide with screw cover.
- C. Install boxes in conduit runs wherever necessary to avoid excessive runs or bends. Do not exceed 100' runs without pull boxes.
- D. Rigidly secure boxes to walls or ceilings. Conduit runs will not be considered as adequate support.
- E. Install boxes with covers in accessible locations. Size boxes in accordance with Article 314 of the latest edition of the National Electric Code.
- F. Do not install pull or junction boxes for joint use of line voltage and signal or low voltage controls unless all conductors are insulated for the highest voltage being used in the same box.
- G. Install all components as indicated.
- H. Tag ends of conduit with system identification letters.

- I. Test conduit for clear passage.
- J. Neatly mark inside of outlet boxes with system identification letters using black felt-ink marker.

3.13 RACEWAY COLOR

- A. Conduit and junction boxes/pull box covers shall be colored as indicated below.
 - 1. In existing facilities, existing color scheme shall be used. Verify existing color scheme and submit for Owner approval.

END OF SECTION

SECTION 26 05 29
SUPPORTING DEVICES

PART 1 - GENERAL

1.01 DESCRIPTION

- A. General:
 - 1. Furnish all labor materials, tools, equipment and services for all conduit and equipment supports, straps, clamps, steel channel, etc., and fastening hardware for supporting.
 - 2. Completely coordinate with work of all other trades.
 - 3. Although such work is not specifically indicated, furnish and install all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation.
 - 4. See Section 26 00 01 for General Electrical Requirements.
 - 5. See Division 01 for General Requirements.
 - 6. Exterior work shall utilize stainless steel (304 or 316) supports, channel, hardware, threaded rod clamps, straps, etc.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. CADDY
- B. B-Line
- C. Steel City

2.02 MATERIAL

- A. Support Channel: Galvanized
- B. Hardware: Corrosion resistant

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Fasten hanger rods, conduit clamps, and outlet and junction boxes to building structure using precast insert system, expansion anchors, preset inserts, beam clamps, spring steel clips. Do not use spring steel clips and clamps. Do not hang any device directly from a metal deck.
- B. File and debur cut ends of support channel and spray paint with cold galvanized paint to prevent rusting.
- C. Use toggle bolts or hollow wall fasteners in hollow masonry, plaster, or gypsum board partitions and walls; expansion anchors or preset inserts in solid masonry walls; self-drilling anchors or expansion anchor on concrete surfaces; sheet metal screws in sheet metal studs; and wood screws in wood construction.
- D. Do not fasten supports to piping, ductwork, mechanical equipment, cable tray or conduit.
- E. Do not use powder-actuated or plastic anchors.
- F. Do not drill structural steel members unless approved by Architect/Engineer.

- G. Fabricate supports from galvanized structural steel or steel channel, rigidly welded or bolted to present a neat appearance. Use hexagon head bolts with spring lock washers under all nuts.
- H. Install surface-mounted cabinets and panelboards with minimum of four anchors. Provide steel channel supports to stand cabinet one inch off wall.
- I. Bridge studs top and bottom with channels to support flush-mounted cabinets and panelboards in stud walls.
- J. Furnish and install all supports as required to fasten all electrical components required for the project, including free standing supports required for those items remotely mounted from the building structure, catwalks, walkways, etc.
- K. Minimum sized threaded rod for supports shall be 3/8".
- L. Conduit clamps, straps, supports, etc., shall be steel or malleable iron. All straps shall have steel or malleable backing plates.
- M. Conform to Specification Section 05 05 30, "Post-Installed Anchors in Concrete and Masonry (CMU)" for connections of hangers and supports to the structure.

END OF SECTION

SECTION 26 05 26
GROUNDING AND BONDING

PART 1 - GENERAL

1.01 DESCRIPTION

- A. General:
 - 1. Furnish all labor, materials, tools, equipment, and services for grounding as indicated in accord with provisions of Contract Documents.
 - 2. Completely coordinate with work of all other trades.
 - 3. Although such work is not specifically indicated, furnish and install all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation.
 - 4. See Section 26 00 01 for General Electrical Requirements.
 - 5. See Division 01 for General Requirements.

1.02 WORK INCLUDED

- A. Grounding electrodes and conductors.
- B. Equipment grounding conductors.
- C. Bonding

1.03 RELATED SECTIONS

- A. Section 03 20 00 - Concrete Reinforcement
- B. Section 03 30 00 - Cast-In-Place Concrete

1.04 REFERENCES

- A. ANSI/NFPA 70 - National Electrical Code.
- B. IEEE/ANSI 142-1982 - Recommended Practice for Grounding of Industrial and Commercial Power System.

1.05 GROUNDING ELECTRODE SYSTEM

- A. Rod Electrode

1.06 PERFORMANCE REQUIREMENTS

- A. Grounding System Resistance: 2 ohms.

1.07 SUBMITTALS

- A. Submit under provisions of Section 26 00 01.
- B. Product Data: Provide data for grounding electrodes and connections.
- C. Test Reports: Indicate overall resistance to ground and resistance of each electrode.
- D. Manufacturer's Instructions: Include instructions for storage, handling, protection, examination, preparation and installation of exothermic connectors.

1.08 PROJECT RECORD DOCUMENTS

- A. Submit under provisions of General conditions.
- B. Accurately record actual locations of grounding electrodes.

1.09 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

1.10 REGULATORY REQUIREMENTS

- A. Conform to requirements of ANSI/NFPA 70.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

PART 2 - PRODUCTS

2.01 ROD ELECTRODE

- A. Acceptable Manufacturers
 - 1. Burndy
 - 2. Blackburn
 - 3. Or Equal
 - 4. Substitutions: Under provisions of General Conditions and Section 26 00 01.
- B. Material: Copper clad steel.
- C. Diameter: 3/4 inch minimum.
- D. Length: 10 feet minimum rods. Rod shall be driven at least 9'-6" deep.
- E. Provide the number of rods required to obtain proper ground resistance. This applies to manholes, padmount switches, transformers, service entrances, etc.

2.02 MECHANICAL CONNECTORS

- A. Acceptable Manufacturers
 - 1. Burndy Co., Hy-Ground Series
 - 2. Or Equal
 - 3. Substitutions: Under provisions of General Conditions and Section 26 00 01.
- B. Type: Compression type applied with compression tool.
- C. Material: Bronze

2.03 EXOTHERMIC CONNECTIONS

- A. Manufacturers:
 - 1. Cadweld
 - 2. Or Equal
 - 3. Substitutions: Under provisions of General Conditions Section 26 00 01.

2.04 WIRE

- A. Material: Stranded copper (aluminum not permitted).

- B. Grounding Electrode Conductor: Size as shown on drawings, specifications or as required by NFPA 70, whichever is larger.
- C. Foundation Electrodes: Bare copper #4 wire in the new footing. Center wire in footing and attach to steel reinforcement.
- D. Feeder and Branch Circuit Equipment Ground: Same size as phase conductors or as indicated on plan.

2.05 BUS

- A. Material: copper (aluminum not permitted).
- B. Size: 1/4" x 2" minimum.

2.06 INTERSYSTEM BONDING TERMINATION

- A. Provide an Intersystem Bonding Termination Bar exterior of main service enclosure with a minimum set of six spare termination points. See NEC "250.94 Bonding of Other Systems" for more information.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that final backfill and compaction has been completed before driving rod electrodes.

3.02 GENERAL

- A. Install Products in accordance with manufacturer's instructions.
- B. Mechanical connections shall be accessible for inspection and checking. No insulation shall be installed over mechanical ground connections.
- C. Ground connection surfaces shall be cleaned and all connections shall be made so that it is impossible to move them.
- D. Attach grounds permanently before permanent building service is energized.
- E. Install rod electrodes at locations indicated or as required by Code, whichever requires the most rods. Install additional rod electrodes as required to achieve specified resistance to ground.
- F. Install #4 AWG bare copper wire, steel reinforcing bar or rod not less than 1/2 inch diameter in foundation footing. Electrode shall be a minimum of 20 feet in footing. Coordinate the concrete encased electrode requirements per NEC 250.52.3 with Structural Engineer.
- G. All connections that are not accessible after installation shall be exothermic connections. This includes but is not limited to within concrete or underground installations.

3.03 LESS THAN 600 VOLT SYSTEM GROUNDING

- A. Supplementary Grounding Electrode: Use driven ground rod in main service equipment area.
- B. Provide code sized copper grounding electrode conductor from main switchboard ground bus, to street side of water meter, building steel, ground rod, and any concrete encased electrodes. Provide bonding jumper around water meter. Install conductor in separate rigid conduit. Bond conduit as described above.

- C. Receptacle Grounding: All receptacle circuits and permanently wired equipment, except light fixtures, shall have a separate grounding conductor. Receptacles shall be connected to the ground conductor utilizing pigtails. At time of final inspection, any one device found improperly grounded shall mean a complete check by the Contractor of every device on the project at no additional cost to the Owner.
- D. Provide separate ground wire for light fixtures, motors and other equipment items from equipment items to nearest conduit system box. Provide green wire ground continuously from panel to all surface raceway systems and where indicated on plans.
- E. Provide grounding conductor in all non-metallic and flexible raceways. Terminate each end on a grounding lug, bus or bushing.
- F. Bond together system neutrals, service equipment enclosures, exposed non-current carrying metal parts of electrical equipment, metal raceway systems, grounding conductor in raceways and cables, receptacle ground connectors and plumbing systems.
- G. Equipment Grounding Conductor: Provide separate, insulated conductor within each feeder circuit raceway. Terminate each end on suitable lug, bus, or bushing. Where conductors are run in parallel in multiple raceways or cables, the equipment grounding conductors shall be run in parallel in each raceway or cable. Each parallel equipment grounding conductor shall be sized on the basis of the ampere rating of the overcurrent device protecting the circuit conductors in the raceway or cable.
- H. Equipment grounding shall comprise a permanent bonding together of all metallic, noncurrent - carrying parts of the Electrical System (raceways, boxes, panels, cabinets, equipment enclosures, housings, motor frames, lighting fixtures, etc.) to insure a continuous grounding circuit. Provide a grounding bushing on each conduit entering service entrance equipment, bonding same to equipment grounding stud/bar/bus.
- I. Equipment Grounding Conductor: Provide separate, insulated grounding conductor in all branch circuit and feeder raceways. Terminate each end on suitable lug, bus, or bushing.
- J. Transformers Downstream from Service Equipment: Ground the secondary neutral at the transformer. Provide a grounding electrode conductor from the transformer to the nearest component of the building's main grounding electrode system.

3.04 FIELD QUALITY CONTROL

- A. Inspect grounding and bonding system conductors and connections for tightness and proper installation.
- B. Measure ground resistance from system neutral connection at service entrance to convenient ground reference point using suitable ground testing equipment. Resistance shall not exceed 2 ohms.

END OF SECTION

SECTION 26 05 19

WIRE AND CABLE - 600 VOLT AND BELOW

PART 1 - GENERAL

1.01 DESCRIPTION

- A. General:
 - 1. Furnish all labor, materials, tools, equipment, and services for all wire and cable (600 V and below) as indicated, in accord with provisions of Contract Documents.
 - 2. Completely coordinate with work of all other trades.
 - 3. Although such work is not specifically indicated, furnish and install all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation.
 - 4. See Section 26 00 01 for General Electrical Requirements.
 - 5. See Division 01 for General Requirements.

1.02 WORK INCLUDED

- A. Building wire and cable.
- B. Control wire and cable.
- C. Underground wire and cable.
- D. Wiring connectors and connections.

1.03 RELATED SECTIONS

Section 26 05 33 - Raceways and Boxes
Section 26 05 53 - Electrical Identification

1.04 REFERENCES

- A. ANSI/NFPA 70 - National Electrical Code.

1.05 SHOP DRAWING SUBMITTALS

- A. Submit under provisions of General conditions and Section 26 00 01.
- B. Submit product data: Provide for each cable assembly type.
- C. Submit factory test reports: Indicate procedures and values obtained.
- D. Submit shop drawings for modular wiring system including layout of distribution devices, branch circuit conduit and cables, circuiting arrangement, and outlet devices.
- E. Submit manufacturer's installation instructions: Indicate application conditions and limitations of use stipulated by product testing agency specified under Regulatory Requirements.

1.06 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years documented experience.

1.07 REGULATORY REQUIREMENTS

- A. Conform to requirements of ANSI/NFPA 70.

- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

1.08 PROJECT CONDITIONS

- A. Verify that field measurements are as shown on Drawings.
- B. Conductor sizes are based on copper.
- C. Wire and cable routing shown on Drawings is approximate unless dimensioned. Route wire and cable as required to meet Project Conditions.
- D. Where wire and cable routing is not shown, and destination only is indicated, determine exact routing and lengths required.

1.09 COORDINATION

- A. Coordinate Work under provisions of General conditions and Section 26 00 01.
- B. Determine required separation between cable and other work.
- C. Determine cable routing to avoid interference with other work.

PART 2 - PRODUCTS

2.01 GENERAL

- A. All wire shall be new, delivered to the site in unbroken cartons and shall be less than one year old out of manufacturer's stock.
- B. All conductors shall be copper.
- C. Aluminum conductors for 100 amp feeders and larger may be substituted for copper if accepted by authority having jurisdiction, A/E and Owner. Provide a written acceptance letter from Owner along with shop drawing submittal. The following requirements shall be met when aluminum conductors are used:
 - 1. Aluminum alloy conductors shall be compact stranded conductors of a recognized Aluminum Association 8000 Series aluminum alloy conductor material (AA-8000 Series alloy)
 - 2. 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.
 - 3. 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.
 - 4. 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.
 - 5. All aluminum conductors shall terminate on a compression lug or compression adapter. An oxide-inhibiting joint compound must be applied on the aluminum conductor during termination. The compression connectors shall be installed according to manufacturers' instructions with the compression tool recommended by the manufacturer of the connector.
 - 6. The contractor shall perform an infrared survey of all aluminum conductor connections after the installation is complete and in normal service. Infrared surveys shall be performed during periods of maximum possible loading with at least 30% of rated load of the equipment being inspected. All connections with elevated temperatures shall be corrected by the contractor.
 - 7. No copper-to-aluminum transitions permitted when splicing onto existing copper feeders.
- D. Insulation shall have a 600 volt rating.

- E. In mechanical rooms, light fixtures, and other high temperature applications, the insulation shall be rated 90°C. Other areas shall use insulation rated 75°C unless stated.
- F. All conductors must be suitable for the application intended. Conductors #10 and larger must be stranded. Conductors #12 and smaller may be solid or stranded with the following requirements or exceptions.
- G. All conductors terminated with crimp type devices must be stranded.
- H. Stranded conductors may only be terminated with UL or ETL Listed type terminations or methods: e.g. stranded conductors may not be wrapped around a terminal screw but must be terminated with a crimp type device if a terminal screw is used or must be terminated in an approved back wired method.

2.02 BUILDING WIRE

- A. Description: Single conductor insulated wire.
- B. Insulation: Type THW, THHN/THWN, XHHW insulation for feeders and branch circuits.
- C. Use conductors not smaller than #12 AWG for power and lighting circuits.

2.03 WIRING CONNECTORS

- A. Split Bolt Connectors: Not acceptable.
- B. Solderless Pressure Connectors: High copper alloy terminal. May be used only for cable termination to equipment pads. Not approved for splicing.
- C. Spring Wire Connectors: Solderless spring type pressure connector with insulating covers for copper wire splices and taps. Use for conductor sizes 10 AWG and smaller.
- D. Mechanical Connectors: Bolted type tin-plated; high conductivity copper alloy; spacer between conductors; belled cable entrances.
- E. Compression (crimp) Connectors: Long barrel; seamless, tin-plated electrolytic copper tubing; internally beveled barrel ends. Connector shall be clearly marked with the wire size and type and proper number and location of crimps.
- F. Cord Connectors: All cord connectors should be Kellums type using wire mesh cord restraint.
- G. Provide watertight Crouse-Hinds or equal cord grips in appropriate areas.

2.04 MC INTERLOCKED ARMORED FEEDER CABLE

- A. Where allowed in other parts of this specification, and approved by the authority having jurisdiction, in lieu of conduit MC cable may be used as directed here.
- B. 3 or 4 conductors, stranded, insulated with heat and moisture resistant cross-linked polyethylene (Type XHHW-2), phase identified, cabled together with suitable fillers and bare copper segregated ground conductor. (2 grounded/4 conductors). Cablecore covered with binder tape, aluminum or galvanized steel interlocked armor.
- C. Suitable for use in NEC Hazardous locations: Class 1, Div. 2 - Class II, Div.2.
- D. Standards:
 - 1. UL 1569
 - 2. Flame Rated: IEEE-383 (70,000 BTU)
 - 3. ICEA T-29-520 (210,000 BTU)

4. IEEE 120/CSA FT-4
 5. Sunlight Resistant for CT Use; Direct Burial
 6. Oil Resistant II Jacket
 7. Color Code K-2/other color codes available
 8. Temperature rating at 90°C Wet/Dry
 9. Per ICEA S-66-524/NEMA WC-7
 10. NEC Article 330
- E. Armored feeder cable may be used for panel feeder circuits only. When armored cable is used in a parallel feeder circuits, then ground conductors in each of the runs of the parallel feeder shall be sized for the circuit breaker serving the feeder circuits as indicated in the NEC Table 250-122.
- F. Provide armored cable suitable for use. Use PVC jacketed armored in corrosive areas, wet locations and direct burial applications. All other areas may be non-PVC jacketed. Cable installed in grade under concrete or pavement shall be in Schedule 40 PVC.

2.05 MC INTERLOCKED ARMORED BRANCH CIRCUIT CABLE

- A. Where allowed in other parts of this specification, and approved by the authority having jurisdiction, in lieu of conduit, MC cable may be used as directed here for the following:
1. Lighting branch circuits
 2. Receptacle branch circuits
 3. Cable tray where identified for such use
- B. Lightweight steel interlocked armor, 600 volt copper conductors, THHN/THWN insulated 2, 3 or 4 conductor solid sizes #12 or #10 AWG. Green insulated grounding conductor sizes #12 or #10 AWG.
- C. MC branch circuit cable for dry interior use only concealed within walls or accessible ceilings.
- D. MC branch circuit cable shall not originate from panelboards. MC branch circuit cable shall originate from a local junction box in the area that devices are served.
- E. Where switches control lighting loads, the grounded circuit conductor for the controlled lighting circuit shall be provided at the switch location.
- F. Standards:
1. UL 1596 Standard for Metal-Clad Cables
 2. UL Standard 83
 3. UL Standard 1063
 4. UL Standard, UL Standard 1569 for Type MC.
 5. UL Classified 1, 2, and 3 hour through-penetration firestop systems.
 6. N.E.C. Article 330 Metal-Clad Cable: Type MC.
- G. In Patient Care areas, hospital grade MC cable shall be used.

2.06 G-PORTABLE POWER CABLE

- A. 4-conductor with fully rated insulated ground wire, 600/2000 volt rating.
- B. 90°C ethylene propylene rubber (EPR) insulation and reinforced two-layer extra heavy duty lead-cured chlorinated polyethylene (CPE) jacket.
- C. Sun, oil, and chemical resistant.
- D. Temperature range of -40°C to 90°C.
- E. Suitable for continuous submersion in water.
- F. Compliance with ICEA S75-381 portable and power fed cables, and MSHA listed.

PART 3 - EXECUTION

3.01 GENERAL WIRING METHODS

- A. All wire and cable shall be installed in conduit unless indicated otherwise. However, low voltage control or signal cables may be installed without conduit above accessible ceilings if the cable meets NEC requirements for the application. Fire alarm cabling shall be installed in conduit.
- B. Except where fixture whips are configured in accordance with NEC 210.19(4), Exception No. 1, 330.30(D)(2), do not use wire smaller than 12 AWG for power and lighting circuits, 14 AWG for control wiring greater than 60 volts, or 18 AWG for voltages less than 60 volts, all sizes subject to NEC 725 requirements.
- C. All conductors shall be sized to prevent excessive voltage drop at rated circuit ampacity. As a minimum use 10 AWG conductor for 20 ampere, 120 volt branch circuit home runs longer than 100 feet, for emergency lighting and exit sign wiring, and for 20 ampere, 277 volt branch circuit home runs longer than 200 feet. Wire and cable size shall be increased from size indicated unless indicated otherwise or required by code to meet the following voltage drop requirements:
 - 1. 3% drop for branch circuits.
 - 2. 5% drop for motor circuits.
- D. Make conductor lengths for parallel conductors equal.
- E. Splice only in junction or outlet boxes.

3.02 WIRING INSTALLATION IN RACEWAYS

- A. Pull all conductors into a raceway at the same time. Use Listed wire pulling lubricant for pulling 4 AWG and larger wires and for other conditions when necessary.
- B. Install wire in raceway after interior of building has been physically protected from the weather and all mechanical work likely to injure conductors has been completed.
- C. Completely and thoroughly swab raceway system before installing conductors.
- D. Place all conductors of a given circuit (this includes phase wires, neutral (if any), and ground conductor) in the same raceway. If parallel phase and/or neutral wires are used, then place an equal number of phase and neutral conductors in same raceway or cable.
- E. VFD Installations: Install VFD input wiring and output wiring in separate conduit system. Do not mix VFD input power and output power, or control wiring in a common raceway. Power wiring from VFD output to the motor shall be Type XHHW-2 insulation single conductor wire unless indicated otherwise.
- F. Aluminum conductors shall not be used for serving individual motors, chillers, VFD's and motor controllers.

3.03 CABLE INSTALLATION

- A. Provide protection for exposed cables where subject to damage.
- B. Neatly train and lace wiring inside boxes, equipment, and panelboards.
- C. Support exposed low voltage cables above accessible ceilings; do not rest on ceiling tiles. Use J hooks or cable tray to support cables from building structure. Tie wraps are not acceptable. DO NOT SUPPORT CABLES FROM OTHER EQUIPMENT. See Division 27 00 00 for more information.
- D. Use suitable cable fittings and connectors.

- E. G-cable shall be provided in continuous length. Splicing is not acceptable.

3.04 WIRING CONNECTIONS AND TERMINATIONS

- A. Splice only in accessible junction boxes.
- B. Wire splices and taps shall be made firm, and adequate to carry the full current rating of the respective wire without soldering and without perceptible temperature rise.
- C. Use solderless spring type pressure connectors with insulating cover for wire splices and taps, 10 AWG and smaller.
- D. Use mechanical or compression connectors for wire splices and taps, 8 AWG and larger. Tape uninsulated conductors and connectors with electrical tape to 150 percent of the insulation value of conductor.
- E. Thoroughly clean wires before installing lugs and connectors.
- F. At all splices and terminations, leave tails long enough to cut splice out and completely resplice.

3.05 FIELD QUALITY CONTROL

- A. Feeders and branch circuits shall have their insulation tested after installation and before connection to utilization devices such as fixtures, motors, or appliances.
- B. Test shall be performed by meggar and conductors shall test free from short-circuits and grounds.
- C. Test conductors phase-to-phase and phase-to-ground.
- D. The contractor shall furnish the instruments, materials, and labor for these tests.

3.06 WIRE AND CABLE INSTALLATION SCHEDULE

- A. Interior Locations: Building and control wire in raceways.
- B. Above Accessible Ceiling: Building and control wire in raceways.
- C. Exterior Locations: Building and control wire in raceways.
- D. High Temperature Areas (light fixtures and mechanical rooms): Building wire rated 90°C in raceways.

3.07 WIRE COLOR

- A. General:
 - 1. For wire sizes 10 AWG and smaller - Wire shall be colored as indicated below.
 - 2. For wire sizes 8 AWG and larger - Identify wire with colored tape at all terminals, splices and boxes. Colors to be as indicated below.
 - 3. In existing facilities, use existing color scheme.
 - 4. In new facilities, use black and red for single phase circuits at 120/240 volts, use black, red and blue for circuits at 120/208 volts single or three phase, and use orange, brown and yellow for circuits at 277/480 volts single or three phase. Note: This includes fixture whips except for Listed whips mounted by the fixture manufacturer on the fixture and Listed as a System.
- B. Neutral Conductors: White. Where there are two or more neutrals in one conduit, each shall be individually identified with the proper circuit. See requirements of NEC 200-6, 200-7, 210-4, and 310-12.

- C. Branch Circuit Conductors: Three or four wire home runs shall have each phase uniquely color coded.
- D. Feeder Circuit Conductors: Each phase shall be uniquely color coded.
- E. Ground Conductors: Green for 6 AWG and smaller. For 4 AWG and larger, identify with green tape at both ends and all visible points including in all junction boxes. See requirements of NEC 210-5 and 310-12.

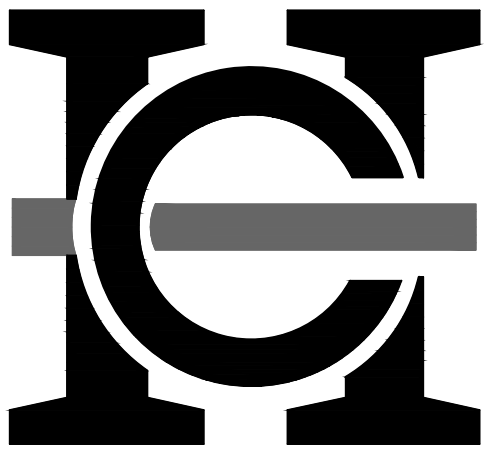
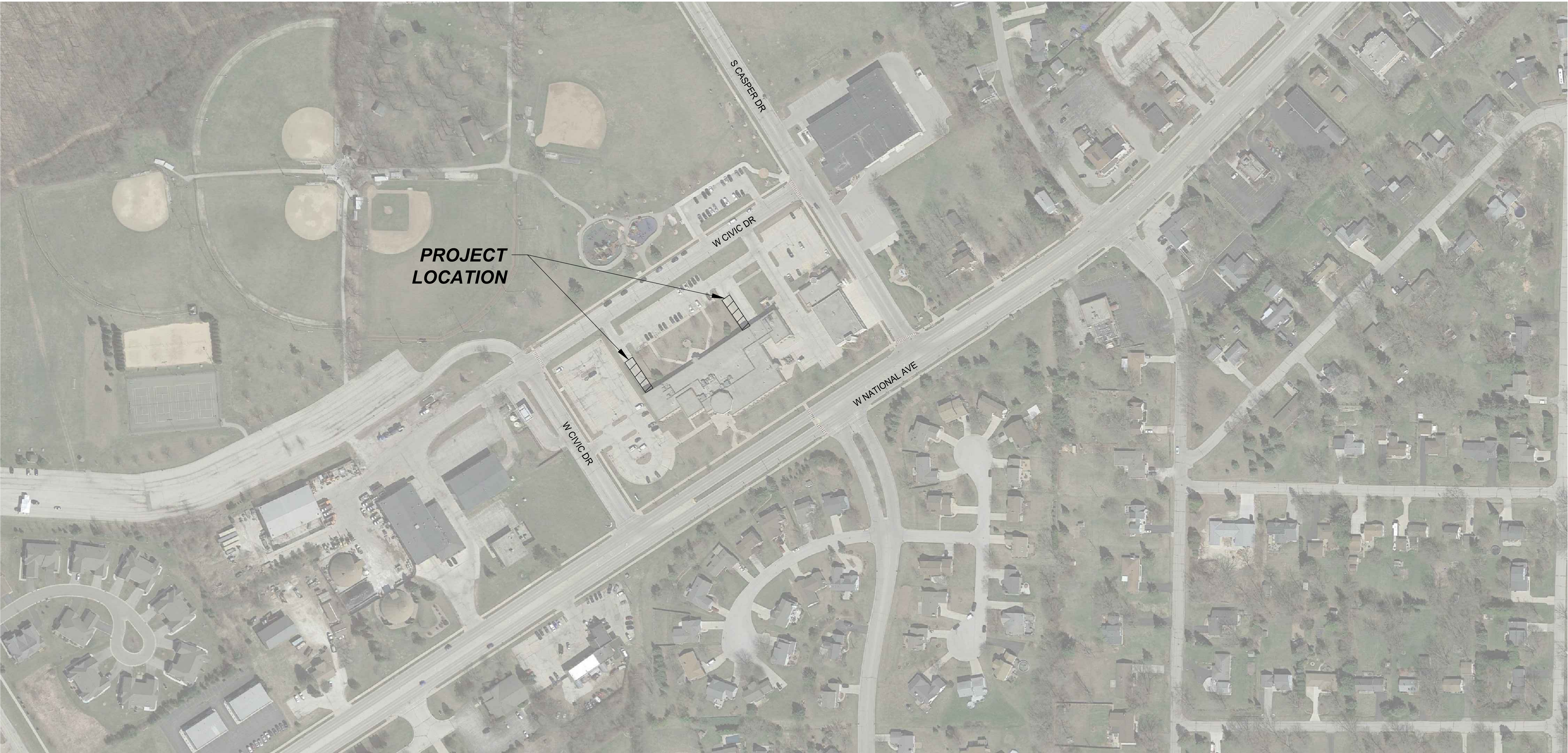
3.08 BRANCH CIRCUITS

- A. In general, the use of multiwire branch circuits having a common neutral feeding loads, producing a high level of harmonics, is discouraged due to the problems with overheating of the common neutral.
- B. Therefore, if multiwire branch circuits used for loads producing harmonics (such as fluorescent lighting, and computer receptacles) then the neutral shall be sized two times phase conductor overcurrent protection.
- C. Multi-wire branch circuits shall be provided with a means that will simultaneously disconnect all ungrounded conductors at a point where the branch circuit originates. Contractor shall provide multi-pole breakers or approved breaker ties as required.

3.09 EMERGENCY CIRCUITS

- A. All emergency system wiring shall be installed in raceways separate from each other in addition to the normal system.

END OF SECTION



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Revisions

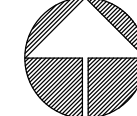
LEGEND:

UTILITY	GRADING	SITE	GENERAL NOTES AND SPECIFICATIONS	CIVIL SHEET INDEX:
EXISTING: — W — W — WATERMAIN — E — E — BURIED ELECTRIC — OHW — OHW — OVERHEAD WIRE — GAS — GAS — GAS LINE — SAN — SAN — SANITARY SEWER — ST — ST — STORM SEWER UTILITY POLE LIGHT POLE SANITARY MANHOLE FIRE HYDRANT WATER VALVE STORM SEWER STRUCTURE PROPOSED: — W — W — WATERMAIN — E — E — ELECTRICAL LINE — GAS — GAS — GAS LINE — SAN — SAN — SANITARY SEWER — ST — ST — STORM SEWER WATER VALVE STORM SEWER STRUCTURE FLARED END SECTION	EXISTING: MAJOR CONTOUR MINOR CONTOUR EXIST SPOT ELEVATION PROPOSED: MAJOR CONTOUR MINOR CONTOUR SPOT ELEVATION (FINISHED GRADE, TOP OF PAVEMENT, FLANGE OF CURB) DOOR ELEVATION GROUND GRADE AT BUILDING SPOT ELEVATION (T/C - TOP OF CURB, E/P - EDGE OF PAVEMENT) RETAINING WALL SPOT ELEVATION (T/W - TOP OF WALL, B/W - GROUND GRADE AT BOTTOM) FLARED END SECTION (PIPE SIZE, INVERT ELEVATION) DRAINAGE FLOW DIRECTION EMERGENCY OVERFLOW ROUTE	EXISTING: EXISTING PARKING COUNT EXISTING SIGN EXISTING ADA PARKING SPACE PROPOSED: PARKING COUNT ADA PARKING SPACE SIGN TRUNCATED DOMES PAVEMENT MARKING DIRECTIONAL ARROWS	GENERAL NOTES AND SPECIFICATIONS - THE EXISTING SITE INFORMATION ON THIS PLAN WAS TAKEN FROM A SITE SURVEY PROVIDED BY RA SMITH. THE ENGINEER MAKES NO WARRANTY OR REPRESENTATION WITH REFERENCE TO THE ACCURACY AND COMPLETENESS OF THE EXISTING CONDITIONS INDICATED OR NOT INDICATED ON THE ENGINEERING PLANS PROVIDED. THE CONTRACTOR SHALL VERIFY THE LOCATION OF ALL EXISTING SITE CONDITIONS INCLUDING UNDERGROUND UTILITIES, UNDERGROUND UTILITY ELEVATIONS, BUILDING SETBACKS AND EXISTING BUILDING LOCATIONS. THE CONTRACTOR SHALL INFORM THE OWNER AND ENGINEER OF ANY DISCREPANCIES PRIOR TO COMMENCING WITH WORK. QUESTIONS REGARDING THE EXISTING SURVEY SHALL BE DIRECTED TO THE PARTIES LISTED ABOVE. - BEFORE PROCEEDING WITH ANY UTILITY CONSTRUCTION, CONTRACTOR SHALL EXCAVATE EACH EXISTING LATERAL TO BE CONNECTED TO (VERIFYING ELEVATION, LOCATION AND SIZE). SHOULD THE EXISTING UTILITY NOT BE AS INDICATED ON THE PLAN, THE ENGINEER SHALL BE NOTIFIED IMMEDIATELY FOR EVALUATION. - WHEN PROPOSED UTILITIES CROSSING EXISTING UTILITIES, CONTRACTOR SHALL VERIFY THE EXACT LOCATION AND ELEVATION OF ALL EXISTING UTILITIES PRIOR TO STARTING CONSTRUCTION. IF A CONFLICT IS FOUND NOTIFY THE ENGINEER AND PROVIDE ENGINEER THE EXACT LOCATION AND ELEVATION (TOP AND BOTTOM) OF THE EXISTING UTILITIES. - ALL UTILITY CONSTRUCTION SHALL ADHERE TO THE STANDARD SPECIFICATIONS FOR SEWER AND WATER CONSTRUCTION IN WISCONSIN (2003), AS WELL AS, THE MUNICIPAL CONSTRUCTION STANDARDS AND THE DEPT. OF SAFETY AND PROFESSIONAL SERVICES SEC. 382-387. - ALL PERMITS MUST BE RECEIVED FROM THE MUNICIPALITY AND WDNR (IF REQUIRED) PRIOR TO THE START OF CONSTRUCTION. IT IS THE CONTRACTORS RESPONSIBILITY TO ENSURE ALL APPLICABLE PERMITS ARE RECEIVED PRIOR TO STARTING CONSTRUCTION. - NOTIFY THE PUBLIC WORKS INSPECTION DEPT. AT LEAST 48 HOURS BEFORE STARTING CONSTRUCTION. - BACKFILL REQUIREMENTS AND ROADWAY/SIDEWALK RESTORATION SHALL ADHERE TO LOCAL STANDARDS (GRANULAR BACKFILL UNDER OR WITHIN 5' OF CURBS, SIDEWALK, OR PAVEMENT. SPOIL MAY BE USED ELSEWHERE. SLURRY BACKFILL WILL BE REQUIRED IN PUBLIC ROADWAYS.) - ALL BUILDING UTILITIES SHALL BE VERIFIED WITH THE ARCHITECTURAL PLANS PRIOR TO CONSTRUCTION. - PROPOSED STORM SEWER SHALL BE PVC, ASTM D-3034, SDR 35 WITH RUBBER ELASTOMERIC JOINTS CONFORMING TO ASTM D-3212 (UNLESS OTHERWISE NOTED). - A MEANS TO LOCATE BURIED UNDERGROUND EXTERIOR NONMETALLIC UTILITIES MUST BE PROVIDED. PROVIDE TRACER WIRE OR OTHER METHODS IN ORDER TO BE LOCATED IN ACCORD WITH THE PROVISIONS SECTIONS 162.0715(2R) OF THE STATE STATUTES. - UTILITY TRENCHES SHALL BE MECHANICALLY COMPACTED IN ACCORDANCE WITH THE STANDARD SPECIFICATIONS FOR SEWER AND WATER CONSTRUCTION IN WISCONSIN. - ALL MANHOLES, CATCH BASINS, INLETS, VALVES BOXES, ETC WITHIN THE PROJECT AREA SHALL BE RESET AND ADJUSTED TO MATCH FINISH GRADE. - ALL EXCAVATED OR STRIPPED MATERIALS NOT BEING REPLACED IN UTILITY TRENCHES OR BEING USED FOR FILL SHALL BE REMOVED FROM THE SITE, UNLESS OTHERWISE DIRECTED BY THE OWNER. - SEE ARCHITECTURAL PLANS FOR EXACT BUILDING & FOUNDATION DETAILS AND ORIENTATION. - ALL ON-SITE CONCRETE CURB AND GUTTER TO BE 18" WIDE VERTICAL FACE, UNLESS OTHERWISE NOTED. REVERSE OR REGULAR STYLE CURB DENOTED ON PLANS. - ALL CURB ELEVATIONS ARE EDGE OF PAVEMENT UNLESS OTHERWISE NOTED. SEE CURB DETAIL FOR TOP OF CURB ELEVATIONS. - ALL CURB RADII ARE MEASURED TO THE FACE OF CURB UNLESS OTHERWISE NOTED. - CONTRACTOR SHALL MATCH PROPOSED CONCRETE CURB AND GUTTER, SIDEWALK AND PAVEMENT TO EXISTING IN ELEVATION AND ALIGNMENT. - REMOVAL OF CURB AND GUTTER, SIDEWALK AND PAVEMENT SHALL BE IN ACCORDANCE WITH THE STANDARD SPECIFICATIONS OF THE WISCONSIN D.O.T. - ALL CONCRETE FOR CURB AND GUTTER, ROADWAY AND SIDEWALKS MUST CONFORM TO THE STANDARD SPECIFICATIONS FOR READY MIXED CONCRETE. MINIMUM 28 DAY COMPRESSIVE STRENGTH TEST MUST EQUAL 4000 PSI. - CONTRACTOR IS RESPONSIBLE FOR PROTECTING ALL PROPERTY CORNERS. - CONTRACTOR IS RESPONSIBLE FOR REPAIRING ANY DAMAGE TO EXISTING UTILITIES OR SITE IMPROVEMENTS. CONTRACTOR SHALL DOCUMENT ALL EXISTING DAMAGE PRIOR TO START OF CONSTRUCTION AND NOTIFY CONSTRUCTION MANAGER OF ANY FINDINGS. - PROJECT SAFETY ON-SITE SHALL BE THE SOLE RESPONSIBILITY OF THE CONTRACTOR. - CONTRACTOR IS RESPONSIBLE FOR VERIFYING EXISTING SOIL CONDITIONS. CONSTRUCTION MANAGER MAY HAVE SOILS REPORT FOR MORE INFO. - CONTRACTOR IS RESPONSIBLE FOR PROVIDING THE OWNER WITH A SET OF AS-BUILT PLANS SHOWING ANY CHANGES DURING CONSTRUCTION.	C1.10 GENERAL NOTES AND SITE LOCATION C1.20 SITE AND GRADING PLAN C1.30 EXISTING SURVEY

Sheet

GENERAL
NOTES AND
SITE LOCATION

PLAN



NORTH SCALE: 1" = 100'

Project

NEW BERLIN SAFETY
BUILDING HVAC
SYSTEM UPDATES
AND SNOW MELT

Date

12-23-2022

Project No.

19-1011.18

Sheet No.

C1.10

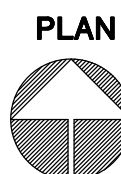


IN ACCORDANCE WITH WISCONSIN STATUTE 182.0175, DAMAGE TO TRANSMISSION FACILITIES, EXCAVATOR SHALL BE SOLELY RESPONSIBLE TO PROVIDE ADVANCE NOTICE TO THE DESIGNATED "ONE CALL SYSTEM" NOT LESS THAN THREE WORKING DAYS PRIOR TO COMMENCEMENT OF ANY EXCAVATION REQUIRED TO PERFORM WORK CONTAINED ON THESE DRAWINGS. AND FURTHER, EXCAVATOR SHALL COMPLY WITH ALL OTHER REQUIREMENTS OF THIS STATUTE RELATIVE TO EXCAVATOR'S WORK.

Revisions

Sheet

**EXISTING
SURVEY**



SCALE: 1" = 20'

Project

**NEW BERLIN SAFETY
BUILDING HVAC
SYSTEM UPDATES
AND SNOW MELT**

Date

12-23-2022

Project No.

19-1011.18

Sheet No.

C1.30

NOTE: SURVEY COMPLETED BY RA SMITH. THE ENGINEER MAKES NO WARRANTY OR REPRESENTATION WITH REFERENCE TO THE ACCURACY AND COMPLETENESS OF THE EXISTING CONDITIONS INDICATED OR NOT INDICATED ON THE ENGINEERING PLANS PROVIDED.

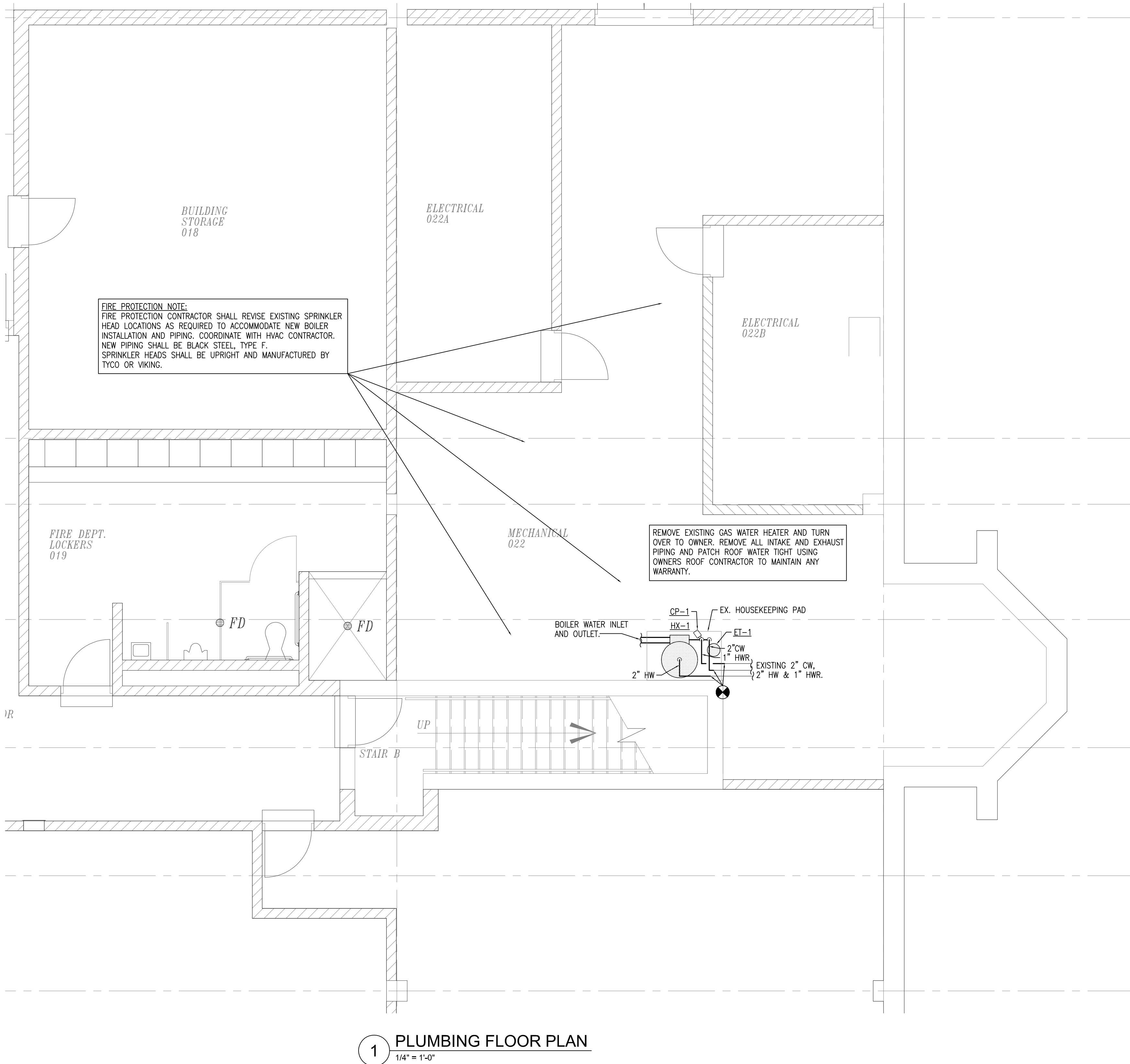
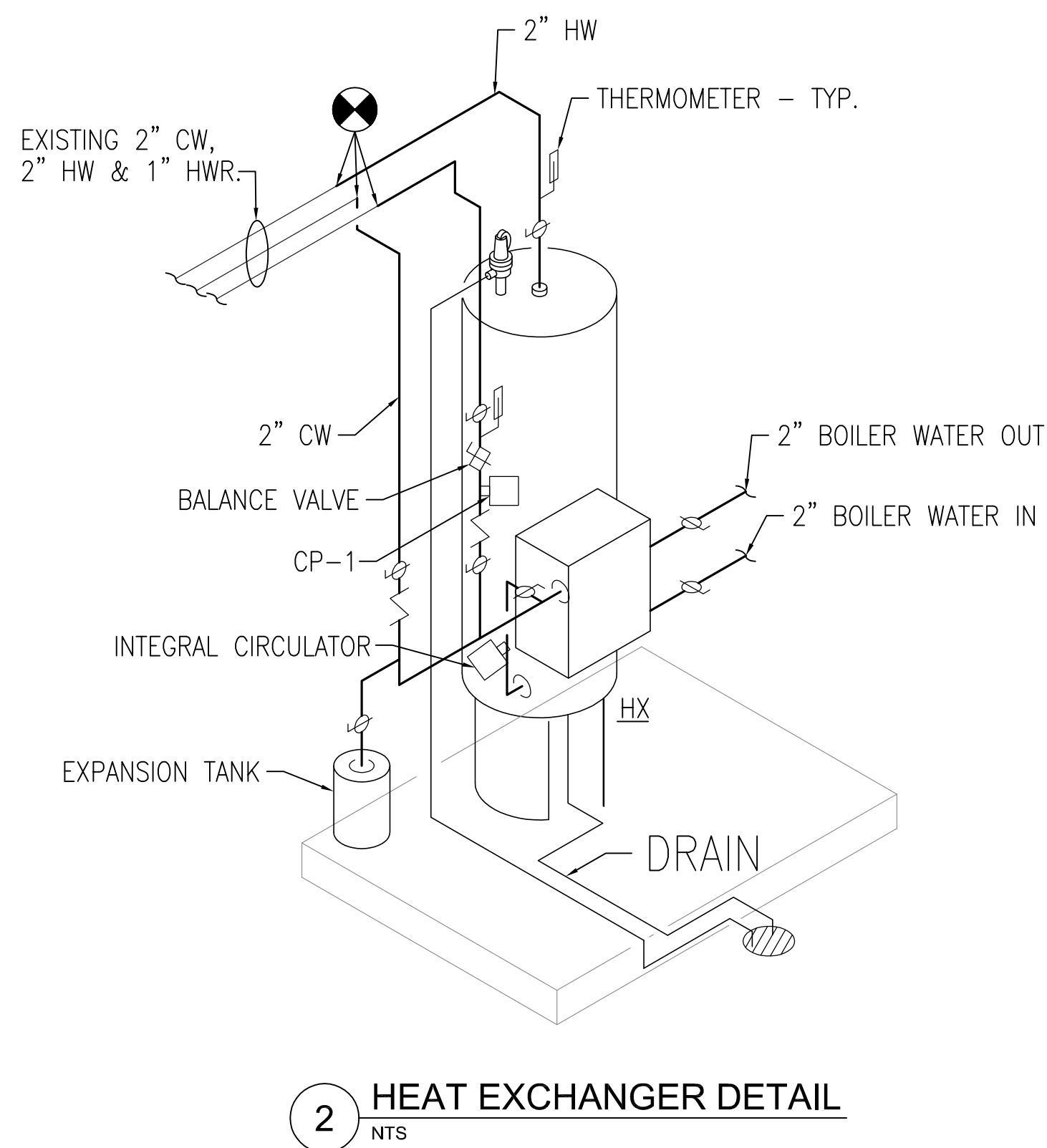


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- GENERAL PLUMBING NOTES:
- DRAWINGS OF ALL OTHER TRADES SHALL BE REVIEWED. THIS CONTRACTOR SHALL COORDINATE THE INSTALLATION AND SCHEDULING OF HIS WORK WITH OTHER TRADES TO PREVENT INTERFERENCE WITH THEIR RESPECTIVE INSTALLATIONS.
 - DEVIATIONS FROM 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.
 - 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.
 - 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.
 - COORDINATE REMOVAL OF EXISTING GAS WATER HEATER WITH OWNER TO PREVENT LONG WATER SHUT DOWN TIME.

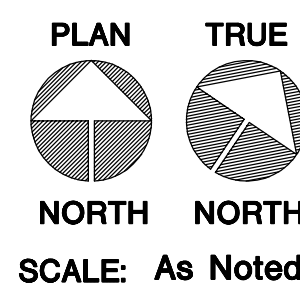
PLUMBING LEGEND		
SYMBOL	ABBR.	DESCRIPTION
	CW	COLD WATER PIPING
	HW	HOT WATER PIPING
	HWR	HOT WATER RETURN PIPING
	UP	PIPING UP
	DN	PIPING DOWN
	C.O.	CLEANOUT
		BALL VALVE
		CHECK VALVE
	FD	FLOOR DRAIN
	HD	HUB DRAIN OR SITE DRAIN
		POINT OF CONNECTION OF NEW PIPING TO EXISTING
		SHOCK ARRESTOR
	HX	HEAT EXCHANGER



Revisions

Sheet

PLUMBING FLOOR PLAN AND DETAILS



Project

NEW BERLIN SAFETY BUILDING HVAC SYSTEM UPDATES AND SNOW MELT

Date

DECEMBER 23, 2022

Project No.

19-1011.18

Sheet No.

PLUMBING SHEET INDEX:
P1.0 PLUMBING FLOOR PLAN AND DETAILS

P1.0



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GENERAL ABBREVIATIONS

A	ARCHITECT
A/E	ARCHITECT-ENGINEER
AFF	ABOVE FINISHED FLOOR
ALD	ACOUSTICALLY LINED DUCTWORK
ALT	ALTERNATE
AP	ACCESS PANEL
BAS	BUILDING AUTOMATON SYSTEM
BOD	BOTTOM OF DUCT
BTU	BRITISH THERMAL UNIT
BTUH	BRITISH THERMAL UNIT PER HOUR
CA	COMBUSTION AIR
CAV	CONSTANT AIR VOLUME
CFM	CUBIC FEET PER MINUTE
CL	CENTERLINE
CLG	CEILING
CM	CONSTRUCTION MANAGER
COND	CONDENSATE
DAT	DISCHARGE AIR TEMPERATURE
DB	DRY BULB
DDC	DIRECT DIGITAL CONTROL
DG	DOOR GRILLE
DR	DRAIN
DX	DIRECT EXPANSION
EA	EXHAUST AIR
EAT	ENTERING AIR TEMPERATURE
EC	ELECTRICAL CONTRACTOR
EL	ELEVATION
ESP	EXTERNAL STATIC PRESSURE
EWT	ENTERING WATER TEMPERATURE
FC	FAIL CLOSED
FD	FLOOR DRAIN
FLA	FULL LOAD AMPS
FO	FAIL OPEN
FPI	FEET PER INCH
FPM	FEET PER MINUTE
FT	FEET
GA	GAUGE
GC	GENERAL CONTRACTOR
GPM	GALLONS PER MINUTE
HD	HUB DRAIN
IE	INVERT ELEVATION
LAT	LEAVING AIR TEMPERATURE
LWT	LEAVING WATER TEMPERATURE
MBH	THOUSANDS OF BTU PER HOUR
MC	MECHANICAL CONTRACTOR
NA	NOT APPLICABLE
NC	NORMALLY CLOSED
NO	NORMALLY OPEN
NPT	NATIONAL PIPE THREAD
NTS	NOT TO SCALE
OA	OUTSIDE AIR
OC	ON CENTER
OED	OPEN END DUCT
OV	OUTLET VELOCITY
PC	PLUMBING CONTRACTOR
PCF	POUNDS PER CUBIC FOOT
PD	PRESSURE DROP
POR	POINT OF REMOVAL
PSI	POUNDS PER SQUARE INCH
PSIG	POUNDS PER SQUARE INCH GAUGE
RA	RETURN AIR
RPM	REVOLUTIONS PER MINUTE
SA	SUPPLY AIR
SOG	SLAB ON GRADE
SP	STATIC PRESSURE

DUCTWORK

	SUPPLY DUCT (UP OR SECTION)
	OUTDOOR AIR DUCT (UP OR SECTION)
	SUPPLY OR OUTSIDE AIR DUCT (DOWN/OR AWAY)
	EXHAUST DUCT (UP OR SECTION)
	RETURN DUCT (UP OR SECTION)
	EXHAUST OR RETURN DUCT (DOWN/OR AWAY)
	ROUND DUCTWORK UP
	ROUND DUCTWORK DOWN
	ACOUSTICALLY LINED DUCT
	FLEXIBLE CANVAS CONNECTION
	SECURITY BARS
	DROP (D) OR RISE (R)

DAMPERS

	MANUAL VOLUME DAMPER
	AUTOMATIC DAMPER
	BACKDRAFT DAMPER
	SMOKE DAMPER
	FIRE DAMPER (HORIZONTAL)
	FIRE DAMPER (VERTICAL)
	COMBINATION FIRE/SMOKE DAMPER
	COMBINATION FIRE/SMOKE DAMPER
	OPOSED BLADE DAMPER
	PARALLEL BLADE DAMPER

FIELD MOUNTED CONTROLS

	THERMOSTAT
	ROOM HUMIDISTAT
	PRESSURE SENSOR
	ROOM SENSOR
	SWITCH
	DUCT SMOKE DETECTOR

SPECIAL DESIGNATION

	EQUIPMENT NOTATION
	KEYED NOTE
	PLAN CONTINUATION REFERENCE
	DETAIL REFERENCE
	PLAN / DETAIL
	REVISION REFERENCE
	CONNECT TO EXISTING
	PITCH
	FLOW
	LINE INDICATES DEMOLITION

PIPING SYMBOLS

	TEE OUTLET UP
	TEE OUTLET DOWN
	ELBOW UP
	ELBOW DOWN
	UNION
	FLANGED JOINT
	CAP OR BLIND FLANGE
	CONCENTRIC REDUCER
	ECCENTRIC REDUCER
	DROP (D) OR RISE (R)

EQUIPMENT

	ROOF VENTILATOR, INTAKE (ROOF PLAN)
	ROOF VENTILATOR, EXHAUST (ROOF PLAN)
	ROOF VENTILATOR, INTAKE (PLAN VIEW)
	ROOF VENTILATOR, EXHAUST (PLAN VIEW)
	ROOF VENTILATOR, LOUVERED
	VARIABLE AIR VOLUME BOX W/ REQUIRED 36" CLEARANCE
	VARIABLE AIR VOLUME BOX WITH REHEAT COIL W/ REQUIRED 36" CLEARANCE
	EQUIPMENT
	LOCATION OF ACCESS CLEARANCE
	UNIT HEATER
	REHEAT COIL
	HUMIDIFIER
	PUMP
	SUCTION DIFFUSER
	REDUCER
	REDUCED
	SQUARE TO ROUND TRANSITION

VALVES

	BALL VALVE
	BUTTERFLY VALVE
	MOTORIZED BUTTERFLY VALVE
	GAUGE VALVE
	DRAIN BALL VALVE
	CHECK SWING GATE VALVE
	SPRING LOADED CHECK VALVE
	BALANCING VALVE
	PRESSURE REDUCING VALVE
	SELF CONTAINED PRESSURE REDUCING VALVE
	RELIEF VALVE / SAFETY VALVE
	SOLENOID VALVE
	THREE WAY CONTROL VALVE
	TRIPLE DUTY VALVE
	BACKFLOW PREVENTOR
	TWO-WAY CONTROL VALVE
	PLUG VALVE
	GAS SHUT-OFF VALVE

PIPING SPECIALTIES

	THERMOMETER
	PRESSURE GAUGE AND GAUGE VALVE
	FLEXIBLE CONNECTOR
	DIAL THERMOMETER
	PRESSURE/ TEMPERATURE PLUG (PETE'S PLUG)
	DRAIN VALVE W/ CAPPED HOSE CONNECTION
	AUTOMATIC AIR VENT
	AIR VENT MANUAL
	THERMOSTATIC AIR VENT
	VACUUM BREAKER
	STRAINER
	STRAINER W/ BLOWDOWN
	FLOW SWITCH
	AUTOMATIC FLOW REGULATOR
	DIFFERENTIAL PRESSURE TRANSMITTER
	BASKET STRAINER

PIPING SYSTEMS

	CONDENSATE PUMP DISCHARGE
	CONDENSER WATER RETURN
	CONDENSER WATER SUPPLY
	COLD WATER
	COLD SOFT WATER
	CHILLED WATER RETURN
	CHILLED WATER SUPPLY
	DRAIN
	GAS (LOW PRESSURE, 0.25 PSIG OR LESS)
	GLYCOL RETURN
	GLYCOL SUPPLY
	HIGH PRESSURE GAS
	HOTCHILLED WATER RETURN
	HOTCHILLED WATER SUPPLY
	HOT WATER RETURN
	HOT WATER SUPPLY
	LOW PRESSURE CONDENSATE
	LOW PRESSURE STEAM
	NON-POTABLE COLD WATER
	NON-POTABLE SOFT WATER
	MAKEUP WATER
	PUMPED CONDENSATE
	REFRIGERANT HOT GAS
	REFRIGERANT LIQUID LINE
	REFRIGERANT SUCTION LINE
	VENT
	VACUUM (AIR)

GRILLES & DIFFUSERS

	CEILING DIFFUSER WITH FLEX DUCTWORK
	CEILING DIFFUSER WITH HARD DUCTWORK (SINGLE LINE)
	CEILING DIFFUSER WITH HARD DUCTWORK
	CEILING RETURN OR TRANSFER GRILLE WITH HARD DUCTWORK (SINGLE LINE)
	CEILING RETURN OR TRANSFER GRILLE WITH FLEX DUCTWORK
	CEILING RETURN OR TRANSFER GRILLE WITH HARD DUCTWORK
	CEILING EXHAUST GRILLE WITH FLEX DUCTWORK (SINGLE LINE)
	CEILING EXHAUST GRILLE WITH FLEX DUCTWORK
	CEILING EXHAUST GRILLE WITH HARD DUCTWORK
	SLOT DIFFUSER WITH FLEXIBLE CONNECTION
	SIDEWALL GRILLE

MECHANICAL SHEET INDEX

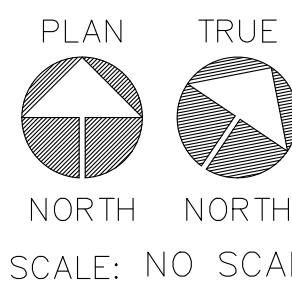
ML	MECHANICAL LEGEND
M1.0A	MECHANICAL PLAN - LOWER LEVEL SIDE A
M1.0B	MECHANICAL PLAN - LOWER LEVEL SIDE B
M1.1A	MECHANICAL PLAN - FIRST FLOOR SIDE A
M1.1B	MECHANICAL PLAN - FIRST FLOOR SIDE B
M3.0	MECHANICAL ENLARGED PLANS - BOILER ROOM
M3.1	MECHANICAL ENLARGED PLANS - PARKING RAMPS
M4.0	FLOW DIAGRAMS
M5.0	MECHANICAL DETAILS
ME1.0	MECHANICAL-ELECTRICAL SCHEDULES

NOTE:
ABBREVIATIONS AND SYMBOLS INDICATED HERE AND NOT USED IN THE
CONTRACT DOCUMENTS DO NOT APPLY TO THIS PROJECT. ADDITIONAL
SYMBOLS MAY BE INDICATED IN THE CONTRACT DOCUMENTS.

Revisions

Sheet

MECHANICAL
LEGEND



Project

NEW BERLIN SAFETY
BUILDING HVAC
SYSTEM UPDATES
AND SNOW MELT

Date

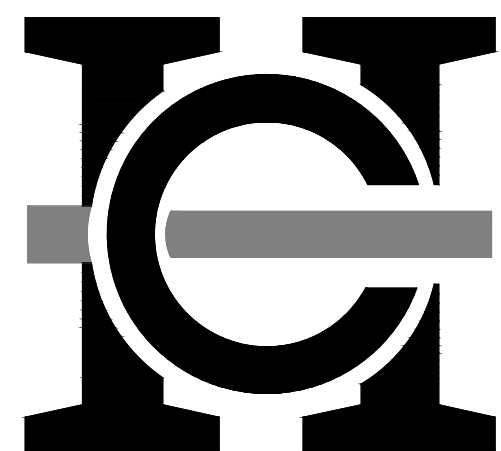
DECEMBER 23, 2022

Project No.

19-1011.18

Sheet No.

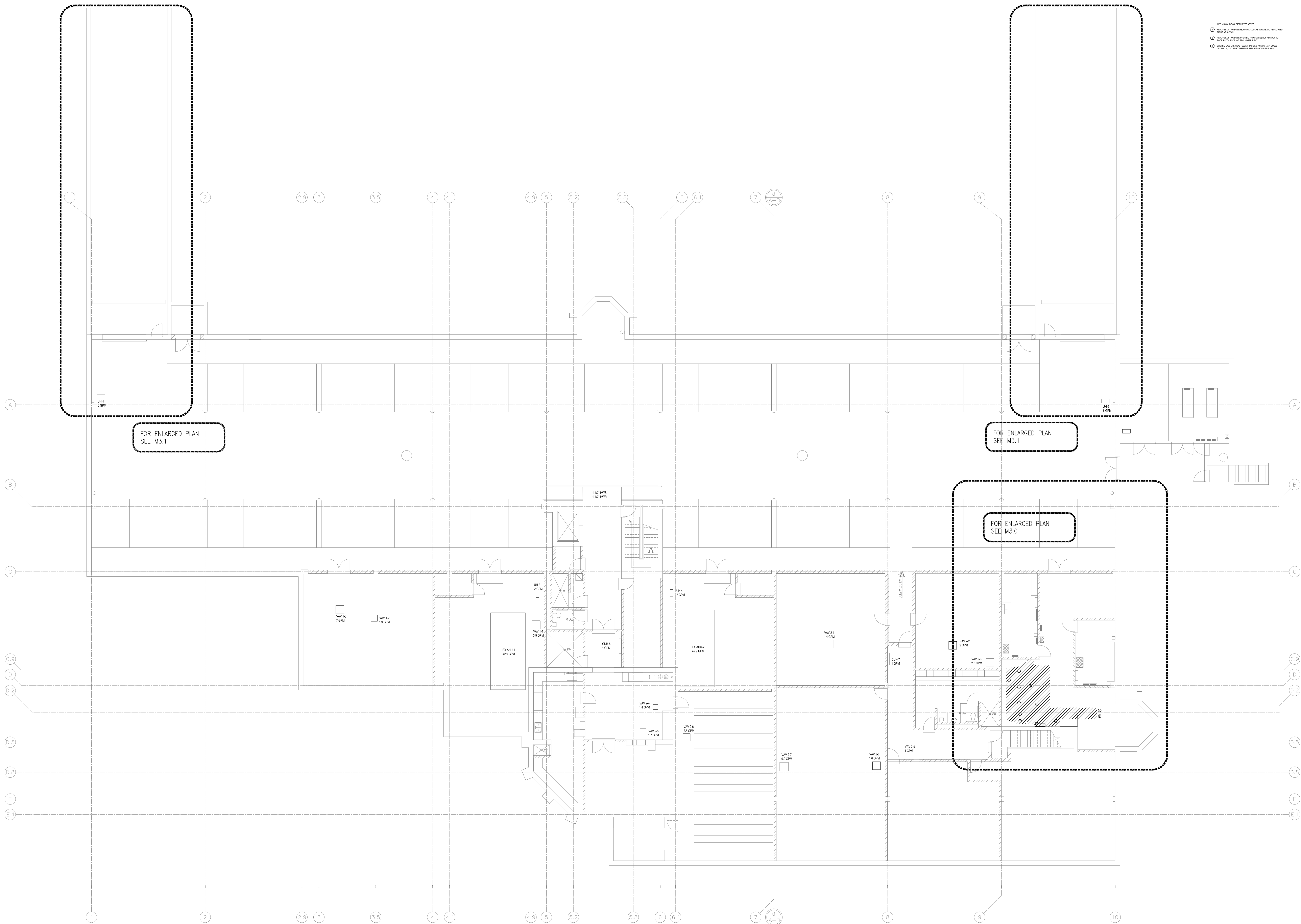
ML



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- MECHANICAL SYMBOLS AND NOTATION
- MECHANICAL SYMBOLS AND NOTATION
- MECHANICAL SYMBOLS AND NOTATION
- MECHANICAL SYMBOLS AND NOTATION



Revisions

Sheet
MECHANICAL
OVERALL PLAN -
LOWER LEVEL

PLAN TRUE
NORTH NORTH
SCALE: 3/32" = 1'-0"

Project
NEW BERLIN SAFETY
BUILDING HVAC
SYSTEM UPDATES
AND SNOW MELT

1 OVERALL MECHANICAL PLAN - LOWER LEVEL
1/4" = 1'-0"

Date

DECEMBER 23, 2022

Project No.

19-1011.18

Sheet No.

M1.0

GENERAL MECHANICAL SCOPE:

PROVIDE NEW SNOW MELT SYSTEM FOR BOTH RAMPS LEADING INTO AND OUT OF THE UNDERGROUND PARKING. DIVISION 23 SHALL BE RESPONSIBLE FOR COORDINATION AND INSTALLATION OF NEW TUBING FOR EACH RAMP ONE RAMP AT A TIME.

EXISTING THREE EXISTING BOILER HOT WATER PLANT IS TO BE REMOVED AND REPLACED WITH A NEW PLANT THAT IS SIZED FOR SNOW MELT. ADDITION: AFTER THE NEW BOILER PLANT AND SNOW MELT SYSTEMS ARE INSTALLED THE ENTIRE HOT WATER SYSTEM SHALL BE RE-BALANCED PER FLOW RATES ON PLANS AND PER SCHEDULE ON SHEET M5.1. COORDINATION SHALL BE DONE TO MINIMIZE DOWN TIME OF THE SYSTEM AND DONE DURING MONTHS WHERE HEATING IS NOT REQUIRED.

EXISTING HWS AND HWR MAINS HAVE MECHANICALLY GROOVED PIPE COUPLINGS THAT HAVE STARTED TO LEAK AS PART OF THIS PROJECT. THE M.C. SHALL REPLACE ALL COUPLINGS AND GASKETS WITH NEW FITTINGS AND GASKET ASSEMBLIES. CONTRACTOR SHALL FIELD VERIFY ALL LOCATIONS AND SIZES OF COUPLINGS BEFORE REPLACEMENT. CONTRACTOR SHALL PROVIDE TO THE OWNER A TABLE INDICATING THE LOCATION, SIZE, MODEL, NUMBER AND TAG FOR ALL NEW COUPLINGS.

FOR CONTRACTORS REFERENCE:

- THE EXISTING COUPLINGS APPEAR TO BE RIGIDLOK FIG. 7401. SEE DETAIL 13 ON SHEET M5.0
- THE COUPLINGS ARE ONLY ON THE PIPE MAINS ON THE FIRST FLOOR AND WITHIN THE BOILER ROOM.
- COUPLINGS APPEAR TO BE EVERY 20 FEET IN THE STRAIGHT RUNS AND THEN AT EVERY ELBOW. THERE APPEARS TO BE A HIGHER CONCENTRATION OF COUPLINGS ABOVE RECORDS AREA 1A. CONTRACTOR SHALL FIELD VERIFY FINAL COUNT AND DIAMETER OF ALL COUPLINGS.
- DRAWINGS SHOW APPROXIMATE LOCATION OF PIPING MAINS AND SIZES. CONTRACTOR TO FIELD VERIFY EXACT LOCATION AND SIZES.

ALTERNATE BID:

ALTERNATE BID NO. 1

EXISTING FAN COIL UNITS AND CONDENSING UNITS ON ROOF THAT HAVE BEEN ABANDONED ARE TO BE REMOVED AS PART OF THIS PROJECT. REMOVE PIPING AND SEAL PIPE PORTAL WATER TIGHT. EQUIPMENT TRAILS ON ROOF ARE TO REMAIN AND CHECKED FOR WATER TIGHTNESS AND SEALED IF NECESSARY. RTU CURRENTLY SERVING THESE AREAS AND ASSOCIATED DUCTWORK ARE TO REMAIN.

ALTERNATE BID NO. 2

A NUMBER OF THE EXISTING CONTROL VALVES HAVE CORROSION AND EVIDENCE OF LEAKING. AS PART OF ALTERNATE BID NO. 2, THIS CONTRACTOR SHALL NOTIFY OWNER AND PROVIDE PICTURES SHOWING VALVE CONDITION, ALONG WITH PRICING FOR REPLACEMENT. CONTRACTOR SHALL REPLACE VALVE UPON OWNERS APPROVAL.

ALTERNATE BID NO. 3

A NUMBER OF VAL BOXES HAVE MISSING OR DAMAGED INSULATION WITHIN THE FIRST COUPLE OF FEET OF THE HOT WATER PIPING. AS PART OF ALTERNATE BID NO. 3, THIS CONTRACTOR SHALL NOTIFY OWNER AND PROVIDE PICTURES OF INSULATION MISSING CONDITION, ALONG WITH PRICING FOR REPLACEMENT. CONTRACTOR SHALL REPLACE/INSTALL INSULATION UPON OWNERS APPROVAL.

ALTERNATE BID NO. 4

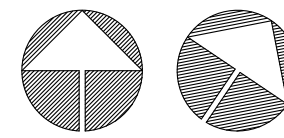
CONTRACTOR SHALL PROVIDE A 20 YEAR EXTENDED WARRANTY ON ALL NEW MECHANICALLY GROOVED PIPE COUPLINGS AND GASKETS. WARRANTY SHALL COVER PARTS AND LABOR FOR ANY FAILED COUPLING OR GASKET.

Revisions

Sheet

MECHANICAL
OVERALL PLAN –
LOWER LEVEL SIDE A

PLAN TRUE



NORTH NORTH
SCALE: 1/8" = 1'-0"

Project

NEW BERLIN SAFETY
BUILDING HVAC
SYSTEM UPDATES
AND SNOW MELT

Date

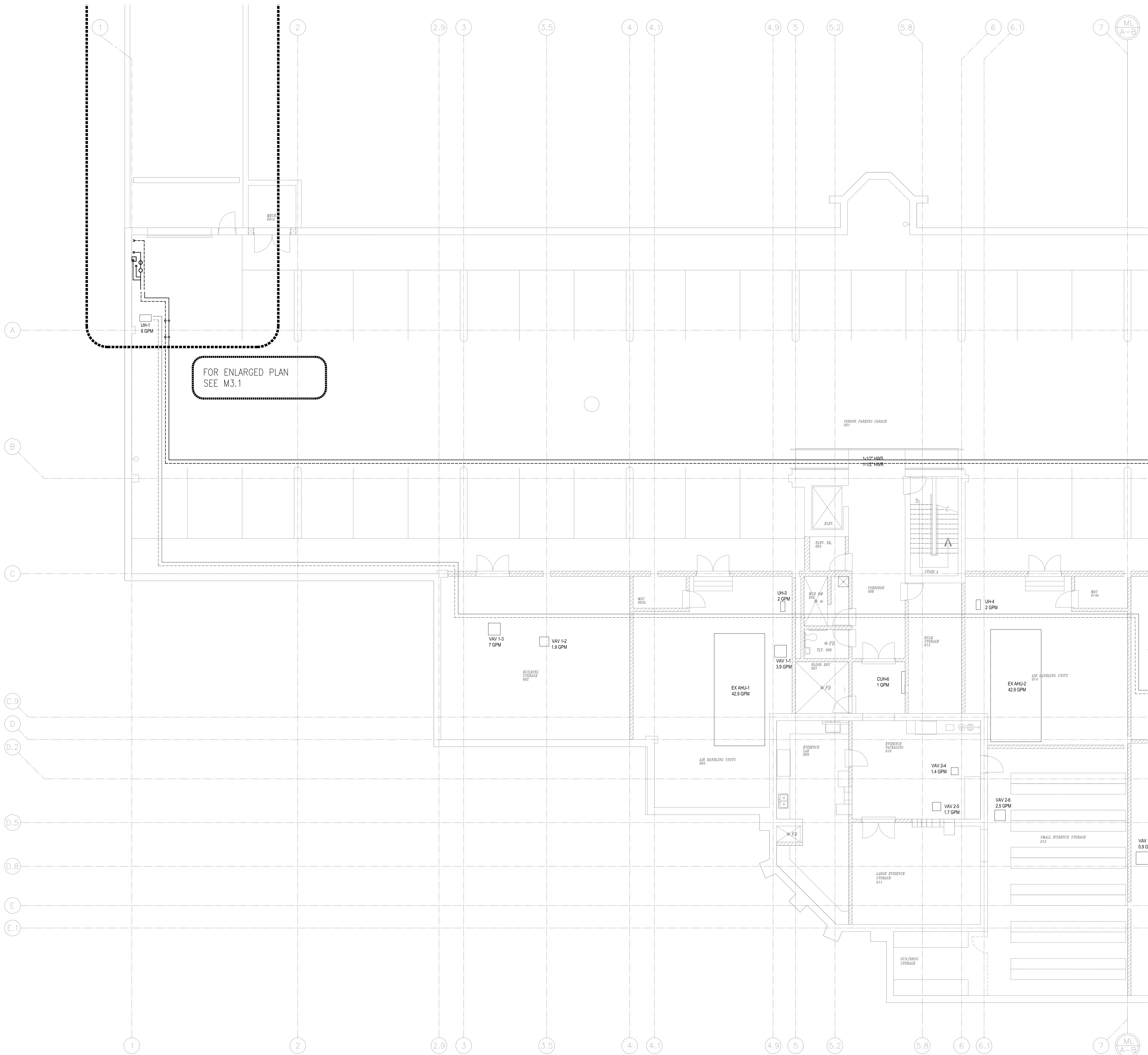
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Project No.

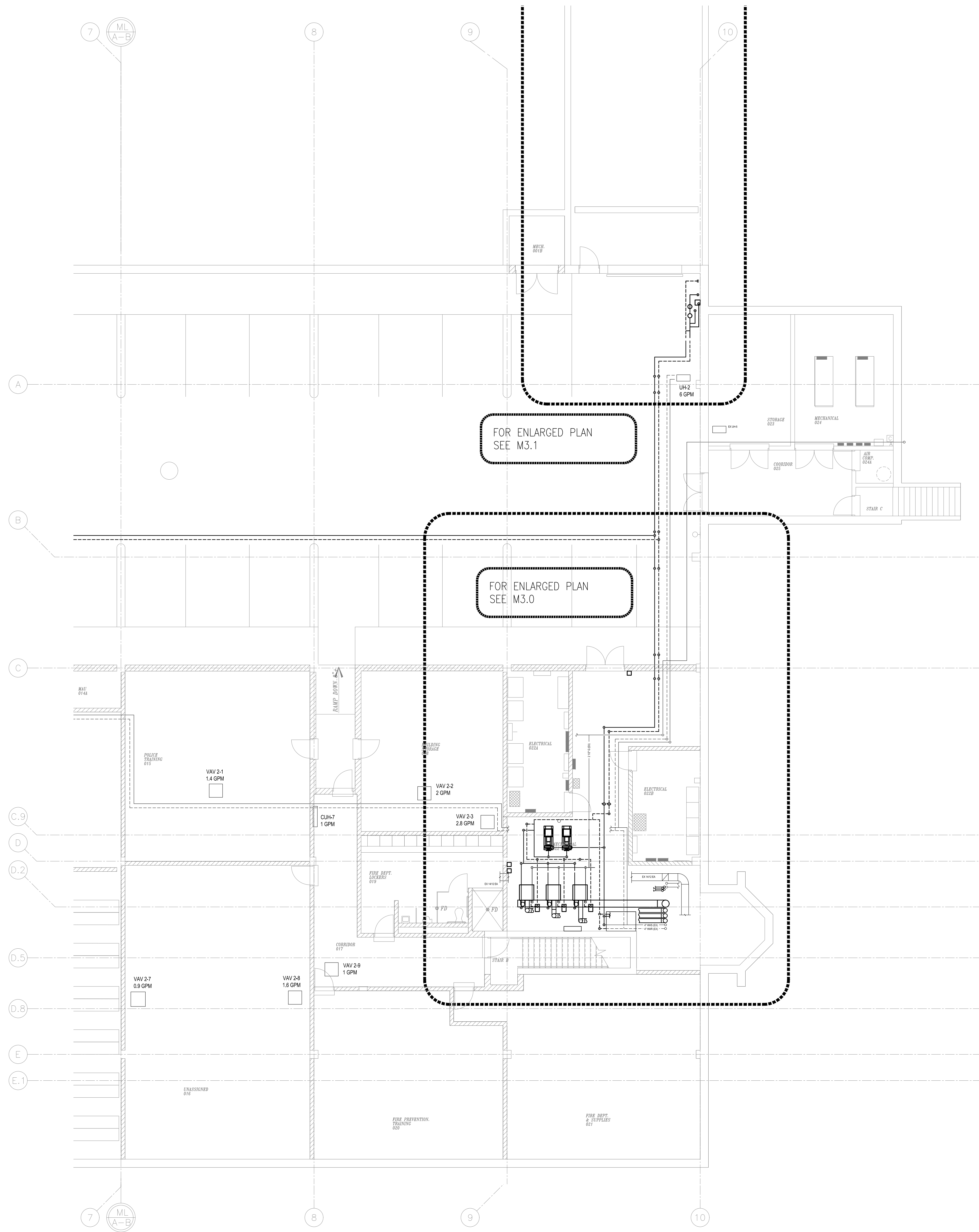
19-1011.18

Sheet No.

M1.0A



1 MECHANICAL PLAN - LOWER LEVEL SIDE A
1/8"=1'-0"



GENERAL MECHANICAL SCOPE:

PROVIDE NEW SNOW MELT SYSTEM FOR BOTH RAMPS LEADING INTO AND OUT OF THE UNDERGROUND PARKING. DIVISION 23 SHALL BE RESPONSIBLE FOR COORDINATION AND INSTALLATION OF NEW TUBING FOR EACH RAMP ONE RAMP AT A TIME.

EXISTING THREE EXISTING BOILER HOT WATER PLANT IS TO BE REMOVED AND REPLACED WITH A NEW PLANT THAT IS UPSIZED FOR SNOW MELT ADDITION. AFTER THE NEW BOILER PLANT AND SNOW MELT SYSTEMS ARE INSTALLED THE ENTIRE HOT WATER SYSTEM SHALL BE RE-BALANCED PER FLOW RATES ON PLANS AND PER SCHEDULE ON SHEET M1.0. COORDINATION SHALL BE DONE TO MINIMIZE DOWN TIME OF THE SYSTEM AND DONE DURING MONTHS WHERE HEATING IS NOT REQUIRED.

EXISTING HWS AND HWR MAINS HAVE MECHANICALLY GROOVED PIPE COUPLINGS THAT HAVE STARTED TO LEAK. AS PART OF THIS PROJECT THE M.C. SHALL REPLACE ALL COUPLINGS AND GASKETS WITH NEW FITTINGS AND GASKET ASSEMBLIES. CONTRACTOR SHALL FIELD VERIFY ALL LOCATIONS AND SIZES OF COUPLINGS BEFORE REPLACEMENT. CONTRACTOR SHALL PROVIDE TO THE OWNER A TABLE INDICATING THE LOCATION, SIZE, MODEL NUMBER AND TAG FOR ALL NEW COUPLINGS.

FOR CONTRACTORS REFERENCE:

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- THE COUPLINGS ARE ONLY ON THE PIPE MAINS ON THE FIRST FLOOR AND WITHIN THE BOILER ROOM.
- COUPLINGS APPEAR TO BE EVERY 20 FEET IN THE STRAIGHT RUNS AND THEN AT EVERY ELBOW. THERE APPEARS TO BE A HIGHER CONCENTRATION OF COUPLINGS ABOVE RECORDS AREA 1A. CONTRACTOR SHALL FIELD VERIFY FINAL COUNT AND DIAMETER OF ALL COUPLINGS.
- DRAWINGS SHOW APPROXIMATE LOCATION OF PIPING MAINS AND SIZES. CONTRACTOR TO FIELD VERIFY EXACT LOCATION AND SIZES.

ALTERNATE BID NO. 1

EXISTING FAN COIL UNITS AND CONDENSING UNITS ON ROOF THAT HAVE BEEN ABANDONED ARE TO BE REMOVED AS PART OF THIS PROJECT. REMOVE PIPING AND SEAL PIPE PORTAL WATER TIGHT. EQUIPMENT RAILS ON ROOF ARE TO REMAIN AND CHECKED FOR WATER TIGHTNESS AND SEALED IF NECESSARY. RTU CURRENTLY SERVING THESE AREAS AND ASSOCIATED DUCTWORK ARE TO REMAIN.

ALTERNATE BID NO. 2

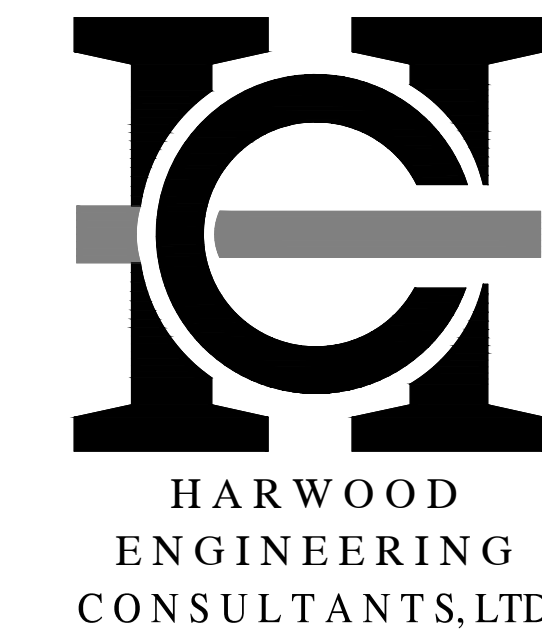
A NUMBER OF THE EXISTING CONTROL VALVES HAVE CORROSION AND EVIDENCE OF LEAKING. AS PART OF ALTERNATE BID NO. 2, THIS CONTRACTOR SHALL NOTIFY OWNER AND PROVIDE PICTURES SHOWING VALVE CONDITION, ALONG WITH PRICING FOR REPLACEMENT. CONTRACTOR SHALL REPLACE VALVE UPON OWNERS APPROVAL.

ALTERNATE BID NO. 3

A NUMBER OF VALV BOXES HAVE MISSING OR DAMAGED INSULATION WITHIN THE FIRST COUPLE OF FEET OF THE HOT WATER PIPING. AS PART OF ALTERNATE BID NO. 3, THIS CONTRACTOR SHALL NOTIFY OWNER AND PROVIDE PICTURES OF INSULATION MISSING CONDITION, ALONG WITH PRICING FOR REPLACEMENT. CONTRACTOR SHALL REPLACE/INSTALL INSULATION UPON OWNERS APPROVAL.

ALTERNATE BID NO. 4

CONTRACTOR SHALL PROVIDE A 20 YEAR EXTENDED WARRANTY ON ALL NEW MECHANICALLY GROOVED PIPE COUPLINGS AND GASKETS. WARRANTY SHALL COVER PARTS AND LABOR FOR ANY FAILED COUPLING OR GASKET.



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Revisions

Sheet
MECHANICAL
OVERALL PLAN –
LOWER LEVEL SIDE B

PLAN TRUE
NORTH NORTH
SCALE: 1/8" = 1'-0"

Project
NEW BERLIN SAFETY
BUILDING HVAC
SYSTEM UPDATES
AND SNOW MELT

Date
DECEMBER 23, 2022
Project No.
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M1.0B
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1 MECHANICAL PLAN - LOWER LEVEL SIDE B
1/8"=1'-0"



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GENERAL MECHANICAL SCOPE:

PROVIDE NEW SNOW MELT SYSTEM FOR BOTH RAMPS LEADING INTO AND OUT OF THE UNDERGROUND PARKING. DIVISION 23 SHALL BE RESPONSIBLE FOR COORDINATION AND INSTALLATION OF NEW TUBING FOR EACH RAMP ONE RAMP AT A TIME.

EXISTING THREE EXISTING BOILER HOT WATER PLANT IS TO BE REMOVED AND REPLACED WITH A NEW PLANT THAT IS UPSIZED FOR SNOW MELT ADDITION. AFTER THE NEW BOILER PLANT AND SNOW MELT SYSTEMS ARE INSTALLED THE ENTIRE HOT WATER SYSTEM SHALL BE RE-BALANCED PER FLOW RATES ON PLANS AND PER SCHEDULE ON SHEET ME-10. COORDINATION SHALL BE DONE TO MINIMIZE DOWN TIME OF THE SYSTEM AND DONE DURING MONTHS WHERE HEATING IS NOT REQUIRED.

EXISTING HWS AND HWV MAINS HAVE MECHANICALLY GROOVED PIPE COUPLINGS THAT HAVE STARTED TO LEAK. AS PART OF THIS PROJECT THE M.C. SHALL REPLACE ALL COUPLINGS AND GASKETS WITH NEW FITTINGS AND GASKET ASSEMBLIES. CONTRACTOR SHALL FIELD VERIFY ALL LOCATIONS AND SIZES OF COUPLINGS BEFORE REPLACEMENT. CONTRACTOR SHALL PROVIDE TO THE OWNER A TABLE INDICATING THE LOCATION, SIZE, MODEL NUMBER AND TAG FOR ALL NEW COUPLINGS.

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- COUPLINGS APPEAR TO BE EVERY 20 FEET IN THE STRAIGHT RUNS AND THEN AT EVERY ELBOW. THERE APPEARS TO BE A HIGHER CONCENTRATION OF COUPLINGS ABOVE RECORDS AREA 174. CONTRACTOR SHALL FIELD VERIFY FINAL COUNT AND DIAMETER OF ALL COUPLINGS.
- DRAWINGS SHOW APPROXIMATE LOCATION OF PIPING MAINS AND SIZES. CONTRACTOR TO FIELD VERIFY EXACT LOCATION AND SIZES.

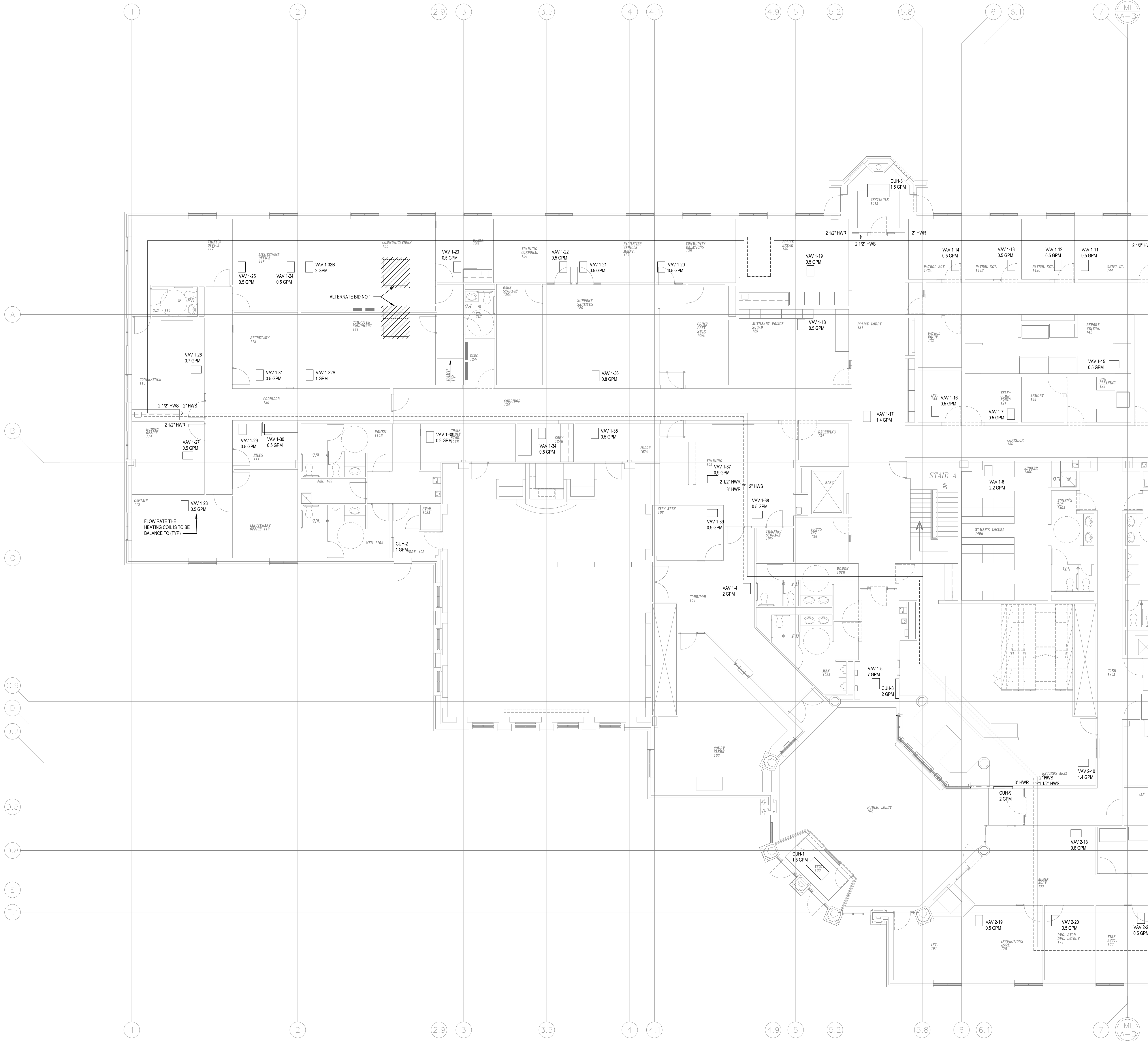
ALTERNATE BIDS:

ALTERNATE BID NO. 1
EXISTING FAN COIL UNITS AND CONDENSING UNITS ON ROOF THAT HAVE BEEN ABANDONED ARE TO BE REMOVED AS PART OF THIS PROJECT. REMOVE PIPING AND SEAL PIPE PORTAL WATER TIGHT. EQUIPMENT RAILS ON ROOF ARE TO REMAIN AND CHECKED FOR WATER TIGHTNESS AND SEALED IF NECESSARY. RTU CURRENTLY SERVING THESE AREAS AND ASSOCIATED DUCTWORK ARE TO REMAIN.

ALTERNATE BID NO. 2
A NUMBER OF THE EXISTING CONTROL VALVES HAVE CORROSION AND EVIDENCE OF LEAKING. AS PART OF ALTERNATE BID NO. 2, THIS CONTRACTOR SHALL NOTIFY OWNER AND PROVIDE PICTURES SHOWING VALVE CONDITION, ALONG WITH PRICING FOR REPLACEMENT. CONTRACTOR SHALL REPLACE VALVE UPON OWNERS APPROVAL.

ALTERNATE BID NO. 3
A NUMBER OF VAV BOXES HAVE MISSING OR DAMAGED INSULATION WITHIN THE FIRST COUPLE OF FEET OF THE HOT WATER PIPING. AS PART OF ALTERNATE BID NO. 3, THIS CONTRACTOR SHALL NOTIFY OWNER AND PROVIDE PICTURES OF INSULATION MISSING CONDITION, ALONG WITH PRICING FOR REPLACEMENT. CONTRACTOR SHALL REPLACE/INSTALL INSULATION UPON OWNERS APPROVAL.

ALTERNATE BID NO. 4
CONTRACTOR SHALL PROVIDE A 20 YEAR EXTENDED WARRANTY ON ALL



1 MECHANICAL PLAN - FIRST FLOOR SIDE A
1/8"=1'-0"

Revisions

Sheet
MECHANICAL
OVERALL PLAN –
FIRST FLOOR SIDE A

PLAN TRUE
NORTH NORTH
SCALE: 1/8" = 1'-0"

Project
NEW BERLIN SAFETY
BUILDING HVAC
SYSTEM UPDATES
AND SNOW MELT

Date

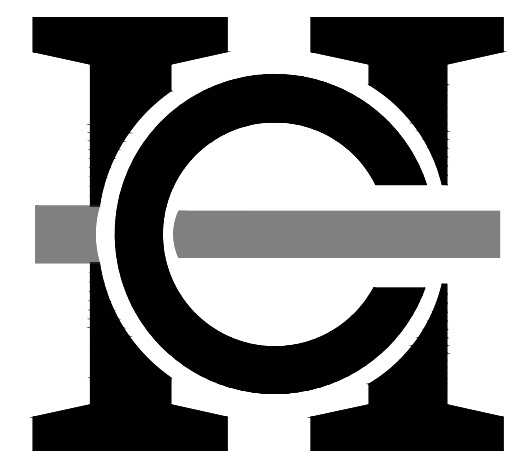
DECEMBER 23, 2022

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19-1011.18

Sheet No.

M1.1A



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GENERAL MECHANICAL SCOPE:

PROVIDE NEW SNOW MELT SYSTEM FOR BOTH RAMPS LEADING INTO AND OUT OF THE UNDERGROUND PARKING. DIVISION 23 SHALL BE RESPONSIBLE FOR COORDINATION AND INSTALLATION OF NEW TUBING FOR EACH RAMP ONE RAMP AT A TIME.

EXISTING THREE EXISTING ROLER HOT WATER PLANT IS TO BE REMOVED AND REPLACED WITH A NEW PLANT THAT IS UPSIZED FOR SNOW MELT ADDITION. AFTER THE NEW ROLER PLANT AND SNOW MELT SYSTEMS ARE INSTALLED THE ENTIRE HOT WATER SYSTEM SHALL BE REBALANCED PER FLOW RATES ON PLANS AND PER SCHEDULE ON SHEET ME1.0. COORDINATION SHALL BE DONE TO MINIMIZE DOWN TIME OF THE SYSTEM AND DONE DURING MONTHS WHERE HEATING IS NOT REQUIRED.

EXISTING HWS AND HWR MANS HAVE MECHANICALLY GROOVED PIPE COUPLINGS THAT HAVE STARTED TO LEAK. AS PART OF THIS PROJECT, THE M.C. SHALL REPLACE ALL COUPLINGS AND GASKETS WITH NEW FITTINGS AND GASKET ASSEMBLIES. CONTRACTOR SHALL FIELD VERIFY ALL LOCATIONS AND SIZES OF COUPLINGS BEFORE REPLACEMENT. CONTRACTOR SHALL PROVIDE TO THE OWNER A TABLE INDICATING THE LOCATION, SIZE, MODEL NUMBER AND TAG FOR ALL NEW COUPLINGS.

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- DRAWINGS SHOW APPROXIMATE LOCATION OF PIPING MAINS AND SIZES. CONTRACTOR TO FIELD VERIFY EXACT LOCATION AND SIZES.

ALTERNATE BIDS:

ALTERNATE BID NO. 1

EXISTING FAN COIL UNITS AND CONDENSING UNITS ON ROOF THAT HAVE BEEN ABANDONED ARE TO BE REMOVED AS PART OF THIS PROJECT. REMOVE PIPING AND SEAL PIPE PORTAL WATER TIGHT. EQUIPMENT RAILS ON ROOF ARE TO REMAIN AND CHECKED FOR WATER TIGHTNESS AND SEALED IF NECESSARY. RTU CURRENTLY SERVING THESE AREAS AND ASSOCIATED DUCTWORK ARE TO REMAIN.

ALTERNATE BID NO. 2

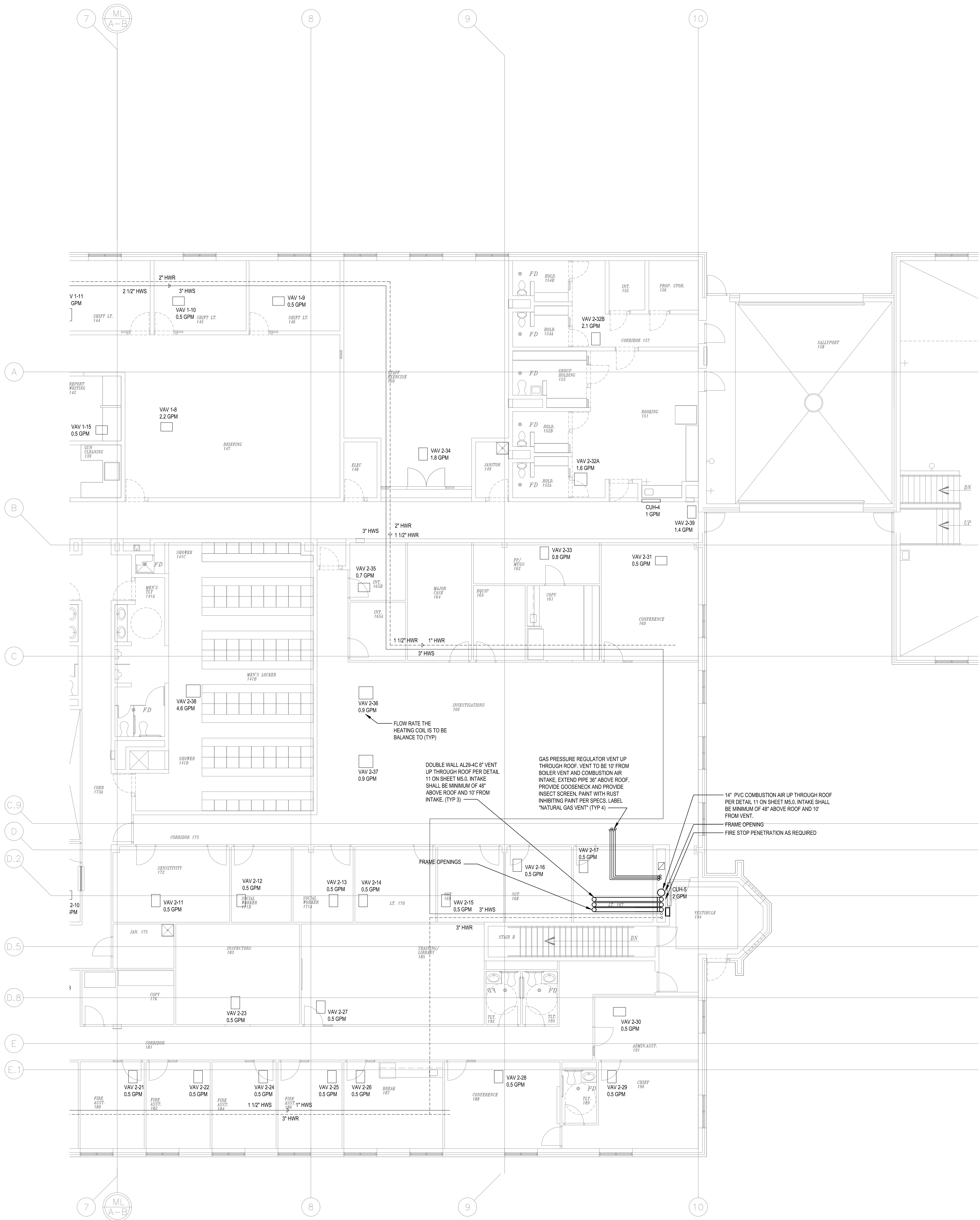
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ALTERNATE BID NO. 3

A NUMBER OF VAV BOXES HAVE MISSING OR DAMAGED INSULATION WITHIN THE FIRST COUPLE OF FEET OF THE HOT WATER PIPING. AS PART OF ALTERNATE BID NO. 3, THIS CONTRACTOR SHALL NOTIFY OWNER AND PROVIDE PICTURES OF INSULATION MISSING CONDITION, ALONG WITH PRICING FOR REPLACEMENT. CONTRACTOR SHALL REPLACE/INSTALL INSULATION UPON OWNERS APPROVAL.

ALTERNATE BID NO. 4

CONTRACTOR SHALL PROVIDE A 20 YEAR EXTENDED WARRANTY ON ALL NEW MECHANICALLY GROOVED PIPE COUPLINGS AND GASKETS. WARRANTY SHALL COVER PARTS AND LABOR FOR ANY FAILED COUPLING OR GASKET.



1 MECHANICAL PLAN - FIRST FLOOR SIDE B
1/8"=1'-0"

Revisions

Sheet
MECHANICAL
OVERALL PLAN –
FIRST FLOOR SIDE B

PLAN TRUE
NORTH NORTH
SCALE: 1/8" = 1'-0"

Project
NEW BERLIN SAFETY
BUILDING HVAC
SYSTEM UPDATES
AND SNOW MELT

Date

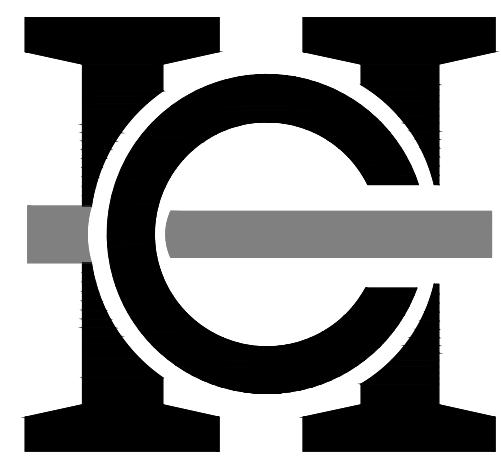
DECEMBER 23, 2022

Project No.

19-1011.18

Sheet No.

M1.1B

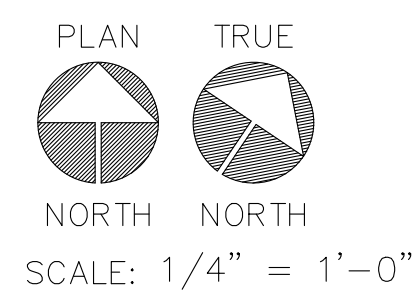


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Revisions

Sheet
MECHANICAL
ENLARGED PLANS -
BOILER ROOM



PLAN TRUE

NORTH NORTH

SCALE: 1/4" = 1'-0"

Project
NEW BERLIN SAFETY
BUILDING HVAC
SYSTEM UPDATES
AND SNOW MELT

Date

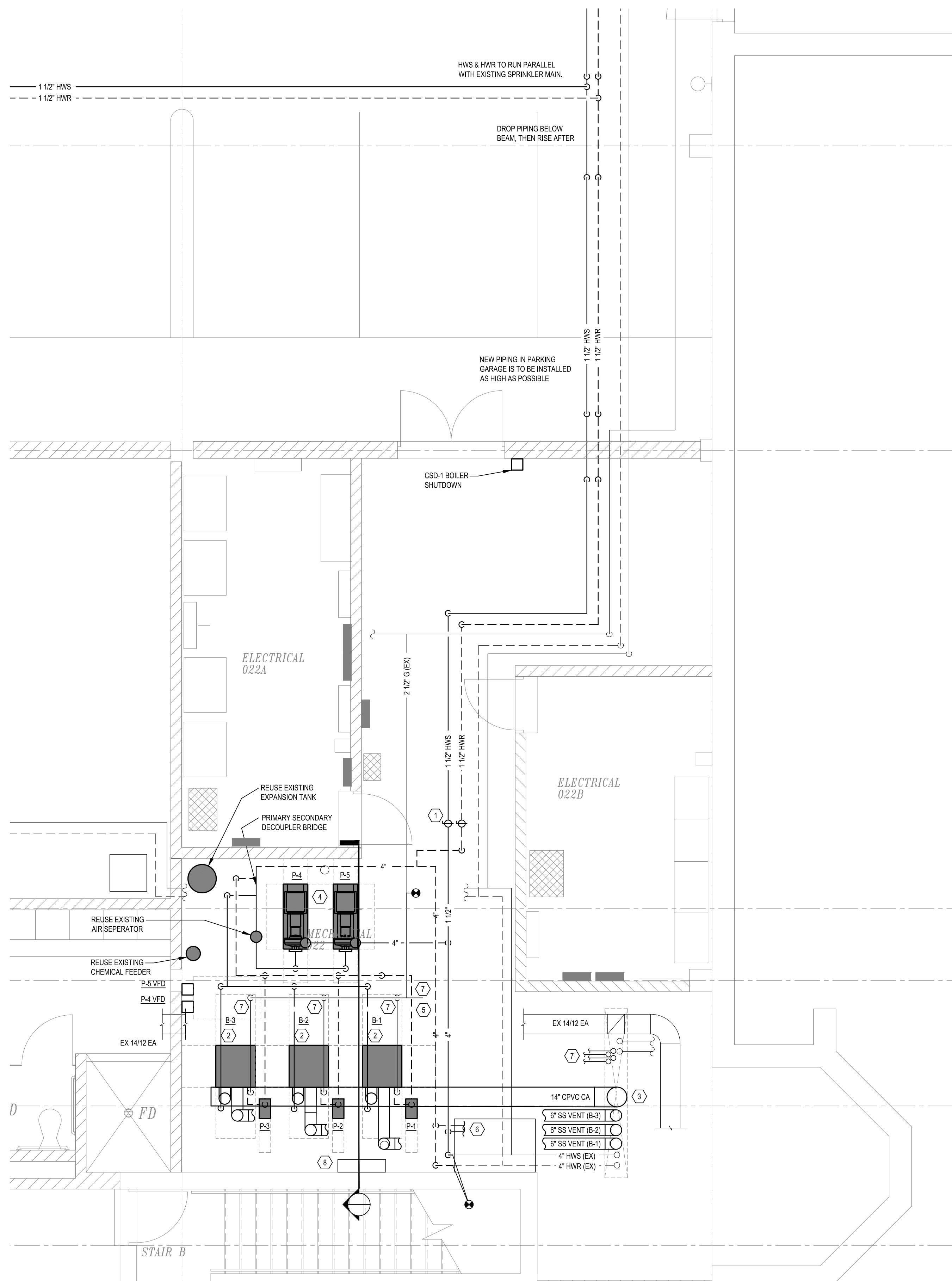
DECEMBER 23, 2022

Project No.

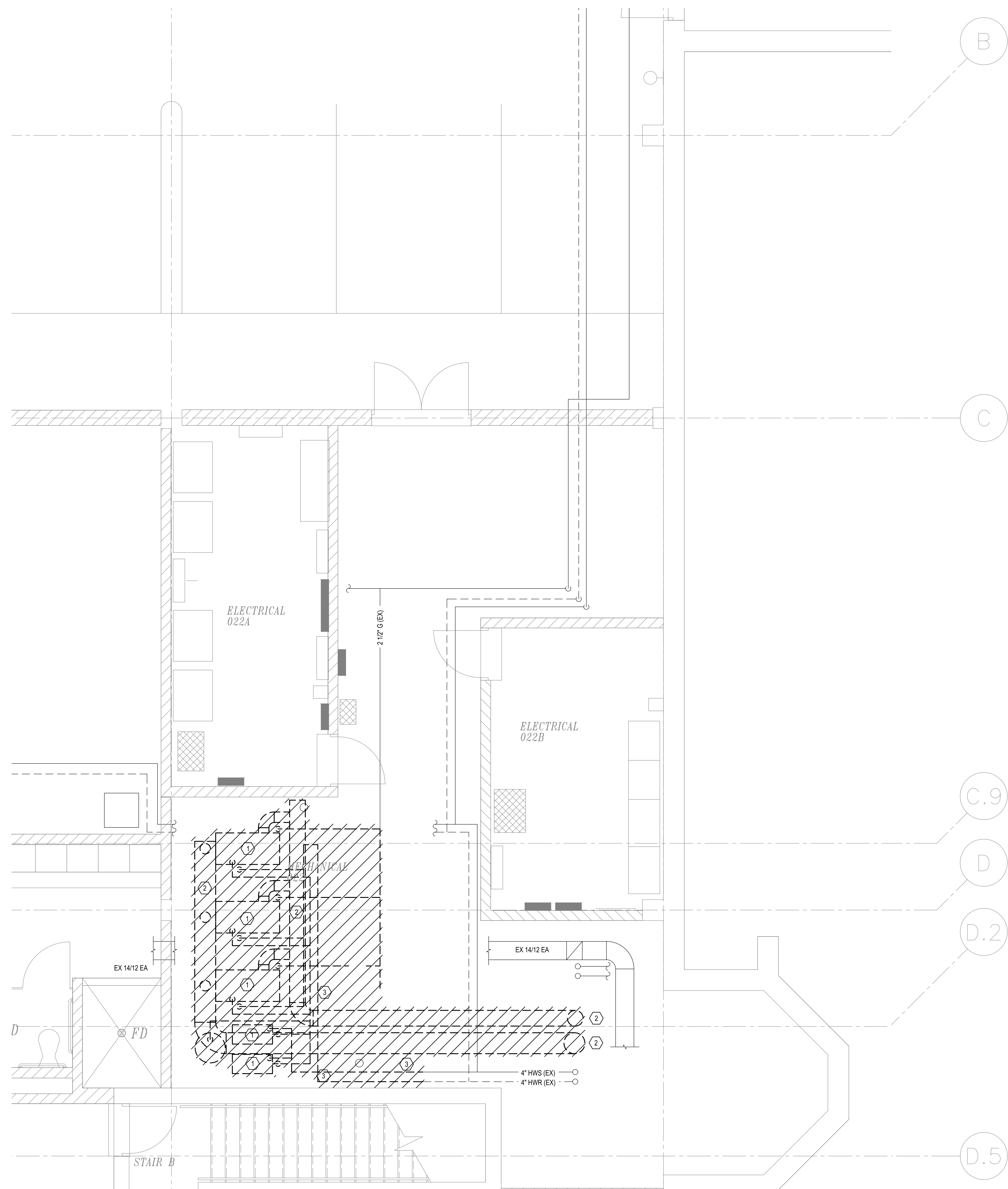
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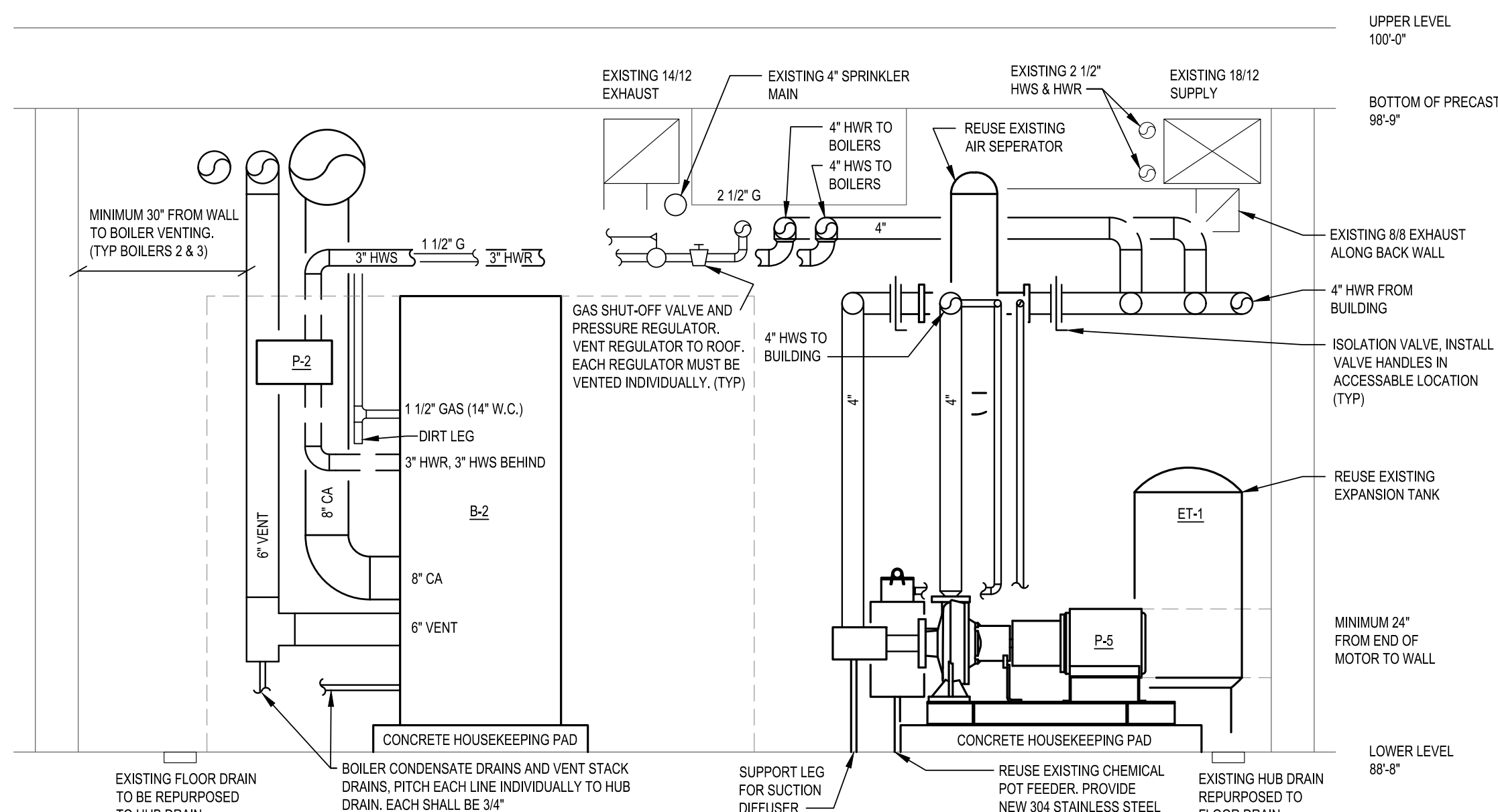
M3.0



2 ENLARGED MECHANICAL PLAN - BOILER ROOM NEW WORK
1/4"=1'-0"



1 ENLARGED MECHANICAL PLAN - BOILER ROOM DEMOLITION
1/4"=1'-0"



3 ENLARGED MECHANICAL SECTION - BOILER ROOM LOOKING WEST
1/4"=1'-0"

MECHANICAL NEW WORK KEYED NOTES:

- 1 PROVIDE ISOLATION VALVES LABEL "SNOW MELT ISOLATION"
- 2 NEW BOILER TO BE PLACED ON NEW CONCRETE HOUSEKEEPING PAD. PROVIDE 3/4" CONDENSATE DRAIN LINE WITH NEUTRALIZE KIT TO NEAREST HUB DRAIN. PROVIDE NEW 1 1/2" GAS LINE WITH SHUT OFF VALVE AND DIRT LEG.
- 3 PROVIDE EACH BOILER WITH NEW CPVC 8" COMBUSTION AIR AND NEW DOUBLE WALL AL204C 8" VENT. RUN VENTS UP THROUGH CHASE TO ROOF. TERMINATE COMBUSTION AIR, PITCH VENTS BACK TOWARDS BOILERS AND PROVIDE DRAIN TEE.
- 4 PROVIDE CONCRETE HOUSEKEEPING PAD AND INERTIAL BASE FOR PUMPS P-4 AND 5.
- 5 PROVIDE 1" GAS LINE WITH SHUT-OFF VALVE AND CAP FOR FUTURE. (UP TO 500 MBH)
- 6 PROVIDE 1" HWS AND HWR LINES BELOW BOILER VENTING TO DOMESTIC WATER HEATER. COORDINATE FINAL LOCATION OF HEATER WITH DIVISION 22. PROVIDE ISOLATION VALVES AND CAP. FINAL CONNECTION TO WATER HEATER BY DIVISION 22.
- 7 PROVIDE GAS PRESSURE REGULATOR FOR EACH BOILER AND FOR FUTURE GAS TEE. REDUCE PRESSURE TO 1/2" WC. PROVIDE INDIVIDUAL VENTS TO ROOF FOR EACH REGULATOR. SEE GAS PIPING DIAGRAM ON SHEET M4.0 FOR PIPE SIZING
- 8 EXISTING BOILER WATER FEED IN THIS AREA. RECONNECT TO NEW BOILER PLANT

MECHANICAL DEMOLITION KEYED NOTES:

- 1 REMOVE EXISTING BOILERS, PUMPS, CONCRETE PADS AND ASSOCIATED PIPING AS SHOWN
- 2 REMOVE EXISTING BOILER VENTING AND COMBUSTION AIR BACK TO ROOF. PATCH ROOF AND SEAL WATER TIGHT
- 3 EXISTING GWS CHEMICAL FEEDER, TACO EXPANSION TANK MODEL CBX425-125, AND SPROTHERM AIR SEPARATOR TO BE REUSED.

GENERAL MECHANICAL SCOPE:

PROVIDE NEW SNOW MELT SYSTEM FOR BOTH RAMPS LEADING INTO AND OUT OF THE UNDERGROUND PARKING. DIVISION 23 SHALL BE RESPONSIBLE FOR COORDINATION AND INSTALLATION OF NEW TUBING FOR EACH RAMP ONE RAMP AT A TIME.

EXISTING THREE EXISTING BOILER HOT WATER PLANT IS TO BE REMOVED AND REPLACED WITH A NEW PLANT THAT IS UPISIZED FOR SNOW MELT ADDITION. AFTER THE NEW BOILER PLANT AND SNOW MELT SYSTEMS ARE INSTALLED THE ENTIRE HOT WATER SYSTEM SHALL BE REBALANCED PER FLOW RATES ON PLANS AND PER SCHEDULE ON SHEET ME1.6. COORDINATION SHALL BE DONE TO MINIMIZE DOWN TIME OF THE SYSTEM AND DONE DURING MONTHS WHERE HEATING IS NOT REQUIRED.

EXISTING HWS AND HWR MAINS HAVE MECHANICALLY GROOVED PIPE COUPLINGS THAT HAVE STARTED TO LEAK. AS PART OF THIS PROJECT, THE M.C. SHALL REPLACE ALL COUPLINGS AND GASKETS WITH NEW FITTINGS AND GASKET ASSEMBLIES. CONTRACTOR SHALL FIELD VERIFY ALL LOCATIONS AND SIZES OF COUPLINGS BEFORE REPLACEMENT. CONTRACTOR SHALL PROVIDE TO THE OWNER A TABLE INDICATING THE LOCATION, SIZE, MODEL NUMBER AND TAG FOR ALL NEW COUPLINGS.

FOR CONTRACTORS REFERENCE:

- THE EXISTING COUPLINGS APPEAR TO BE RIDGIDLOK FIG. 7401. SEE DETAIL 13 ON SHEET M5.0
- THE COUPLINGS ARE ONLY ON THE PIPE MAINS ON THE FIRST FLOOR AND WITHIN THE BOILER ROOM.
- COUPLINGS APPEAR TO BE EVERY 20 FEET IN THE STRAIGHT RUNS AND THEN AT EVERY ELBOW. THERE APPEARS TO BE A HIGHER CONCENTRATION OF COUPLINGS ABOVE RECORDS AREA 174.
- CONTRACTOR SHALL FIELD VERIFY FINAL COUNT AND DIAMETER OF ALL COUPLINGS.
- DRAWINGS SHOW APPROXIMATE LOCATION OF PIPING MAINS AND SIZES. CONTRACTOR TO FIELD VERIFY EXACT LOCATION AND SIZES.

ALTERNATE BIDS:

ALTERNATE BID NO. 1
EXISTING FAN COIL UNITS AND CONDENSING UNITS ON ROOF THAT HAVE BEEN ABANDONED ARE TO BE REMOVED AS PART OF THIS PROJECT. REMOVE PIPING AND SEAL PIPE PORTAL WATER TIGHT. EQUIPMENT TRAILS ON ROOF ARE TO REMAIN AND CHECKED FOR WATER TIGHTNESS AND SEALED IF NECESSARY. RTU CURRENTLY SERVING THESE AREAS AND ASSOCIATED DUCTWORK ARE TO REMAIN.

ALTERNATE BID NO. 2
A NUMBER OF THE EXISTING CONTROL VALVES HAVE CORROSION AND EVIDENCE OF LEAKING. AS PART OF ALTERNATE BID NO. 2, THIS CONTRACTOR SHALL NOTIFY OWNER AND PROVIDE PICTURES SHOWING VALVE CONDITION, ALONG WITH PROPOSING FOR REPLACEMENT. CONTRACTOR SHALL REPLACE VALVE UPON OWNERS APPROVAL.

ALTERNATE BID NO. 3
A NUMBER OF VALV BOXES HAVE MISSING OR DAMAGED INSULATION WITHIN THE FIRST COUPLE OF FEET OF THE HOT WATER PIPING. AS PART OF ALTERNATE BID NO. 3, THIS CONTRACTOR SHALL NOTIFY OWNER AND PROVIDE PICTURES OF INSULATION MISSING CONDITION, ALONG WITH PROPOSING FOR REPLACEMENT. CONTRACTOR SHALL REPLACE INSULATION UPON OWNERS APPROVAL.

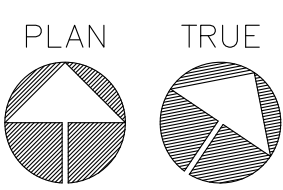
ALTERNATE BID NO. 4
CONTRACTOR SHALL PROVIDE A 20 YEAR EXTENDED WARRANTY ON ALL MECHANICAL EQUIPMENT AND MATERIALS.



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Revisions

Sheet

MECHANICAL
ENLARGED PLANS -
PARKING RAMPS

NORTH NORTH
SCALE: 1/4" = 1'-0"

Project

NEW BERLIN SAFETY BUILDING HVAC SYSTEM UPDATES AND SNOW MELT

Date _____

DECEMBER 23, 2022

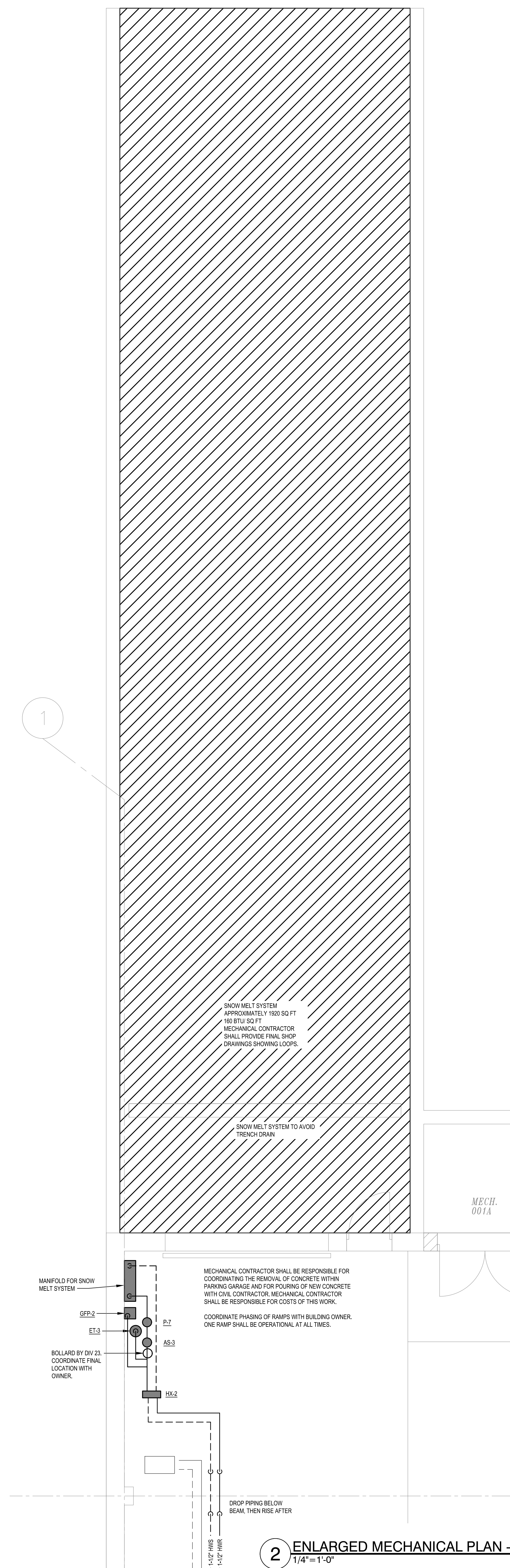
Project No.

19-1011.1E

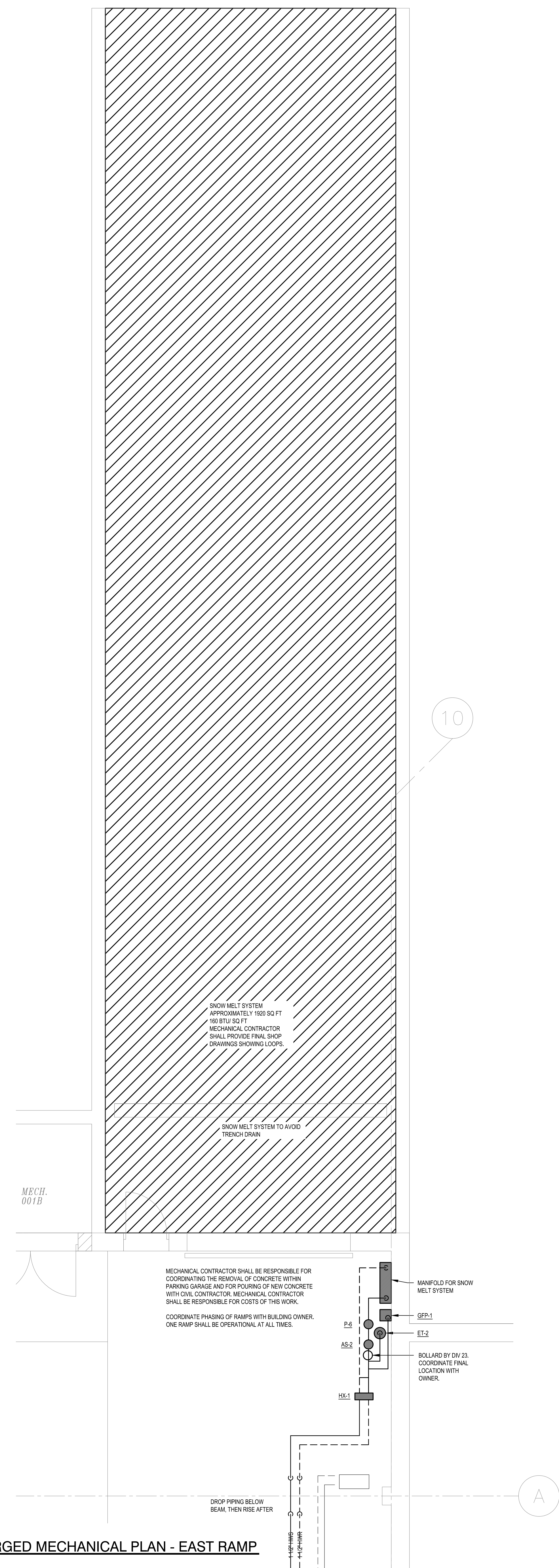
Sheet No.

M3.1

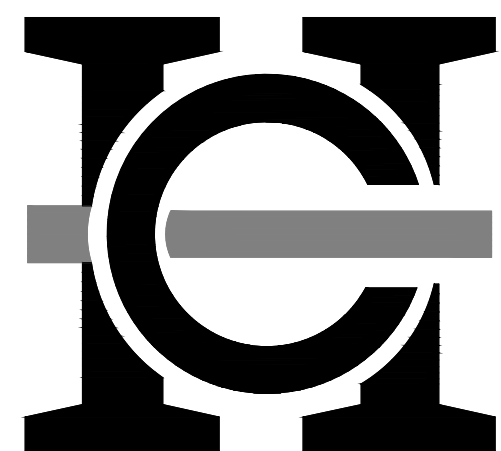
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2 ENLARGED MECHANICAL PLAN - WEST RAMP
1/4" = 1'-0"



1 ENLARGED MECHANICAL PLAN - EAST RAMP
1/4"=1'-0"



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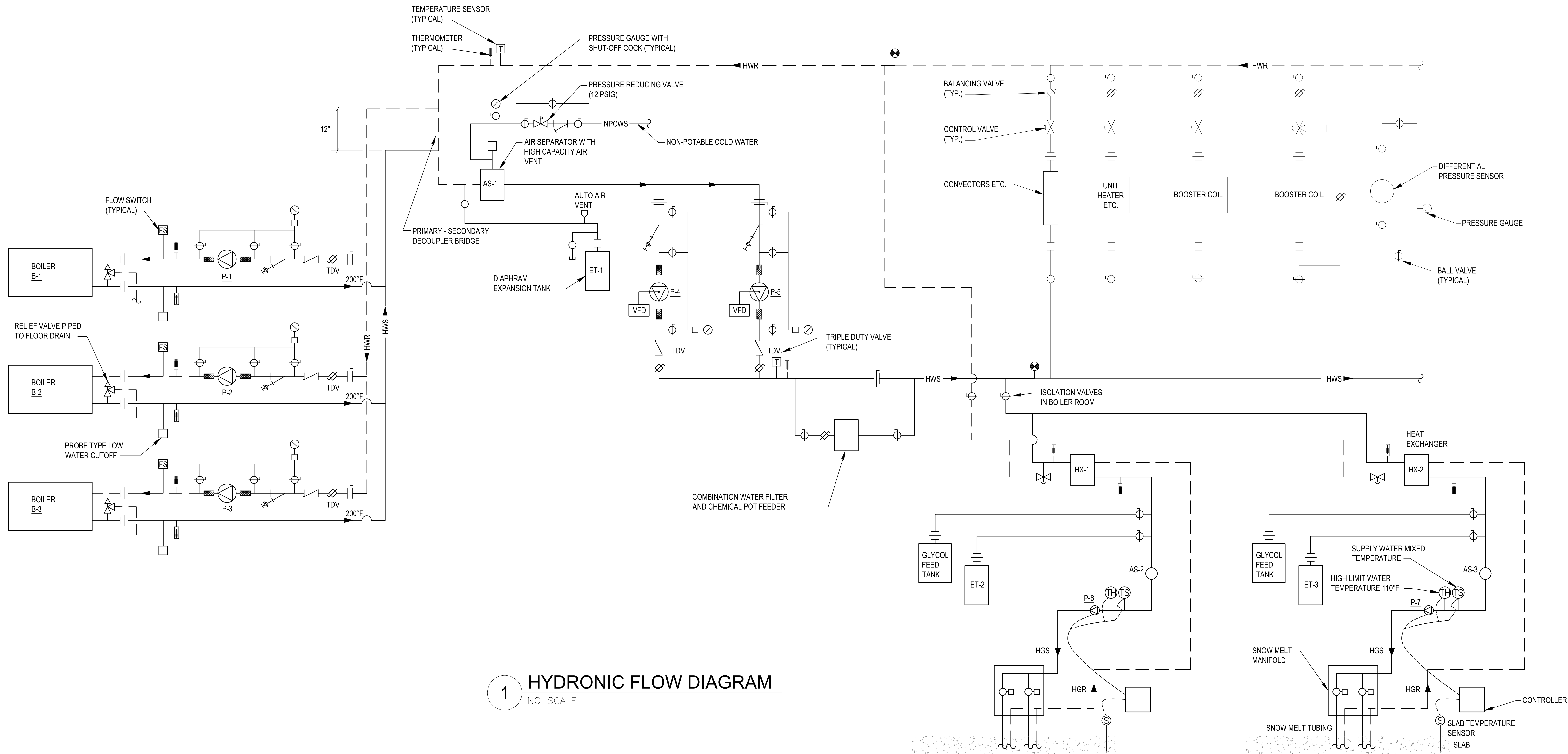
Sheet
MECHANICAL
FLOW DIAGRAM

PLAN TRUE
NORTH NORTH
SCALE: NO SCALE

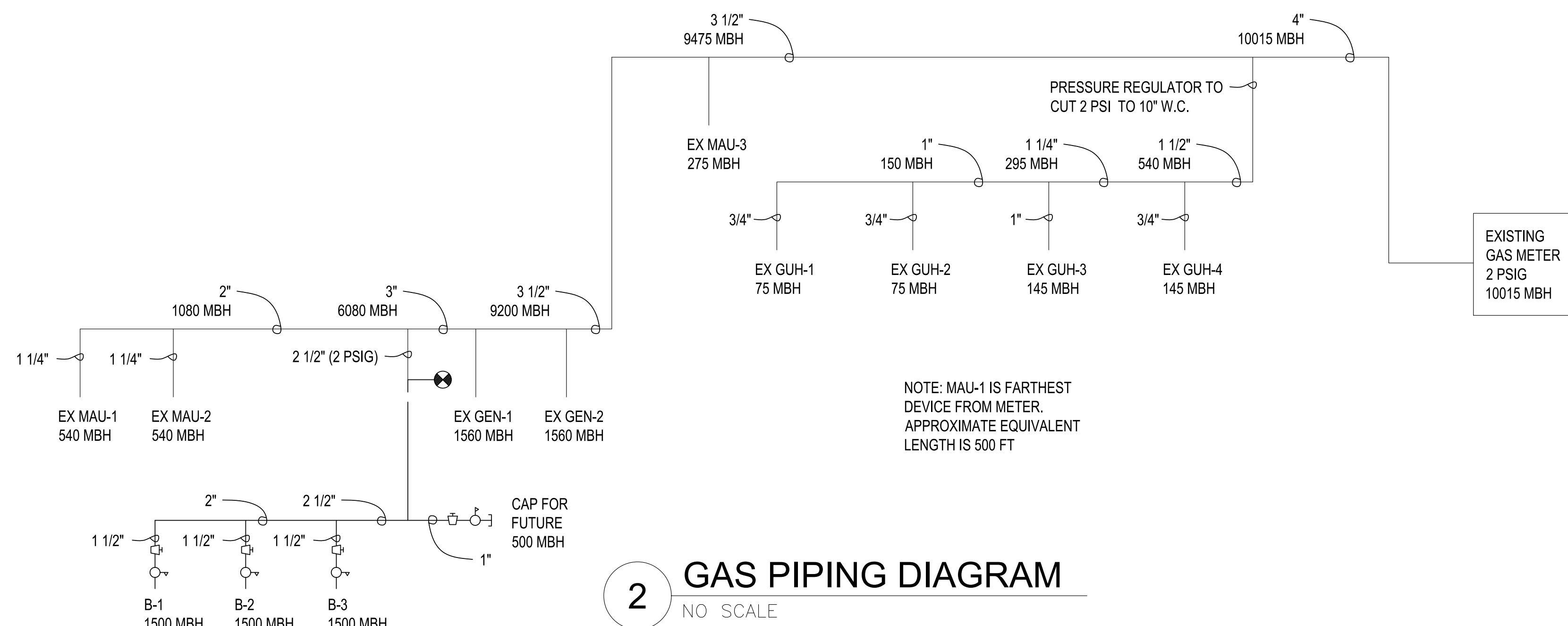
Project
NEW BERLIN SAFETY
BUILDING HVAC
SYSTEM UPDATES
AND SNOW MELT

Date
DECEMBER 23, 2022
Project No.
19-1011.18
Sheet No.

M4.0



1 HYDRONIC FLOW DIAGRAM
NO SCALE



2 GAS PIPING DIAGRAM
NO SCALE



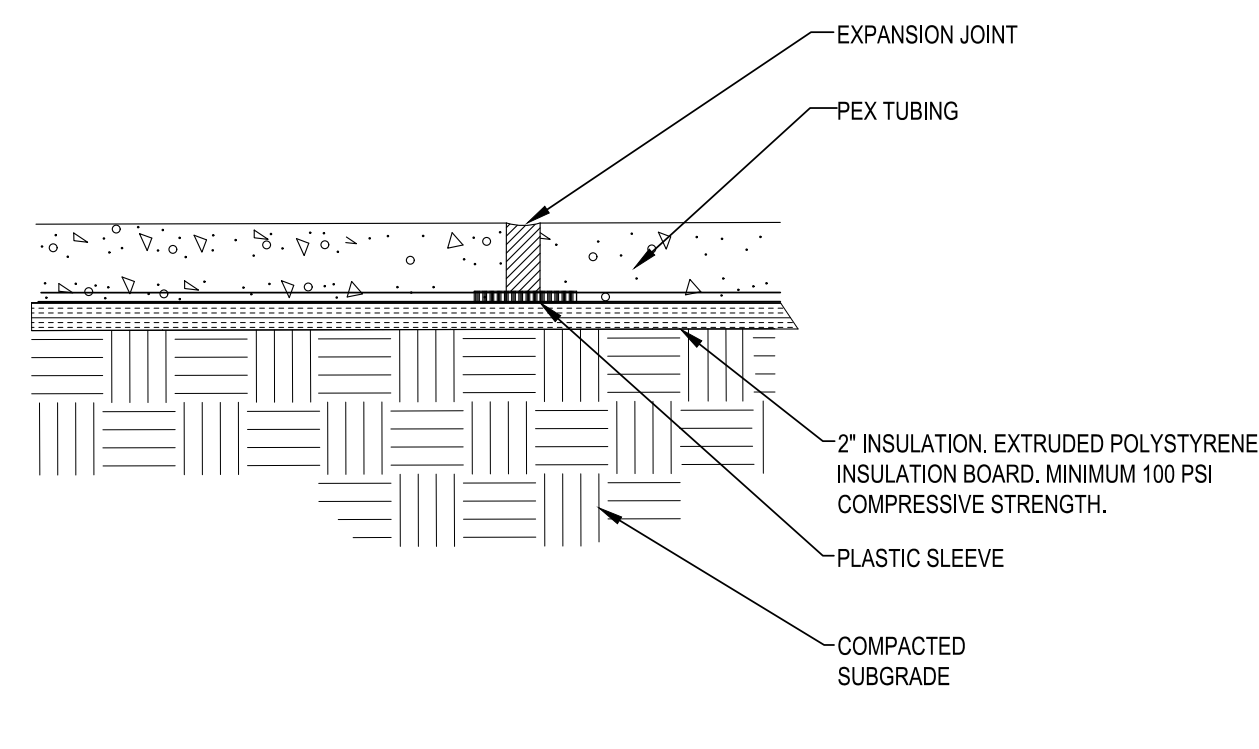
EXISTING MECHANICALLY GROOVED PIPE FITTING IN BOILER ROOM. RIGIDLOK FIG. 7401. CONTRACTOR SHALL FIELD VERIFY ALL EXISTING COUPLINGS BEFORE PURCHASING NEW COUPLINGS TO VERIFY TYPE AND GROOVE CUT. CONTRACTOR SHALL PROVIDE NEW COUPLING AND GASKET AND INSTALL PER MANUFACTURER'S INSTRUCTIONS. CONTRACT SHALL REINSULATE ALL FITTINGS WITH NEW STOCK.

BASE BID: ALL FITTINGS AND GASKETS SHALL HAVE A MINIMUM OF TWO YEAR WARRANTY ON PARTS AND LABOR.

ALTERNATE BID NO. 4: ALL FITTINGS AND GASKETS SHALL HAVE A MINIMUM OF TWENTY YEAR WARRANTY ON PARTS AND LABOR.

13 EXISTING MECHANICALLY GROOVED PIPE FITTING

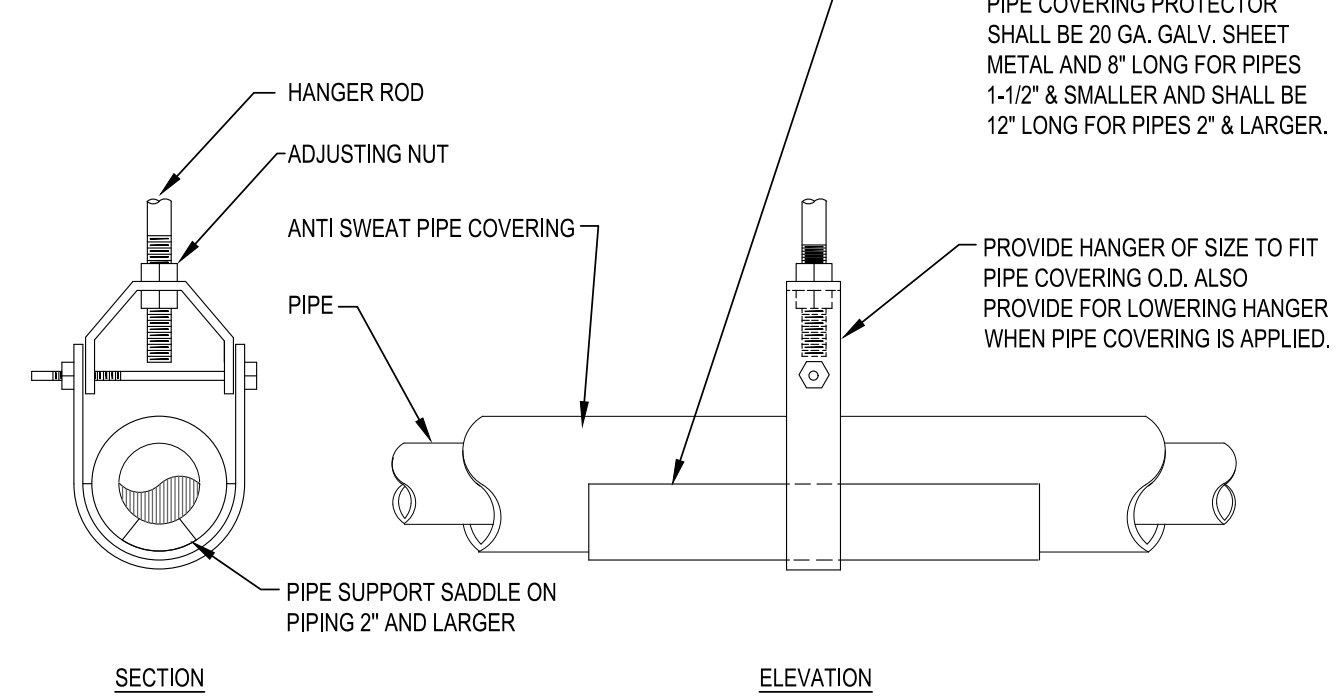
NO SCALE



NOTE: WIRE MESH NOT SHOWN FOR CLARITY

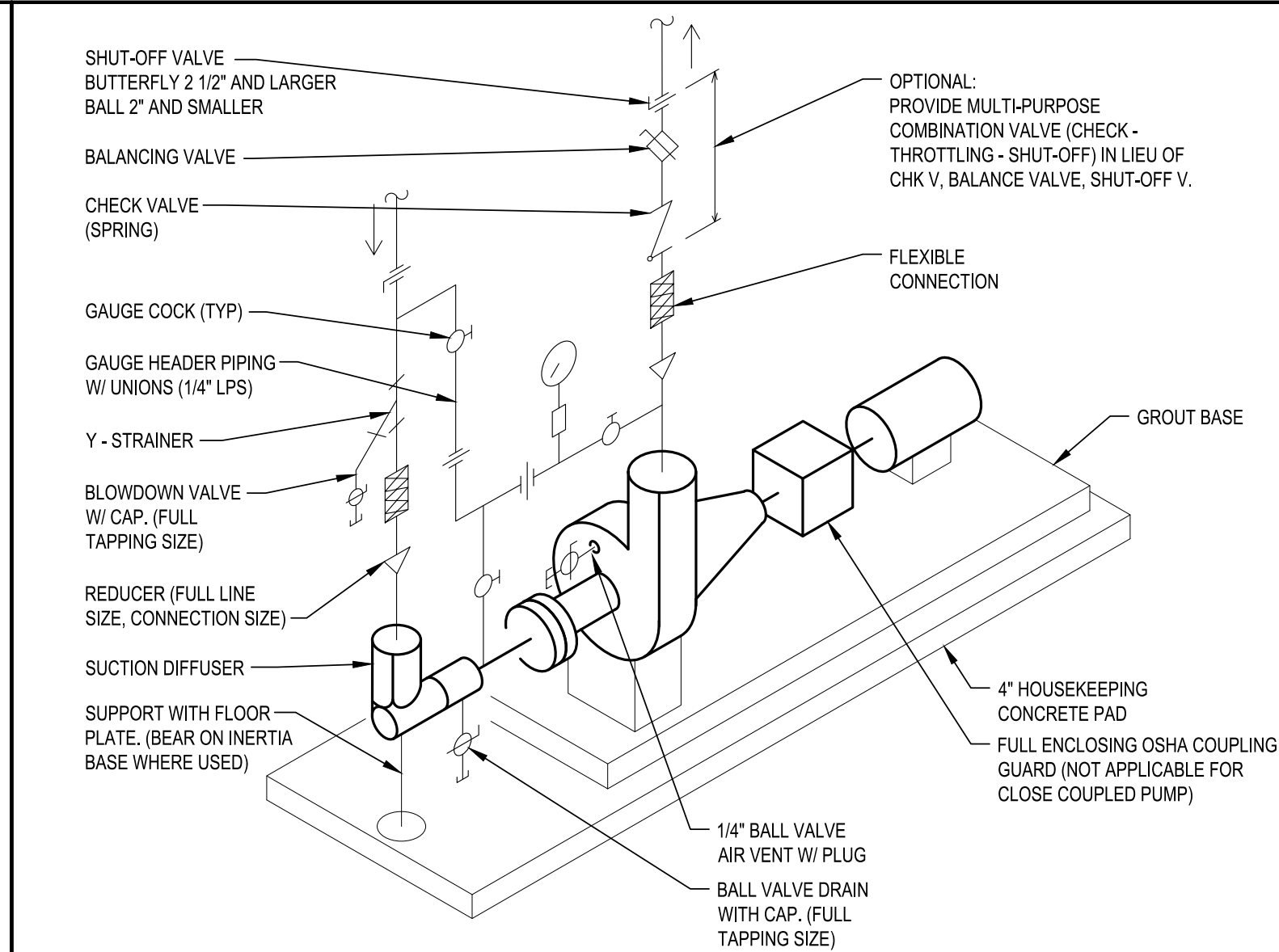
9 SNOWMELT EXPANSION JOINT DETAIL

NO SCALE



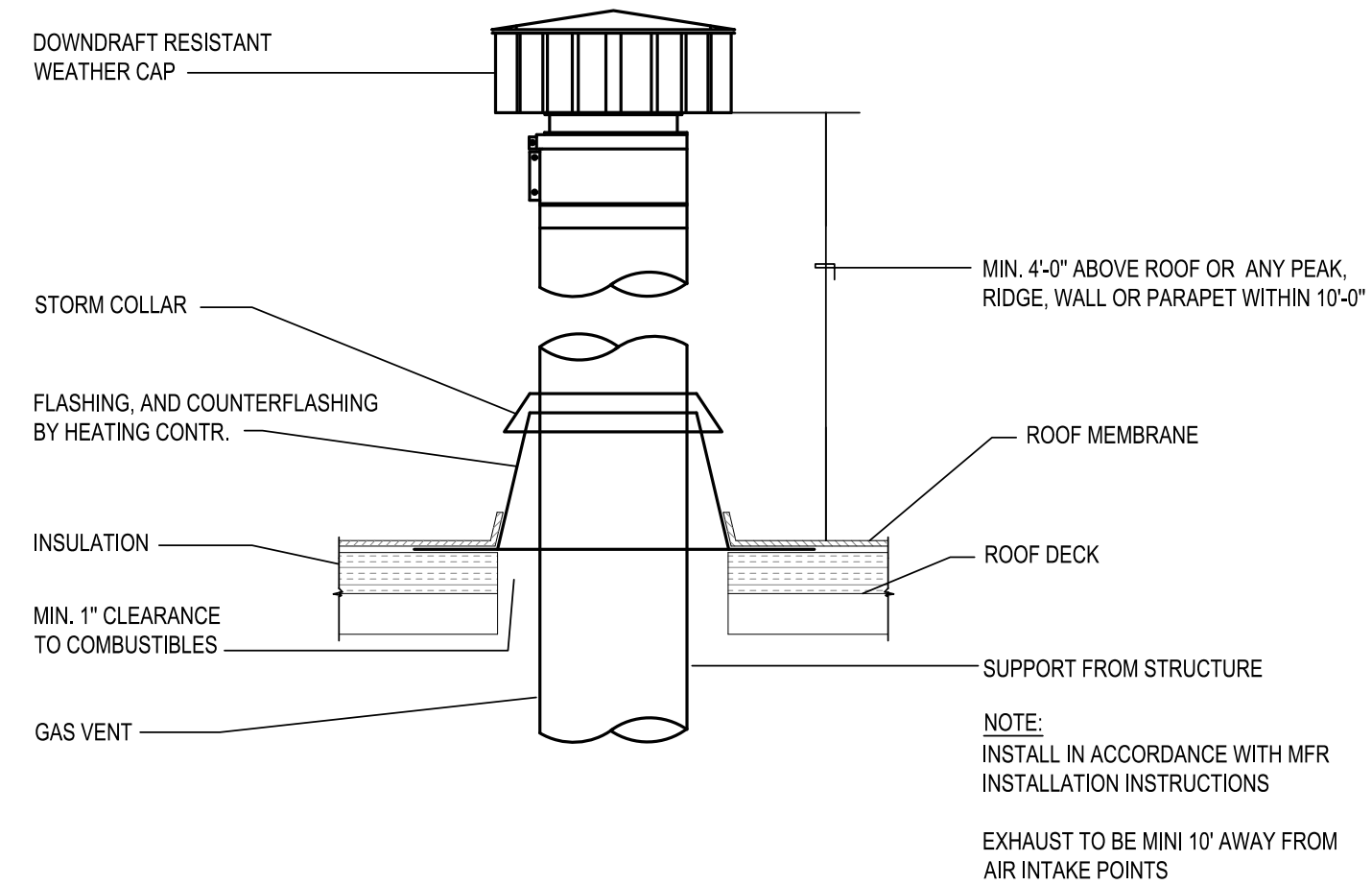
5 PIPE SUPPORT DETAIL

NO SCALE



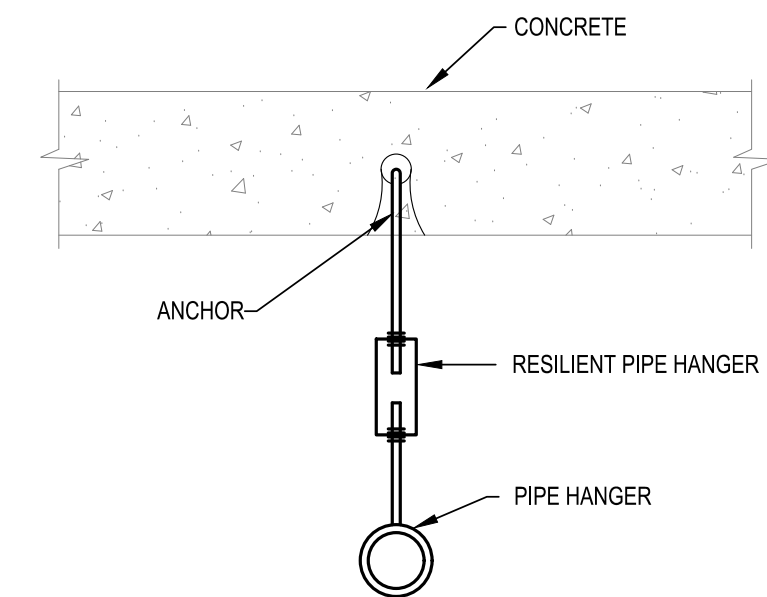
1 BASE MOUNTED END SUCTION PUMP DETAIL

NO SCALE



10 TYPICAL FLUE GAS VENT THROUGH ROOF DETAIL

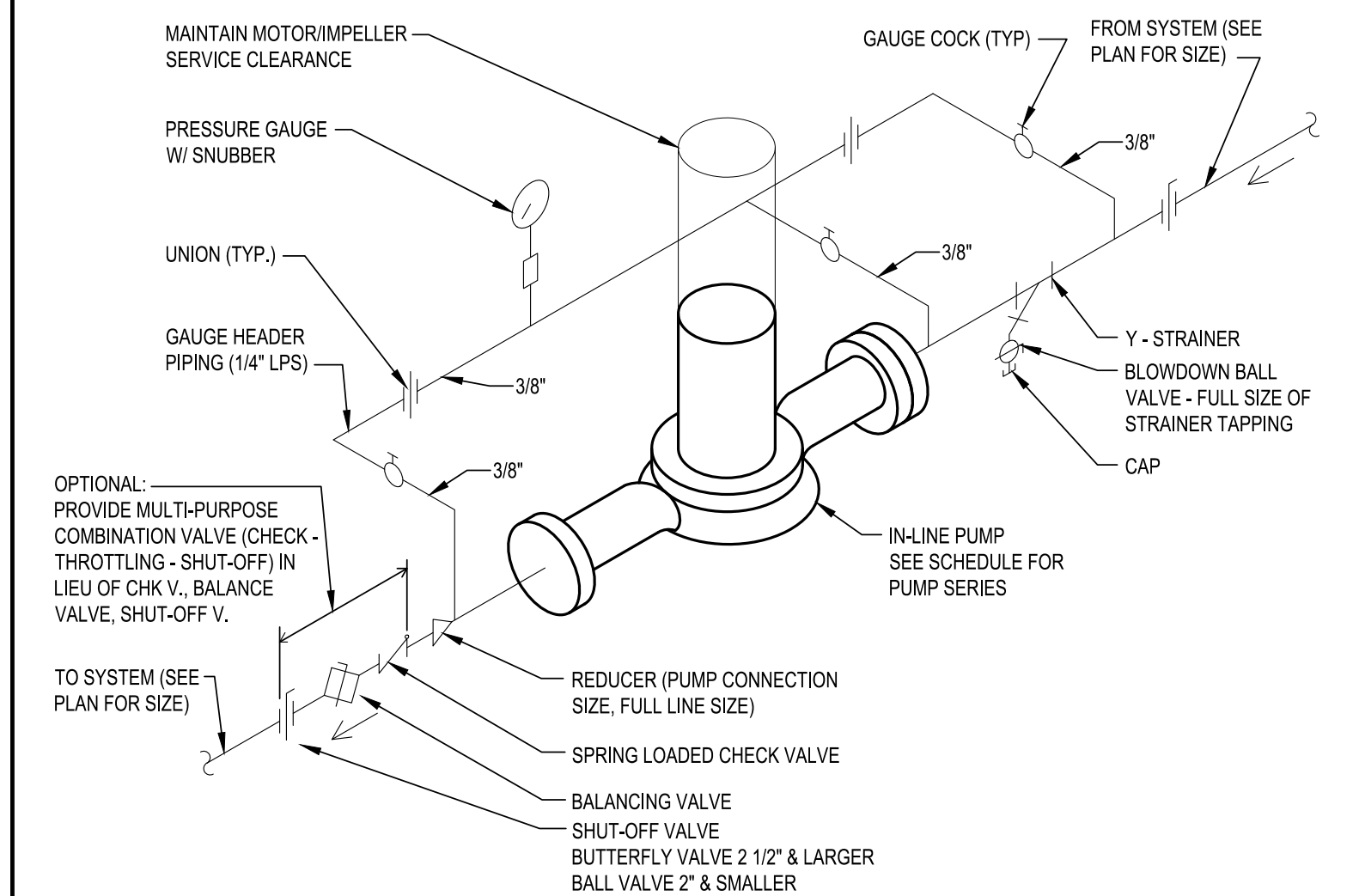
NO SCALE



NOTE: PROVIDE RESILIENT PIPE HANGERS WITHIN 15'-0" OF VIBRATING (ROTATING) EQUIPMENT.

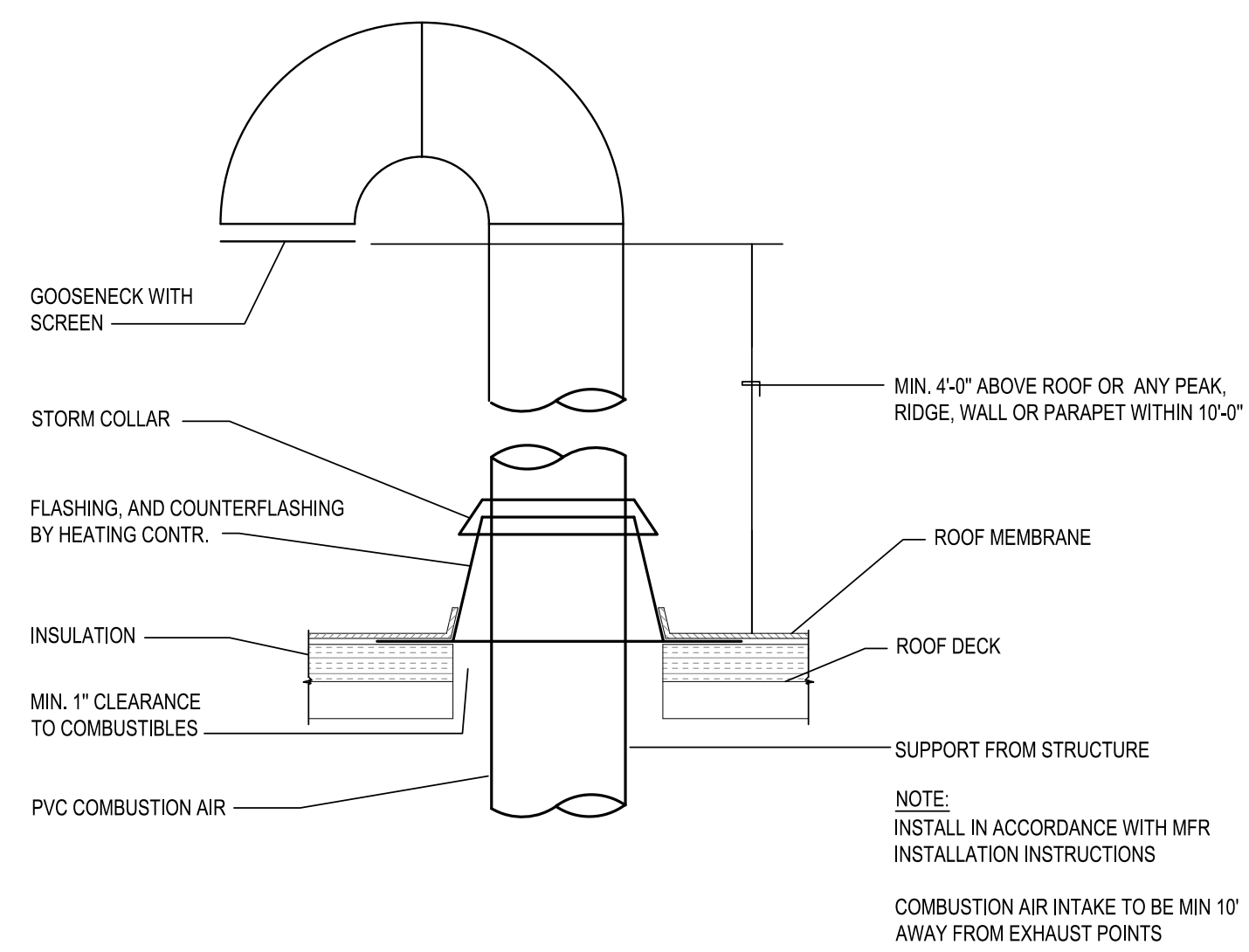
6 TYPICAL PIPE HANGER DETAIL

NO SCALE



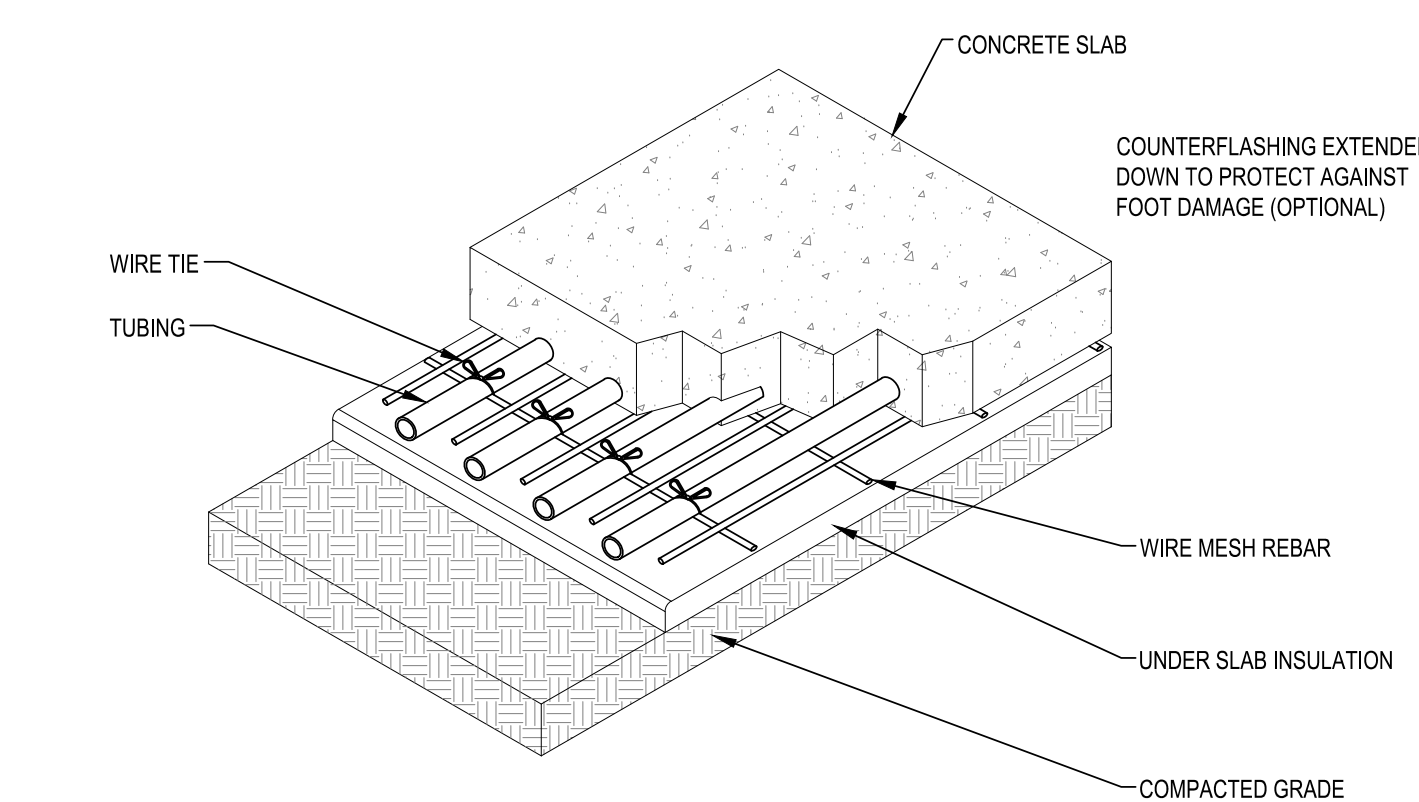
2 IN-LINE PUMP DETAIL

NO SCALE



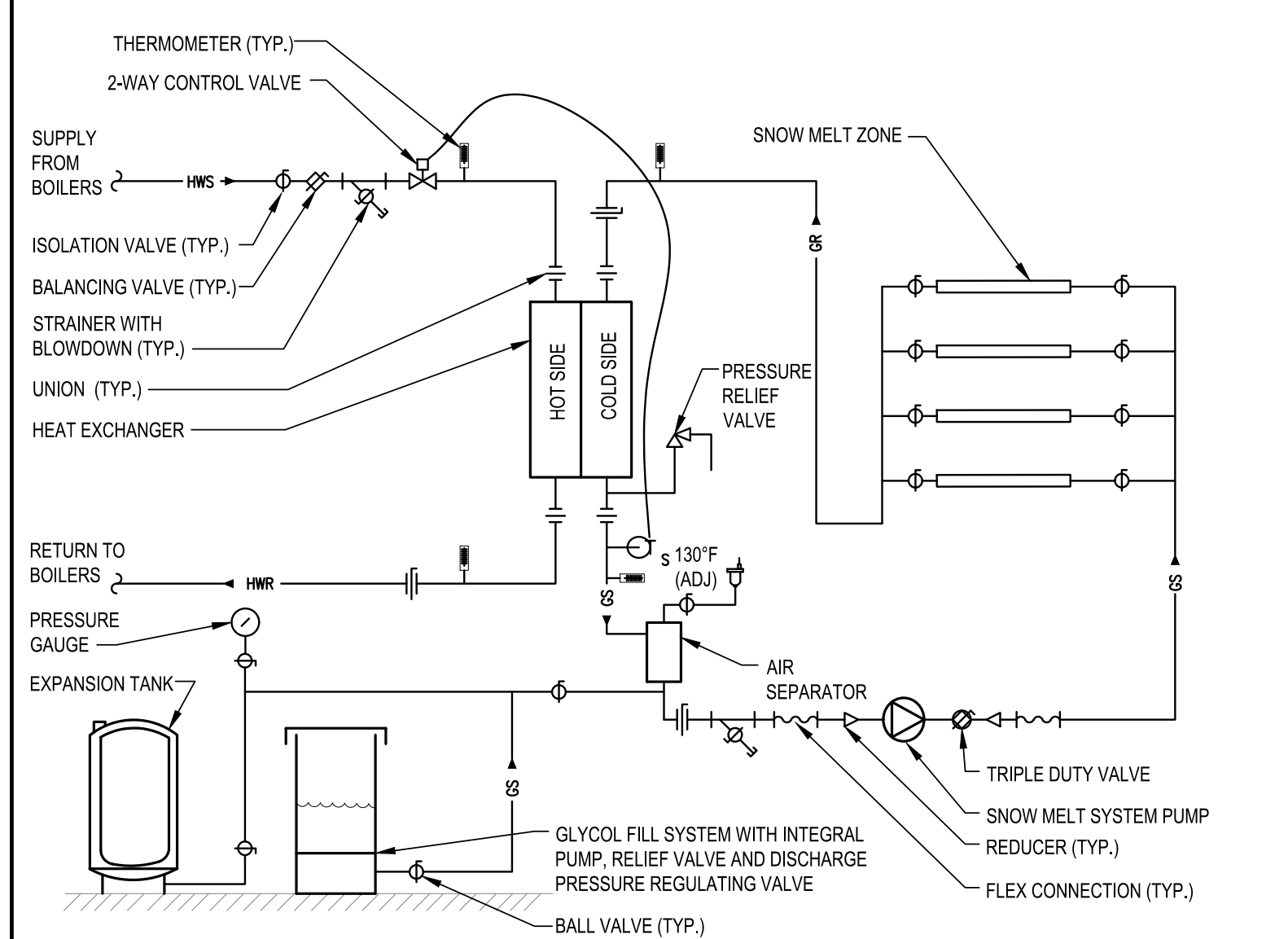
11 TYPICAL COMBUSTION AIR THROUGH ROOF DETAIL

NO SCALE



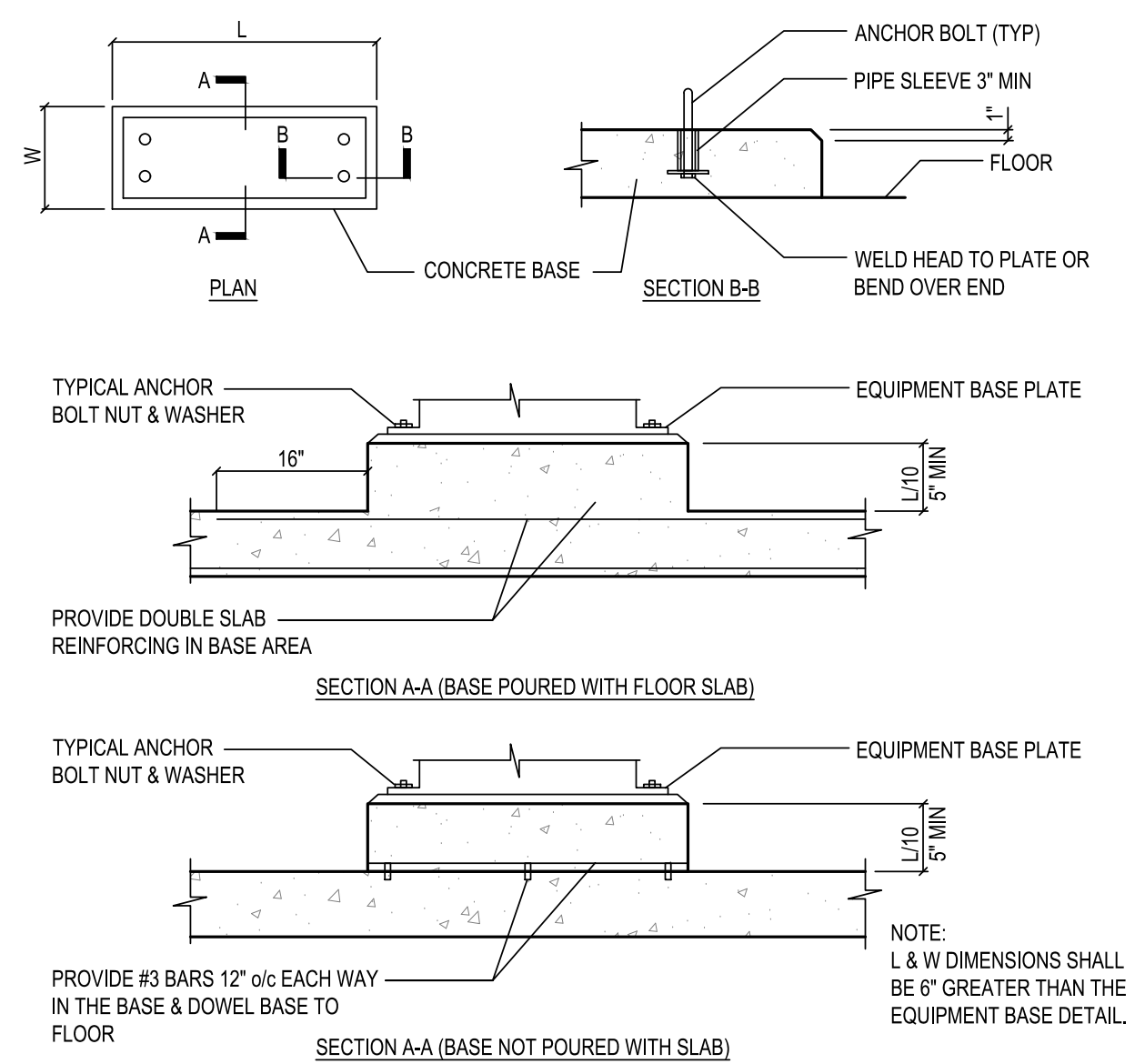
7 SNOW MELT SLAB ON GRADE DETAIL

NO SCALE



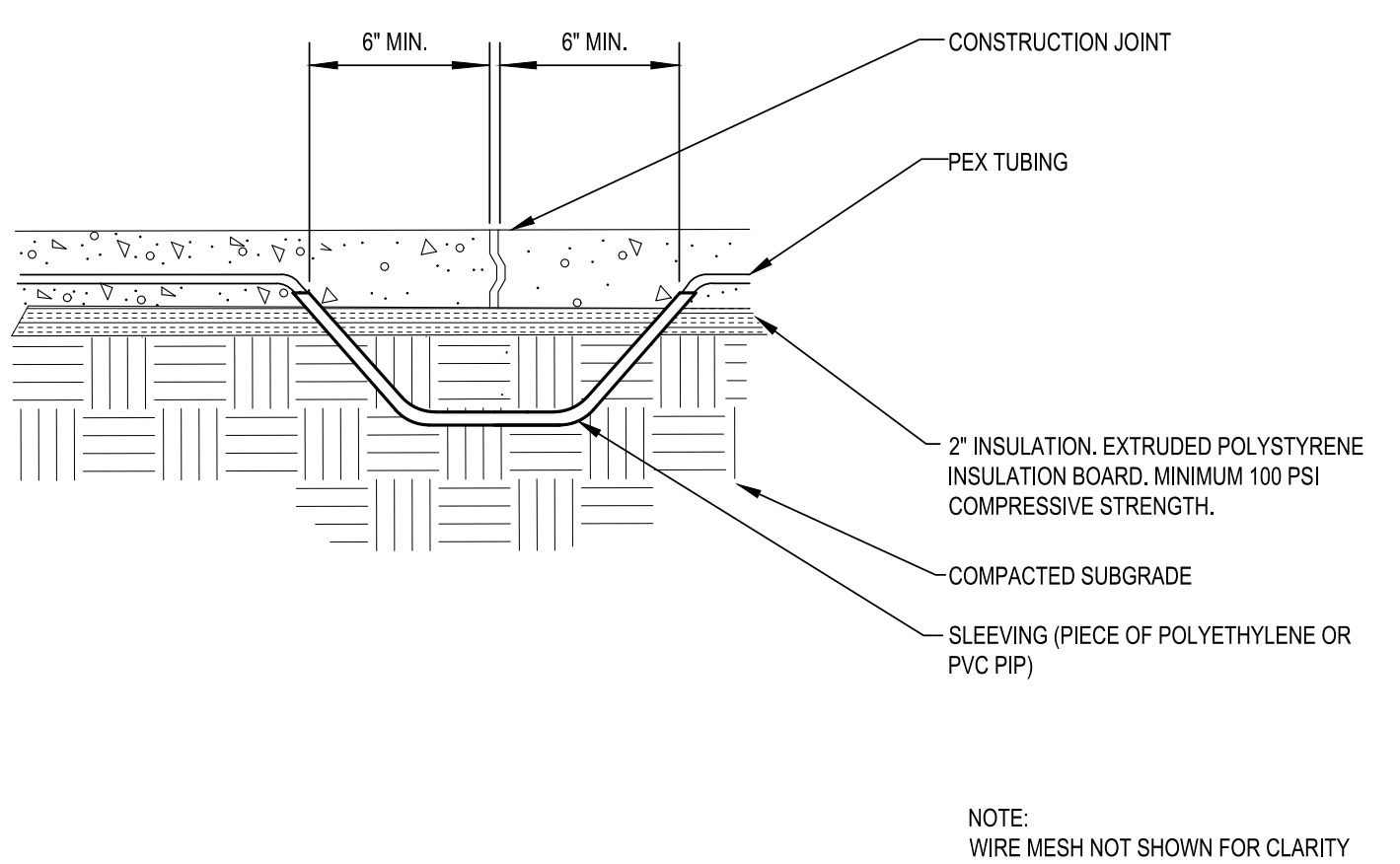
3 SNOW MELT SYSTEM FLOW DIAGRAM

NO SCALE



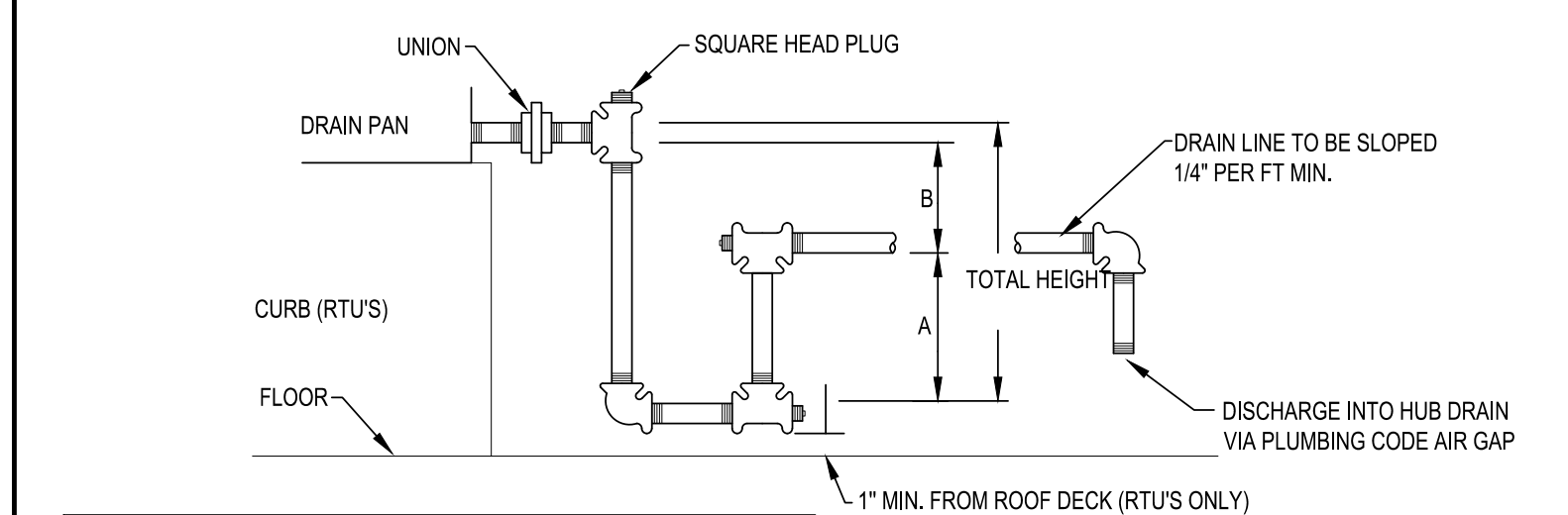
12 CONCRETE EQUIPMENT BASES DETAIL

NO SCALE



8 SNOWMELT PIPING UNDER CONSTRUCTION JOINT DETAIL

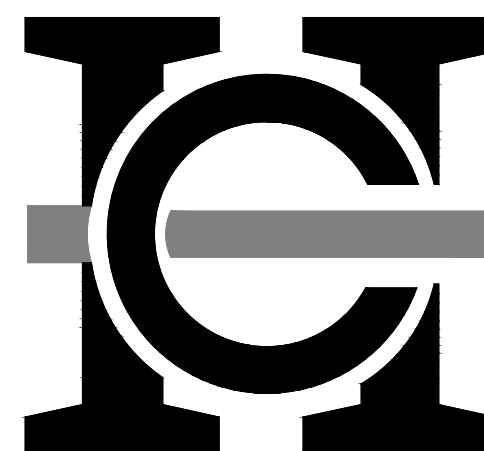
NO SCALE



- NOTES:
1. FILL TRAP MANUALLY ON INITIAL START-UP.
 2. TRAP EACH COMPONENT DRAIN CONNECTION.
 3. PIPE SIZE SHALL NOT BE LESS THAN DRAIN PAN CONNECTION SIZE.
 4. POSITIVE PRESSURE AT DRAIN PAN.
 $A = \text{POS. S.P. ON THE DRAIN PAN} + 2"$
 $B = 1"$
TOTAL HEIGHT OF TRAP = $A+B+(1/2 \times \text{PIPE DIAMETER})$
 5. NEGATIVE PRESSURE AT DRAIN PAN.
 $A = B/2$
 $B = \text{NEED. S.P.} + 2"$
TOTAL HEIGHT OF TRAP = $A+B+(1/2 \times \text{PIPE DIAMETER})$
 6. CONTRACTOR MAY USE STEEL OR COPPER PIPE.
 7. PROVIDE 2" AIR GAP AT DISCHARGE OF DRAIN PIPE.

4 CONDENSATE DRAIN TRAP DETAIL

NO SCALE



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Revisions

Sheet
MECHANICAL
DETAILS

PLAN TRUE
NORTH NORTH
SCALE: NO SCALE

Project
NEW BERLIN SAFETY
BUILDING HVAC
SYSTEM UPDATES
AND SNOW MELT

Date

DECEMBER 23, 2022

Project No.

19-1011.18

Sheet No.

M5.0



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GAS-FIRED HOT WATER BOILER SCHEDULE																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																													
PLAN MARK B-	LOCATION	SERVES	MANUFACTURER	MODEL NO.	TYPE			BURNER DATA				HOT WATER DATA								PRESSURE RELIEF VALVE SETTING (PSIG)	VOLTS/ PHASE	SCCR (KAIC)	ELECTRICAL DATA (60 HZ)														EMERGENCY POWER (YES/NO)	HARDWARE INTERLOCK WITH PLAN MARK NO.	COMMENTS																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
					NON-CONDENSING		CONDENSING	BURNER CAPACITY CONTROL		GAS INPUT (MBH)	GROSS HEATING OUTPUT (MBH)	TYPE		SEALED COMBUSTION		FLOW (GPM)	PRESS. DROP (PT./FD.)	E.W.T. (°F)	L.W.T. (°F)				TREATMENT		VARIABLE FLOW		AMPS				FED FROM		BKR		BR WIRING					DISCONNECT SWITCH																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					
					80% IBR EFFICIENCY	MIN. 87% IBR EFFICIENCY	MIN. 92% IBR EFFICIENCY	MODULATING (3:1 MIN. TURN-DOWN)	ON-OFF 1-STAGE			ATMOSPHERIC	POWER	YES	NO								WATER	GLYCOL (%)	YES	NO	MCA	MOCP	PNL	NO	SIZE	POLE	NO	SIZE	GND	COND				FURN BY	INST. BY	FUSES	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15	R16	R17	R18	R19	R20	R21	R22	R23	R24	R25	R26	R27	R28	R29	R30	R31	R32	R33	R34	R35	R36	R37	R38	R39	R40	R41	R42	R43	R44	R45	R46	R47	R48	R49	R50	R51	R52	R53	R54	R55	R56	R57	R58	R59	R60	R61	R62	R63	R64	R65	R66	R67	R68	R69	R70	R71	R72	R73	R74	R75	R76	R77	R78	R79	R80	R81	R82	R83	R84	R85	R86	R87	R88	R89	R90	R91	R92	R93	R94	R95	R96	R97	R98	R99	R100	R101	R102	R103	R104	R105	R106	R107	R108	R109	R110	R111	R112	R113	R114	R115	R116	R117	R118	R119	R120	R121	R122	R123	R124	R125	R126	R127	R128	R129	R130	R131	R132	R133	R134	R135	R136	R137	R138	R139	R140	R141	R142	R143	R144	R145	R146	R147	R148	R149	R150	R151	R152	R153	R154	R155	R156	R157	R158	R159	R160	R161	R162	R163	R164	R165	R166	R167	R168	R169	R170	R171	R172	R173	R174	R175	R176	R177	R178	R179	R180	R181	R182	R183	R184	R185	R186	R187	R188	R189	R190	R191	R192	R193	R194	R195	R196	R197	R198	R199	R200	R201	R202	R203	R204	R205	R206	R207	R208	R209	R210	R211	R212	R213	R214	R215	R216	R217	R218	R219	R220	R221	R222	R223	R224	R225	R226	R227	R228	R229	R230	R231	R232	R233	R234	R235	R236	R237	R238	R239	R240	R241	R242	R243	R244	R245	R246	R247	R248	R249	R250	R251	R252	R253	R254	R255	R256	R257	R258	R259	R260	R261	R262	R263	R264	R265	R266	R267	R268	R269	R270	R271	R272	R273	R274	R275	R276	R277	R278	R279	R280	R281	R282	R283	R284	R285	R286	R287	R288	R289	R290	R291	R292	R293	R294	R295	R296	R297	R298	R299	R300	R301	R302	R303	R304	R305	R306	R307	R308	R309	R310	R311	R312	R313	R314	R315	R316	R317	R318	R319	R320	R321	R322	R323	R324	R325	R326	R327	R328	R329	R330	R331	R332	R333	R334	R335	R336	R337	R338	R339	R340	R341	R342	R343	R344	R345	R346	R347	R348	R349	R350	R351	R352	R353	R354	R355	R356	R357	R358	R359	R360	R361	R362	R363	R364	R365	R366	R367	R368	R369	R370	R371	R372	R373	R374	R375	R376	R377	R378	R379	R380	R381	R382	R383	R384	R385	R386	R387	R388	R389	R390	R391	R392	R393	R394	R395	R396	R397	R398	R399	R400	R401	R402	R403	R404	R405	R406	R407	R408	R409	R410	R411	R412	R413	R414	R415	R416	R417	R418	R419	R420	R421	R422	R423	R424	R425	R426	R427	R428	R429	R430	R431	R432	R433	R434	R435	R436	R437	R438	R439	R440	R441	R442	R443	R444	R445	R446	R447	R448	R449	R450	R451	R452	R453	R454	R455	R456	R457	R458	R459	R460	R461	R462	R463	R464	R465	R466	R467	R468	R469	R470	R471	R472	R473	R474	R475	R476	R477	R478	R479	R480	R481	R482	R483	R484	R485	R486	R487	R488	R489	R490	R491	R492	R493	R494	R495	R496	R497	R498	R499	R500	R501	R502	R503	R504	R505	R506	R507	R508	R509	R510	R511	R512	R513	R514	R515	R516	R517	R518	R519	R520	R521	R522	R523	R524	R525	R526	R527	R528	R529	R530	R531	R532	R533	R534	R535	R536	R537	R538	R539	R540	R541	R542	R543	R544	R545	R546	R547	R548	R549	R550	R551	R552	R553	R554	R555	R556	R557	R558	R559	R560	R561	R562	R563	R564	R565	R566	R567	R568	R569	R570	R571	R572	R573	R574	R575	R576	R577	R578	R579	R580	R581	R582	R583	R584	R585	R586	R587	R588	R589	R590	R591	R592	R593	R594	R595	R596	R597	R598	R599	R600	R601	R602	R603	R604	R605	R606	R607	R608	R609	R610	R611	R612	R613	R614	R615	R616	R617	R618	R619	R620	R621	R622	R623	R624	R625	R626	R627	R628	R629	R630	R631	R632	R633	R634	R635	R636	R637	R638	R639	R640	R641	R642	R643	R644	R645	R646	R647	R648	R649	R650	R651	R652	R653	R654	R655	R656	R657	R658	R659	R660	R661	R662	R663	R664	R665	R666	R667	R668	R669	R670	R671	R672	R673	R674	R675	R676	R677	R678	R679	R680	R681	R682	R683	R684	R685	R686	R687	R688	R689	R690	R691	R692	R693	R694	R695	R696	R697	R698	R699	R700	R701	R702	R703	R704	R705	R706	R707	R708	R709	R710	R711	R712	R713	R714	R715	R716	R717	R718	R719	R720	R721	R722	R723	R724	R725	R726	R727	R728	R729	R730	R731	R732	R733	R734	R735	R736	R737	R738	R739	R740	R741	R742	R743	R744	R745	R746	R747	R748	R749	R750	R751	R752	R753	R754	R755	R756	R757	R758	R759	R760	R761	R762	R763	R764	R765	R766	R767	R768	R769	R770	R771	R772	R773	R774	R775	R776	R777	R778	R779	R780	R781	R782	R783	R784	R785	R786	R787	R788	R789	R790	R791	R792	R793	R794	R795	R796	R797	R798	R799	R800	R801	R802	R803	R804	R805	R806	R807	R808	R809	R810	R811	R812	R813	R814	R815	R816	R817	R818	R819	R820	R821	R822	R823	R824	R825	R826	R827	R828	R829	R830	R831	R832	R833	R834	R835	R836	R837	R838	R839	R840	R841	R842	R843	R844	R845	R846	R847	R848	R849	R850	R851	R852	R853	R854	R855	R856	R857	R858	R859	R860	R861	R862	R863	R864	R865	R866	R867	R868	R869	R870	R871	R872	R873	R874	R875	R876	R877	R878	R879	R880	R881	R882	R883	R884	R885	R886	R887	R888	R889	R890	R891	R892	R893	R894	R895	R896	R897	R898	R899	R900	R901	R902	R903	R904	R905	R906	R907	R908	R909	R910	R911	R912	R913	R914	R915	R916	R917	R918	R919	R920	R921	R922	R923	R924	R925	R926	R927	R928	R929	R930	R931	R932	R933	R934	R935	R936	R937	R938	R939	R940	R941	R942	R943	R944	R945	R946	R947	R948	R949	R950	R951	R952	R953	R954	R955	R956	R957	R958	R959	R960	R961	R962	R963	R964	R965	R966	R967	R968	R969	R970	R971	R972	R973	R974	R975	R976	R977	R978	R979

E1. EXISTING CIRCUIT BREAKERS IN PANEL NELD MAY BE REUSED.

PUMP SCHEDULE																																												
PLAN MARK E-	LOCATION	SERVES	MANUFACTURER	MODEL	WATER FLOW (GPM)	HEAD (FT)	NPSH (FT)	PUMP EFFIC. (%)	SUCT. (IN.)	DISCH. (IN.)	IMPELLER (IN.)	STARTER DESCRIPTION					ELECTRICAL DATA										EMERGENCY POWER (YES/NO)	HARDWIRE INTERLOCK WITH PLAN MARK NO.	COMMENTS															
												FURNISHED BY	INSTALLED BY	LOCATION	TYPE	COVER MODIFICATION					CONTROLLED BY	HP	BHP	INVERT. DUTY (YES/NO)	PUMP SPEED (RPM)	VOLT/5 PHASE				SCCR (KAIC)	AMPS		FED FROM		BKR		BR WIRING				DISCONNECT SWITCH			
																NEMA RATING	COMB.	BLANK	SS/PB	H.O.A.											P.L.	MCA	MOCP	PNL	NO	SIZE	POLE	NO	SIZE	GND	COND	FURN BY	INST. BY	FUSES
1	22	B-1	TACO	1935E	88	10	3	48	2	2	4.55	M.C.	E.C.	NEAR UNIT	MAG	1	X	-	-	X	X	B-1	0.5	0.45	NO	1750	1201	-	-	-	NELD	13	20	1	2	12	12	12"	M.C.	E.C.	YES	YES	B-1	E1
2	22	B-2	TACO	1935E	88	10	3	48	2	2	4.55	M.C.	E.C.	NEAR UNIT	MAG	1	X	-	-	X	X	B-2	0.5	0.45	NO	1750	1201	-	-	-	NELD	15	20	1	2	12	12	12"	M.C.	E.C.	YES	YES	B-2	E1
3	22	B-3	TACO	1935E	88	10	3	48	2	2	4.55	M.C.	E.C.	NEAR UNIT	MAG	1	X	-	-	X	X	B-3	0.5	0.45	NO	1750	1201	-	-	-	NELD	17	20	1	2	12	12	12"	M.C.	E.C.	YES	YES	B-3	E1
4	22	BUILDING	TACO	2080D	170	70	4	74	2.5	2	9	M.C.	E.C.	SEE PLANS	VFD	1	X	-	-	X	X	DOC	7.5	4.06	YES	1760	4803	-	-	-	NEHA	19,21,23	20	3	3	12	12	12"	M.C.	E.C.	YES	YES	-	E2
5	22	BUILDING	TACO	2080D	170	70	4	74	2.5	2	9	M.C.	E.C.	SEE PLANS	VFD	1	X	-	-	X	X	DOC	7.5	4.06	YES	1760	4803	-	-	-	NEHA	20,22,24	20	3	3	12	12	12"	M.C.	E.C.	YES	YES	-	E2
6	22	EAST RAMP	TACO	1919	23	55	5	37	2	2	7.35	M.C.	E.C.	NEAR UNIT	MAG	1	X	-	-	X	X	DOC	1.5	0.92	NO	1750	4803	-	-	-	NEHA	14,16,18	20	3	3	12	12	12"	M.C.	E.C.	YES	YES	-	E3
7	22	WEST RAMP	TACO	1919	23	55	5	37	2	2	7.35	M.C.	E.C.	NEAR UNIT	MAG	1	X	-	-	X	X	DOC	1.5	0.92	NO	1750	4803	-	-	-	NEHA	14,16,18	20	3	3	12	12	12"	M.C.	E.C.	YES	YES	-	E3
E1. PROVIDE NEW CIRCUIT BREAKERS IN PANEL NELD.																																												
E2. EXISTING CIRCUIT BREAKERS IN PANEL NEHA MAY BE REUSED.																																												
E3. EXISTING SPARE CIRCUIT BREAKER IN PANEL NEHA MAY BE REUSED.																																												

E1. PROVIDE NEW CIRCUIT BREAKERS IN PANEL NELD.

E2. EXISTING CIRCUIT BREAKERS IN PANEL NEHA MAY BE REUSED.

E3. EXISTING SPARE CIRCUIT BREAKER IN PANEL NEHA MAY BE REUSED.

FIXED PLATE HEAT EXCHANGER SCHEDULE																	
PLAN MARK HX-	LOCATION	SYSTEM	MANUFACTURER	MODEL NO.	WATER SIDE					GLYCOL SIDE					COMMENTS		
					FLUID TYPE	INTLET TEMPERATURE	OUTLET TEMPERATURE	FLOW RATE	PRESSURE DROP (FT HD)	PIPE CONNECTION SIZE	FLUID TYPE	INTLET TEMPERATURE	OUTLET TEMPERATURE	FLOW RATE		PRESSURE DROP (FT HD)	PIPE CONNECTION SIZE
1	EAST RAMP	SNOW MELT	TACO	TB12MTG20	WATER	190	160	21	8.3	1 1/4"	40% PROP GLYCOL	90	120	22	9.5	1 1/4"	
2	WEST RAMP	SNOW MELT	TACO	TB12MTG20	WATER	190	160	21	8.3	1 1/4"	40% PROP GLYCOL	90	120	22	9.5	1 1/4"	

AIR SEPARATOR SCHEDULE								
PLAN MARK AS-	LOCATION	SERVES	SIZE (IN.)	WATER FLOW (GPM)	MAX. W.P.D. (FT.)	MANUFACTURER	MODEL NO.	COMMENTS
1	22	HOT WATER	4	170	1	SPROTHERM	VDT400	H1
2	EAST RAMP	GLYCOL	2.5	23	1	SPROTHERM	VDT250	
3	WEST RAMP	GLYCOL	2.5	23	1	SPROTHERM	VDT250	
H1. REUSE EXISTING AIR SERPERATOR								

EXPANSION TANK SCHEDULE									
PLAN MARK ET-	LOCATION	SYSTEM	ACCEPTANCE VOL (GAL)	RELIEF VALVE SETTING (PSIG)	SYSTEM FILL PRESSURE (PSIG)	TANK PRE-CHARGE PRESSURE (PSIG)	MANUFACTURER	MODEL NO.	COMMENTS
1	22	HOT WATER	27	75	12	12	TADO	CBX425-125	H1
2	EAST RAMP	GLYCOL	5	15	12	12	TADO	CM45-125	
3	WEST RAMP	GLYCOL	5	15	12	12	TADO	CM45-125	
H1. REUSE EXISTING EXPANSION TANK									

BALANCING TABLE FOR EXISTING HOT WATER EQUIPMENT					
EQUIPMENT TAG	WATER FLOW (GPM)	EQUIPMENT TAG	WATER FLOW (GPM)	EQUIPMENT TAG	WATER FLOW (GPM)
VAV-1-1	3.9	VAV-2-1	1.4	AHU-1	42.9
VAV-1-2	1.9	VAV-2-2	2	AHU-2	42.9
VAV-1-3	7.0	VAV-3-3	2.8	UH-1	6.00
VAV-1-4	2.0	VAV-2-4	1.4	UH-2	6.00
VAV-1-5	7.0	VAV-3-5	1.7	UH-3	2.00
VAV-1-6	2.2	VAV-2-6	2.5	UH-4	2.00
VAV-1-7	0.5	VAV-2-7	0.9	UH-5	2.00
VAV-1-8	2.2	VAV-2-8	1.6	CUH-1	1.5
VAV-1-9	0.5	VAV-2-9	1	CUH-2	1.0
VAV-1-10	0.5	VAV-2-10	1.4	CUH-3	1.5
VAV-1-11	0.5	VAV-2-11	0.5	CUH-4	1.0
VAV-1-12	0.5	VAV-2-12	0.5	CUH-5	2.0
VAV-1-13	0.5	VAV-2-13	0.5	CUH-6	1.0
VAV-1-14	0.5	VAV-2-14	0.5	CUH-7	1.0
VAV-1-15	0.8	VAV-2-15	0.5	CUH-8	2.0
VAV-1-16	0.5	VAV-2-16	0.5	CUH-9	2.0
VAV-1-17	1.4	VAV-2-17	0.5		
VAV-1-18	0.5	VAV-2-18	0.6		
VAV-1-19	0.5	VAV-2-19	0.5		
VAV-1-20	0.5	VAV-2-20	0.5		
VAV-1-21	0.5	VAV-2-21	0.5		
VAV-1-22	0.5	VAV-2-22	0.5		
VAV-1-23	0.5	VAV-2-23	0.5		
VAV-1-24	0.5	VAV-2-24	0.5		
VAV-1-25	0.5	VAV-2-25	0.5		
VAV-1-26	0.7	VAV-2-26	0.5		
VAV-1-27	0.5	VAV-2-27	0.5		
VAV-1-28	0.5	VAV-2-28	0.5		
VAV-1-29	0.5	VAV-2-29	0.5		
VAV-1-30	0.5	VAV-2-30	0.5		
VAV-1-31	0.5	VAV-2-31	0.5		
VAV-1-32A	1.0	VAV-3-32A	1.6		
VAV-1-32B	2.0	VAV-3-32B	2.1		
VAV-1-33	0.9	VAV-2-33	0.8		
VAV-1-34	0.5	VAV-2-34	1.8		
VAV-1-35	0.5	VAV-2-35	0.7		
VAV-1-36	0.8	VAV-2-36	0.9		
VAV-1-37	0.9	VAV-2-37	0.9		
VAV-1-38	0.5	VAV-2-38	4.8		
VAV-1-39	0.9	VAV-2-39	1.4		

Revisions

Sheet
MECHANICAL
ELECTRICAL
SCHEDULES

PLAN TRUE
NORTH NORTH
SCALE: NO SCALE

Project
NEW BERLIN SAFETY
BUILDING HVAC
SYSTEM UPDATES
AND SNOW MELT

Date

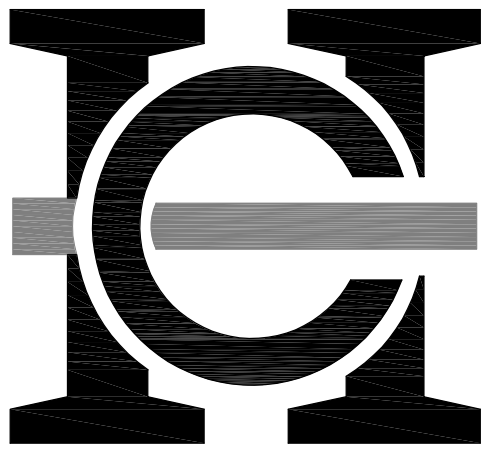
DECEMBER 23, 2022

Project No.

19-1011.18

Sheet No.

ME1.0



HARWOOD
ENGINEERING
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255 North 21st Street Milwaukee Wisconsin 53233
414.475.5554 414.773.9299 fax harwood@hccel.com

SYMBOLS

ANY SYMBOLS UTILIZED ON THE FLOOR PLANS NOT OTHERWISE ON THE SYMBOLS LIST SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEERS PRIOR TO BIDDING FOR CLARIFICATION.

-  AUTOMATIC TRANSFER SWITCH
-  ELECTRICAL DISTRIBUTION PANEL - EXISTING
-  INDICATES DETAIL NUMBER
-  SEE DETAIL
-  INDICATES SHEET NUMBER
-  INDICATES NOTE NUMBER
-  SEE NOTE
-  INDICATES SHEET NUMBER
-  JUNCTION BOX

GENERAL RENOVATION/DEMOLITION NOTES:

1. ELECTRICAL DRAWINGS ARE BASED ON THE BEST INFORMATION AVAILABLE. FOR AREAS BEING REMODELED, WORK SHOWN REFLECTS INFORMATION SHOWN ON AS-BUILT PLANS AND FIELD OBSERVATION; IT IS NOT GUARANTEED 100% ACCURATE. THIS CONTRACTOR MUST FIELD VERIFY CONDITIONS AND MAKE NECESSARY ADJUSTMENTS WITHOUT EXTRA COSTS TO THE PROJECT TO SUIT ACTUAL NEEDS.
2. THE CONTRACTOR SHALL REWIRE/REROUTE/RELOCATE, AS REQUIRED DUE TO CONSTRUCTION, ALL EXISTING CIRCUITS AND EQUIPMENT WHICH ARE TO CONTINUE IN OPERATION.
3. MAINTAIN THE INTEGRITY OF ALL SYSTEMS AFFECTED BY THE REMOVAL OR ADDITION OF ELECTRICAL DEVICES AND CONTROLS IN REMODELED AREAS.
4. ALL ELECTRICAL PANELS SHALL REMAIN IN PLACE AS IS, UNLESS INDICATED OTHERWISE.
5. PROVIDE COMPLETE UPDATED DIRECTORIES FOR ALL PANELS AND SWITCHBOARD AFFECTED BY CONSTRUCTION.
6. EXACT LOCATION OF SPECIAL PURPOSE OUTLETS SHALL BE VERIFIED IN FIELD. VERIFY SPECIFIC WIRING REQUIREMENTS WITH VENDORS' DRAWINGS/INSTRUCTION, COORDINATING ELECTRICAL WORK WITH WORK OF VENDOR AND OTHER TRADES.
7. CLEAN, PRIME AND PAINT ALL EXPOSED CONDUIT TO MATCH ADJACENT AREAS WHEN THE CONDUIT IS IN A FINISHED AREA.
8. FIRE AND/OR SMOKE RATINGS OF WALLS, FLOORS AND CEILINGS SHALL BE MAINTAINED. IF THE INTEGRITY IS SACRIFICED THEN THE BARRIER SHALL BE REPAIRED TO ITS ORIGINAL RATING. ALL PENETRATIONS SHALL BE PROPERLY SEALED.
9. THE CONTRACTOR SHALL NOTE THAT THE EXISTING BUILDING WILL REMAIN IN SERVICE DURING CONSTRUCTION. AREAS OF THE BUILDING WILL BE VACATED FOR SHORT PERIODS AS REQUIRED TO FACILITATE CONSTRUCTION WITH ADVANCED SCHEDULING WITH THE OWNER. PROCEED WITH THE COMPLETION OF THE WORK IN SUCH A MANNER AS TO CAUSE THE LEAST POSSIBLE INTERFERENCE WITH OWNER'S OPERATION. ALL WORK SHALL BE DONE IN A MANNER AND TIME ACCEPTABLE TO OWNER. OUTAGES AND OTHER WORK RENDERING EXISTING EQUIPMENT INOPERATIVE SHALL BE HELD TO A MINIMUM. PRIOR ARRANGEMENTS FOR EACH SHALL BE MADE WITH OWNER AND SHALL BE ACCEPTABLE AS TO TIME AND DURATION. ALL SHUTDOWNS SHALL BE COORDINATED WITH OWNER 4 WEEKS IN ADVANCE. ALL EXISTING SYSTEMS BEING MODIFIED SHALL BE OPERABLE WHEN CONTRACTOR MODIFYING THE SYSTEM IS NOT ON-SITE. SOME SWITCH OVERTS AND SHUTDOWNS MUST BE DONE AFTER NORMAL BUSINESS HOURS/WEEKENDS.
10. THE CONTRACTOR SHALL DO THE NECESSARY DEMOLITION WORK IN THE AFFECTED AREAS. IN ADDITION, PRECEDING DEMOLITION WORK, THEY SHALL DE-ENERGIZE ALL CIRCUITS IN THE AFFECTED AREAS AND WHERE WIRING IS ROUTED THROUGH THESE AREAS SERVING AREAS OF THE BUILDING REMAINING IN SERVICE, PROVIDE TEMPORARY AND/OR PERMANENT WIRING AS REQUIRED. ALSO, WHERE NECESSARY TO MAINTAIN SERVICE IN OTHER AREAS, PROVIDE NECESSARY AND REQUIRED SOURCES OF POWER AND TEMPORARY WIRING. REMOVE ALL CONDUIT AND WIRING OF EQUIPMENT BEING REMOVED AND/OR ABANDONED BACK TO SOURCE. REMOVE ALL LOW-VOLTAGE CABLES NOT BEING REUSED.
11. ANY EXISTING CODE VIOLATIONS CONCEALED DURING PRE-BID WALK THROUGH SHALL BE BROUGHT TO ENGINEER AND OWNER'S ATTENTION FOR EVALUATION. ANY EXISTING CODE VIOLATIONS EXPOSED TO VIEW SHALL BE THE RESPONSIBILITY OF THE E.C. TO CORRECT AT NO ADDITIONAL CHARGE TO OWNER.
12. ALL NEW CIRCUIT BREAKERS BEING INSTALLED IN EXISTING PANELS SHALL MATCH EXISTING BREAKERS INCLUDING AIC RATINGS.

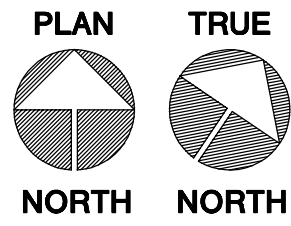
THE "ME SHEET IS PART OF THE ELECTRICAL DRAWING SET. REFER TO DRAWING FOR ELECTRICAL INFORMATION SUCH AS BUT NO LIMITED TO CIRCUIT BREAKER SIZES AND QUANTITIES, WIRE SIZE, CONDUIT SIZE, ETC.

ABBREVIATIONS

A/E	ARCHITECT/ENGINEER	I	INSTALLED
AF	AMP FUSE	IU	INTEGRAL TO UNIT
AFC	AVAILABLE FAULT CURRENT	KW	KILOWATT
AFF	ABOVE FINISHED FLOOR	LIG	LAY-IN GRID
ARCH	ARCHITECT	LOC	LOCATION
AFG	ABOVE FINAL GRADE	LTG	LIGHTING
AR	AS REQUIRED	MAG	MAGNETIC STARTER
AS	AMP SWITCH	MAN	MANUAL STARTER
B	JUNCTION BOX	MC	MECHANICAL CONTRACTOR
BKR	BREAKER	MCB	MAIN CIRCUIT BREAKER
BFG	BELOW FINAL GRADE	MLO	MAIN LUGS ONLY
C	MOUNTED 6" ABOVE COUNTER	MSB	MAIN SWITCHBOARD
CAB	CABINET	MTD	MOUNTED
CB	CIRCUIT BREAKER	NU	NEAR UNIT
cd	CANDELA	NIC	NOT IN CONTRACT
CKT	CIRCUIT	O	OTHERS
CLG	CEILING	OC	ON CENTER
COMB	COMBINATION STARTER W/DISCONNECT SWITCH	ORS	OVER RIDE SWITCH
CONC	CONCRETE	OU	ON UNIT
CP	CONTROL PANEL	P	POLE
CS	COMBINATION STARTER/DISC. SWITCH	PC	PHOTOCELL
D	DISCONNECT SWITCH	PEND	PENDANT
DISC	DISCONNECT SWITCH	PLBG	PLUMBING CONTRACTOR
DN	DOWN	PNL	PANEL
DNLT	DOWN LIGHT	PB	PUSH-BUTTON
EW	ELECTRIC WATER COOLER	P	RECEIPTABLE
E.C	ELECTRICAL CONTRACTOR	REC	RECESSED
ELEV	ELEVATION	SS	SWITCH STATION
EMT	ELECTRICAL METALLIC TUBING	SURF	SURFACE
ENT	ELECTRICAL NON-METALLIC TUBING	SUSP	SUSPENDED
ER	EXISTING TO BE REMOVED	SW	SWITCH
EXP	EXPOSED	TC	TIME CLOCK
EXR	EXISTING EQUIPMENT TO BE REPLACED IN CURRENT LOCATION	TCC	TEMPERATURE CONTROL CONTRACTOR
EXT	EXISTING TO BE RELOCATED	TYP	TYPICAL
EX	EXISTING TO REMAIN AS IS	UM	UNIT MANUFACTURER
F	FURNISHED	VER	VERIFY
FIXT	FIXTURE	VFD	VARIABLE FREQUENCY DRIVE
FLUOR	FLUORESCENT	W	WIRED
G.C.	GENERAL CONTRACTOR	WP	WEATHERPROOF
GFI	GROUND FAULT INTERRUPTING	XFMR	TRANSFORMER
GRC	GALVANIZED RIGID CONDUIT		
GYP	GYPSON BOARD		
HDA	HAND-OFF-AUTO SELECTOR SWITCH		
HP	HORSEPOWER		
HVAC	HEATING, VENTILATING, AND		
HV	AIR CONDITIONING CONTRACTOR		
HW	HEAVYWALL		

Sheet

SYMBOLS, ABBREVIATIONS AND NOTES



NORTH

NORTH

SCALE:

Project

NEW BERLIN SAFETY BUILDING HVAC SYSTEM UPDATES AND SNOW MELT

Date

DECEMBER 23, 2022

Project No.

19-1011.18

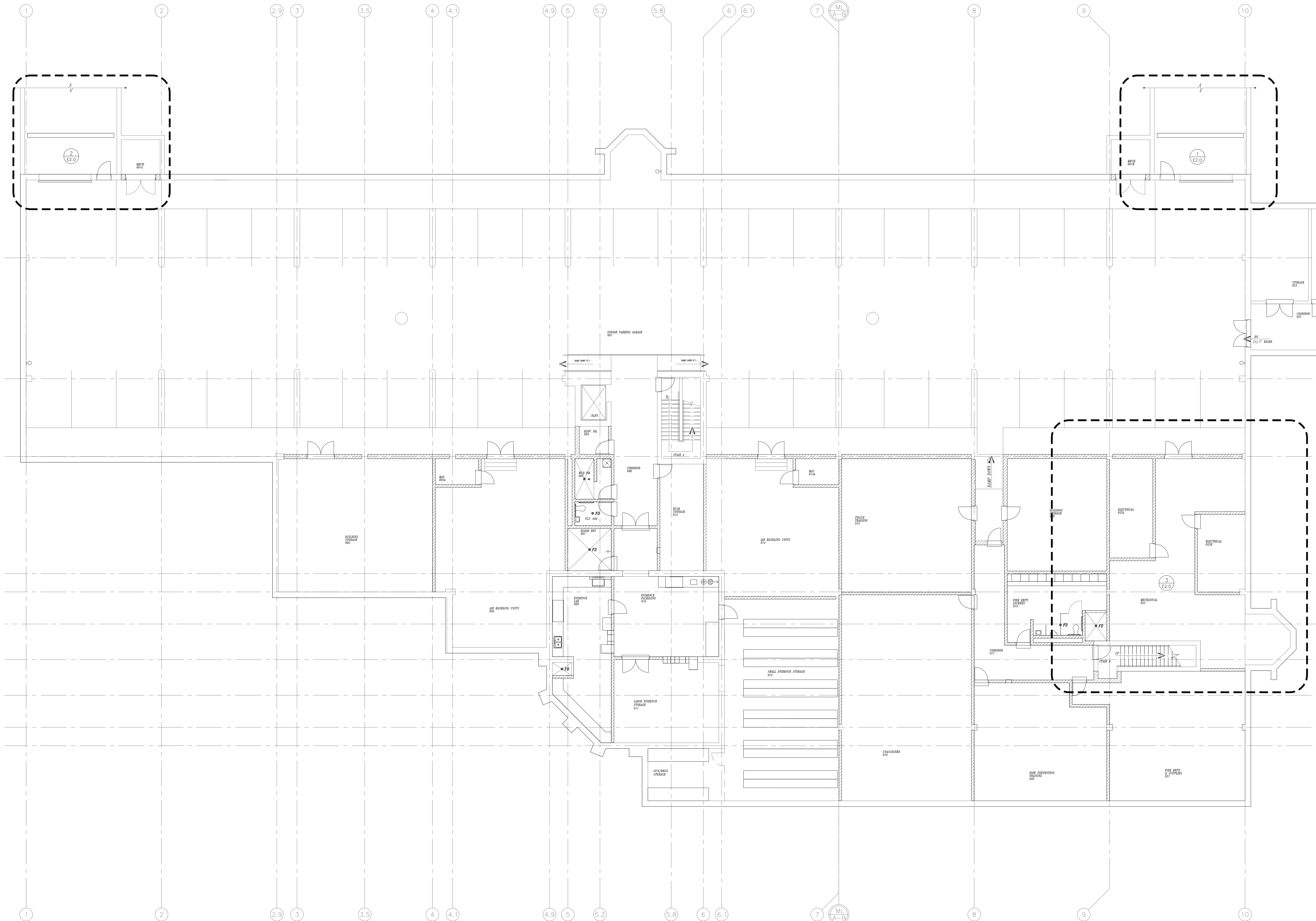
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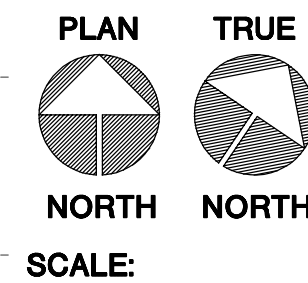
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414.473.5554 414.773.9299 fax harwood@hecl.com



Revisions

Sheet

**ELECTRICAL
OVERALL PLAN -
LOWER LEVEL**



Project

**NEW BERLIN SAFETY
BUILDING HVAC
SYSTEM UPDATES
AND SNOW MELT**

Date

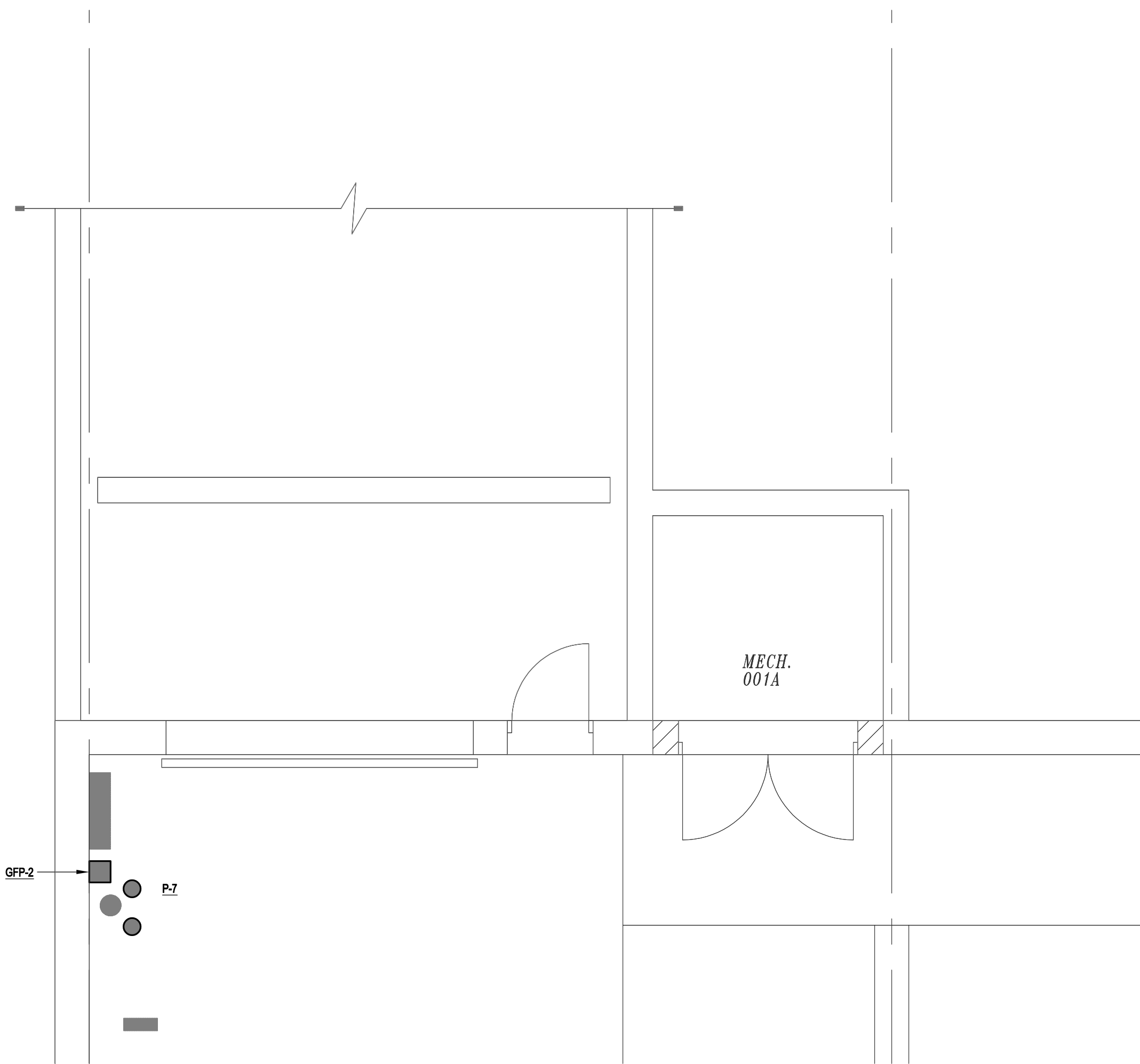
DECEMBER 23, 2022

Project No.

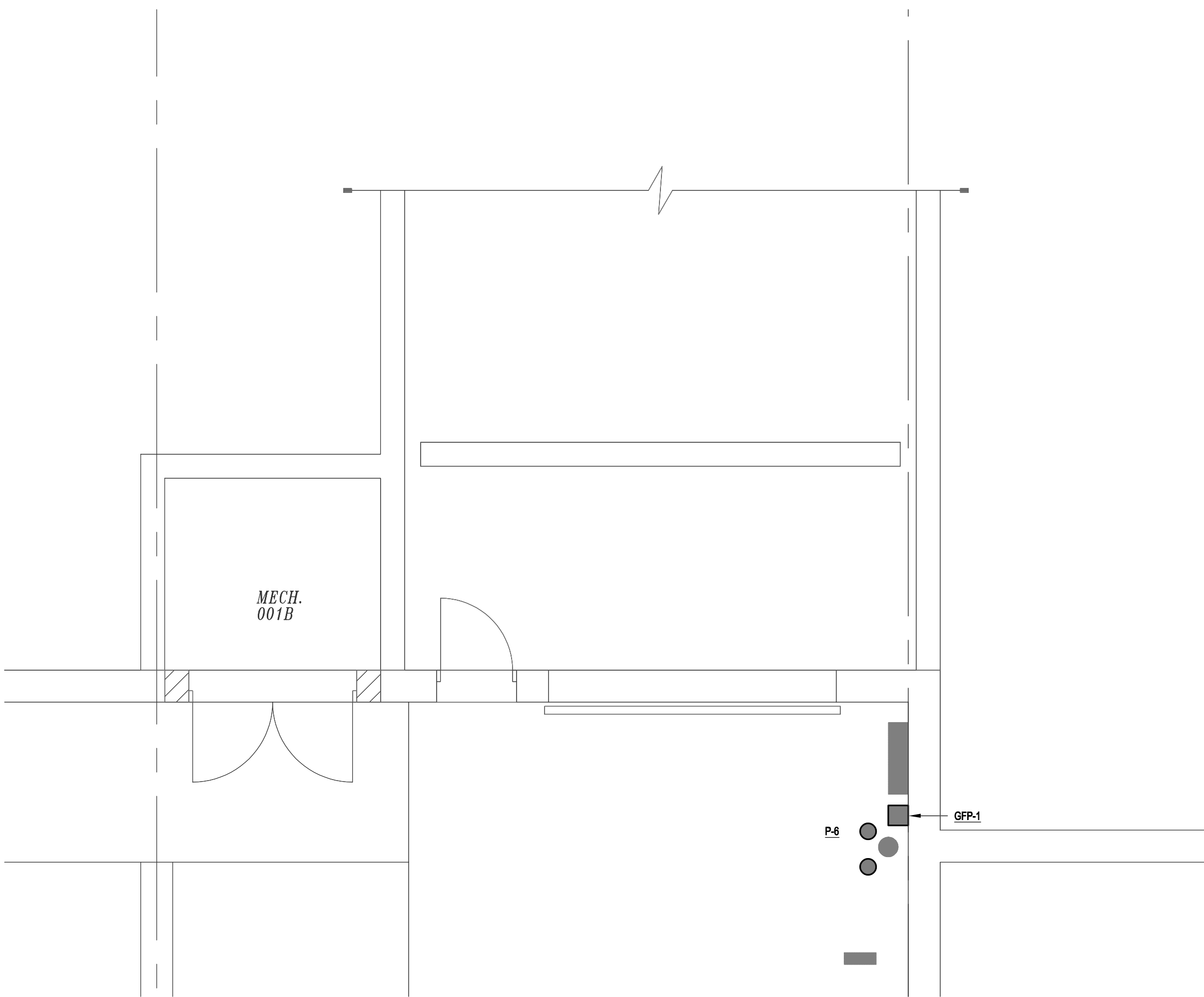
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E1.0



2 ENLARGED ELECTRICAL PLAN - WEST RAMP
1/4"=1'-0"



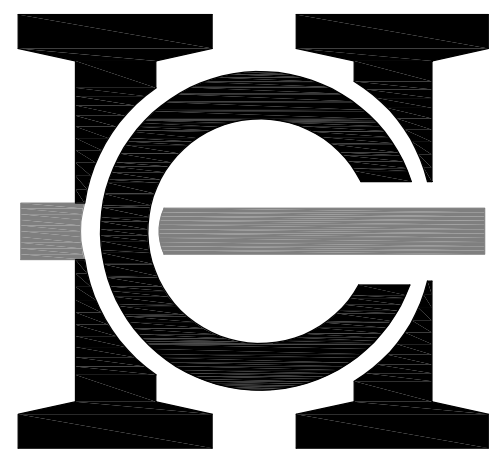
1 ENLARGED ELECTRICAL PLAN - EAST RAMP
1/4"=1'-0"

PLAN NOTES:

- EXISTING MANUAL TRANSFER SWITCH "TSHA" SHALL BE REPLACED WITH A NEW "AUTOMATIC" TRANSFER SWITCH IN THE SAME LOCATION. EXISTING "MTS" IS AN ASCO SERIES 386. EXTEND EXISTING FEEDERS AND CONTROL WIRING AS NEEDED TO NEW LUG LOCATIONS.
- PROVIDE NEW CIRCUIT BREAKERS AS INDICATED ON THE ME1.0 SHEET. NOTE THAT THERE ARE ALSO NOTES ABOUT REUSING EXISTING CIRCUIT BREAKERS.
- PROVIDE A NEW 20A/1P CIRCUIT BREAKER IN PANEL NEL/D TO SERVE THE HEAT EXCHANGER AND CIRCULATING PUMP. (2-#12, #12/ND, 1/2" C)
- REVISE EXISTING SMOKE AND HEAT DETECTORS IN THIS AREA TO ACCOMMODATE NEW BOILER AND PIPING INSTALLATION. COORDINATE WITH HVAC CONTRACTOR.

GENERAL NOTES:

- THE BUILDING WILL REMAIN IN OPERATION DURING CONSTRUCTION. SCHEDULE ALL OUTAGES WITH THE OWNER AT LEAST 4 WEEKS IN ADVANCE. THE CITY OWNED PORTABLE GENERATOR SHALL BE IN CLOSE PROXIMITY WHEN THIS WORK TAKES PLACE.



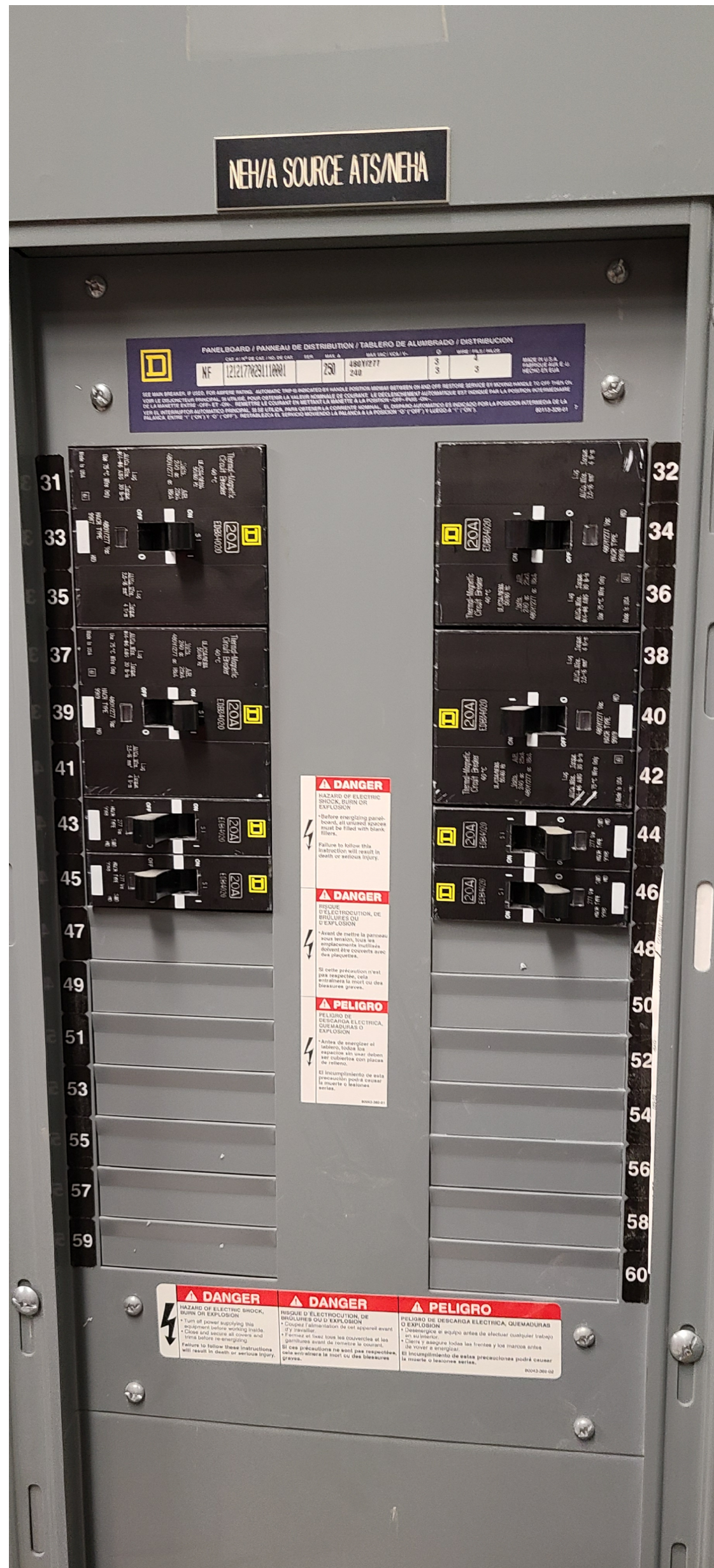
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Revisions



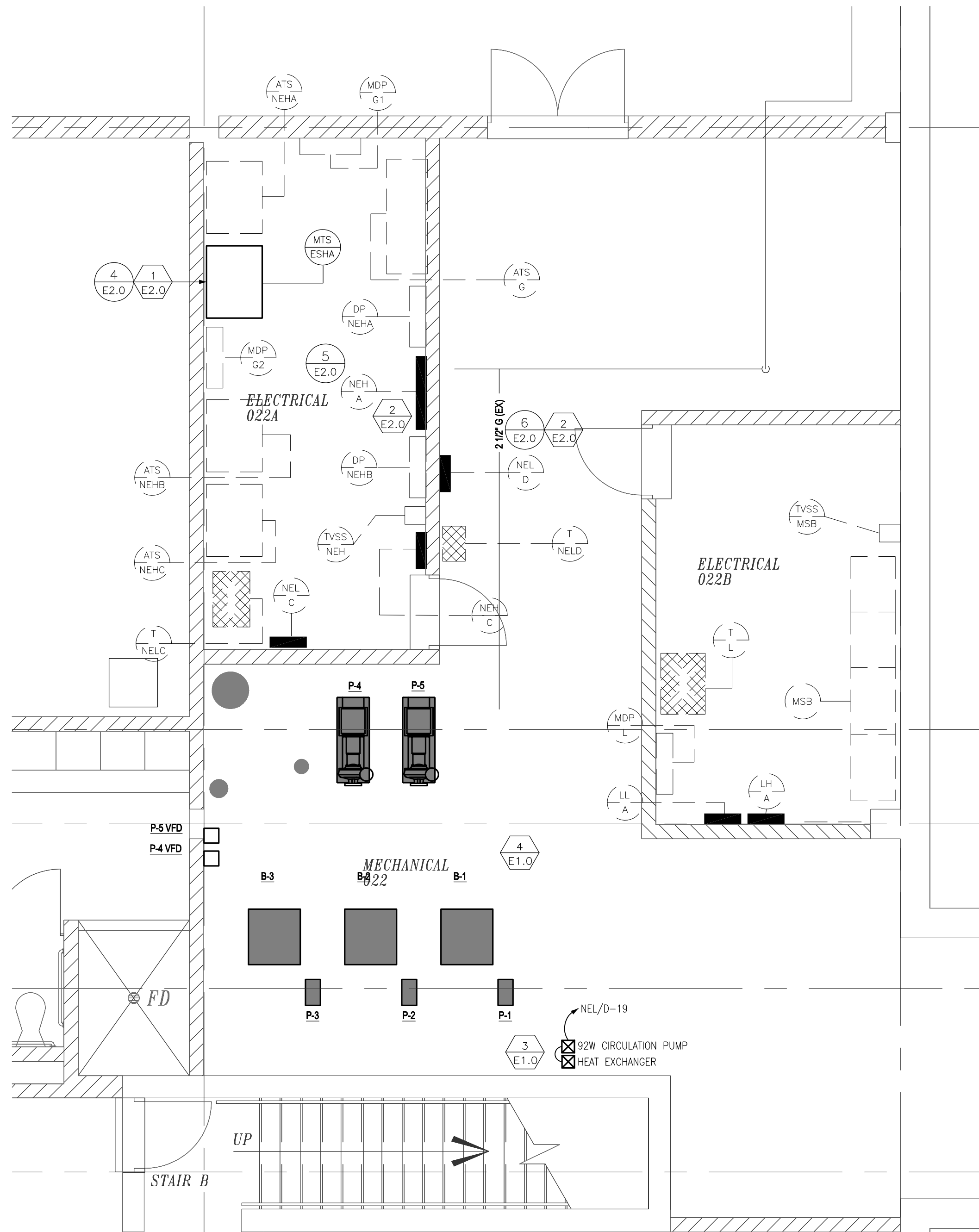
6 EXISTING PANELBOARD "NEL/D"
SCALE: NTS



5 EXISTING PANELBOARD "NEHA"
SCALE: NTS



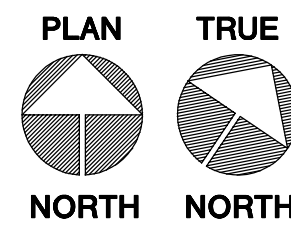
4 EXISTING MANUAL TRANSFER SWITCH "NEHA"
SCALE: NTS



3 ENLARGED ELECTRICAL PLAN - BOILER ROOM NEW WORK
1/4"=1'-0"

Sheet

ELECTRICAL
ENLARGED PLANS -
LOWER LEVEL



SCALE:

Project

NEW BERLIN SAFETY
BUILDING HVAC
SYSTEM UPDATES
AND SNOW MELT

Date

DECEMBER 23, 2022

Project No.

19-1011.18

Sheet No.

E2.0

New Berlin Safety Building – Boiler Replacement
Quest CDN – 8356382
16300 W. National Ave, New Berlin, WI 53151

BID FORM

1. **GENERAL DIRECTIONS TO BIDDERS**

- A. All Bids must be submitted on these standard form sheets inclusive without modification. Fill out all blanks on the Bid Form by typing or writing in ink. Sign in ink. Erasures or other changes in Bid must be explained or noted over signature of Bidder. Enter Bid amount in both written words and printed figures in spaces provided on Bid Form. In case of conflict, amount given in written words will govern.
- B. Base Bid(s) must be for Work bid in strict accordance with the Drawings and Specifications. **INCLUDE BOND COSTS IN THE BASE BID(S).** Bid all requested Alternates. If no change to the Base Bid applies, enter "No Change."
- C. Bid Forms containing qualifications, conditions, omissions, unexplained erasures, alterations or items not called for in Bid Form or other irregularities of any kind may be rejected at the discretion of the Owner.
- D. Bidders shall examine the provisions of the Project Manual thoroughly to ensure compliance with all bidding requirements.
- E. Bidders shall only submit the Bid Forms included in the Project Manual – DO NOT return the Project Manual.
- F. Bidders shall ensure that all items in the Bid Form such as Work Schedule, Bidders Official Title and Signature, and Proof of Responsibility are properly executed.
- G. A bid must be accompanied by a bid security made payable to Owner in an amount of 5% of bidder's maximum bid price (determined by adding the base bid and all alternates), and in the form of a certified check, bank money order or a bid bond issued by a surety acceptable to the City. The bid security will be retained by the City until the City awards the contract to such bidder and such bidder has executed the contract documents and met the other conditions of the Notice of Award, where upon the bid security will be released. If the successful bidder fails to execute and deliver the contract documents and furnish the requirements contract security within 15 days after the Notice of Award, the Owner may consider the bidder to be in default and annul the Notice of Award and the bid security of that bidder will be forfeited. Such forfeiture shall be the Owner's exclusive remedy if the bidder defaults.

- H. The Bidder shall be required to identify any subcontractor, suppliers, individuals or entities to be submitted to the Owner 14 days in advance of the City's acceptance of the agreement. The apparent successful bidder shall, within 5 days after the bid opening, submit to the Owner a list of all such subcontractors, suppliers, individuals or other entities that will be utilized in the completion of the work. An experience statement with pertinent information regarding similar projects and other evidence of qualification for the work that the subcontractor will be performing is required. If the Owner, after review of such information, determines, in its sole discretion, that such subcontractor, supplier, individual or entity is not satisfactory, the Owner, prior to the Notice of Award, shall give notice to the successful bidder requiring that an acceptable substitute be provided. In the event there is any adjustment to the cost as a result of said substitution, Owner may take that into consideration in making the contract award. In the event that the contractor fails to make the substitution requested, the Owner may award the contract to the next lowest responsive responsible bidder.
- I. Bids not conforming to the above directions may be declared irregular and are subject to disqualification at the discretion of the Owner.

THE BIDDER HEREBY AGREES THAT THIS BID IS INVALID WITHOUT BIDDER'S SIGNATURE APPEARING IN THE SIGNATURE BLOCK ON THE LAST PAGE OF THIS BID FORM.

2. BID SUBMITTAL PROCEDURE

In submitting a Bid, the Bidder represents that:

- He/She thoroughly reviewed and understood the Bidding and Contract Documents and the Bid is made in full accordance with these documents and amendments issued thereto.
- He/She has thoroughly reviewed and understands the Bidding and Contract Documents related to the Work of other portions of the Project, if any, being bid concurrently or presently under construction.
- He/She has thoroughly reviewed informational reports and documents available to him/her, visited the project site, become familiar with actual local conditions under which the Work is to be performed and has correlated his/her evaluations and personal observations with the requirements of the Bidding and Contract Documents.
- The contract for the work, if awarded, will be on the basis of materials and equipment specified or described in the bidding documents, and those or equal or substitute or materials and equipment subsequently approved by the Owner prior to the submittal of bids and identified by addendum. No item of material or equipment will be considered by Owner as an or equal or substitute unless written requests for approval has been submitted by the bidder and has been received by the Owner at least 10 days prior to the date of receipt of bids in the case of a proposed substitute. The burden of proof on the merit of the proposed item is upon the bidder. The Owner's decision of approval or disapproval of a proposed item will be final. If the Owner approves any such proposed items, such approval will be set forth as an addendum issued to all perspective bidders. Bidder shall not rely upon approvals made in any other manner. All prices

that Bidder sets forth in this bid shall be based on the presumption that the contractor will furnish the materials and equipment specified or described in the bidding documents as supplemented by any addenda.

- A. After Bid Forms are completed, place one (1) set of signed originals and the Bid Bond in a sealed envelope. Oral, telephonic, e-mailed, or faxed Bids are invalid and will not be considered.
- B. Address the envelope to:
New Berlin Safety Boiler HVAC Replacement
Buildings and Grounds
3805 S Casper Dr
New Berlin, WI 53151
- C. Bidders shall affix their name and address to the front upper left-hand corner of the envelope with the words "Sealed Bid Enclosed" written on the outside. Identified in lower left corner should be: Bid number, project name and opening date.

3. BID CLOSING

- A. Bids must be received on or before ~~9:00 a.m. on February 1, 2023~~ 11:00 a.m. on March 1, 2023. The Bidder assumes full responsibility for timely delivery at the location designated for receipt of Bids. **Bids received after the time and date for receipt of Bids will be rejected and returned unopened.**

4. BID OPENING

- A. Bids will be publicly read at ~~9:00 a.m. on February 1, 2023~~ 11:00 a.m. on March 1, 2023 in the New Berlin City Hall – Common Council Chambers.

(a corporation)

We Southport Engineered Systems, LLC

~~(a partnership)~~

~~(an individual)~~

(Cross out inapplicable)

Of Caledonia, Racine, WI 53108

Street

City

County

State

Zip

hereby agree to execute the proposed Contract and to furnish a satisfactory Public Improvement Performance/Labor and Material Payment Bond, in the amount of one hundred percent (100%), and to provide all labor and material required for the construction of the designated Work, for the prices hereinafter set forth, in strict accordance with the Construction Documents released by: **City of New Berlin**, address: 3805 S. Casper Dr, New Berlin, WI dated January 11, 2023.

Including Amendment Nbr(s). 2 dated 02/20/2023.

5. BASE BID

Base Bid includes all work required to complete the Project, including Building Permits, General Conditions, overhead, profit, insurance, bonds, taxes, and all other expenses. Bid Guarantee ten percent (10%) Bid Bond Cost, Public Improvement Performance Bond and Labor and Materials Payment Bond Cost one hundred percent (100 %) for the sum of:

Eight Hundred Seventy four thousand Dollars (\$ 874,000)

6. ALTERNATE BID "1"

Alternate Bid "1" includes all expenses to remove the abandoned fan coils and condensing units as described.

Add to Base Bid the

Four thousand Four hundred Dollars (\$ 4,400)

7. ALTERNATE BID "2"

Alternate Bid "2" includes the expenses to replace ~~an~~ existing VAV control valve as described.

Add to Base Bid

Twenty Four thousand nine hundred Dollars (\$ 24,900)

8. ALTERNATE BID "3"

Alternate Bid "3" includes the expenses to replace/ install insulation as described.

Add to Base Bid

Five thousand Dollars (\$ 5,000)

9. ALTERNATE BID "4"

Alternate Bid "4" includes the expenses provide 10-year extended warranty on all mechanically grooved couplings and gaskets as described.

Add to Base Bid

No bid Dollars (\$ No bid)

10. SCHEDULE OF VALUES

- A. Submit schedule of standard rates for all personnel, including personnel of subcontractors, involved with project. All \$99/hr except controls \$130/hr
Markups: 20% materials 10% Equip & Subs

B. Include schedule of standard markups.

11. COMMENCEMENT, PROGRESS AND COMPLETION OF WORK

A. If written Notice of Intent to Award Contract is issued not later than February 14, 2023 with a Project commencement of February 20, 2023, can you complete the Work in compliance with the requirements of the Contract Documents by September 15, 2023, in full cooperation and coordination with other Contractors, if any.

Yes ☒ No ☐.

If "No", state additional calendar days required _____.

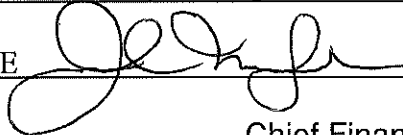
B. The undersigned understands that time is of the essence and agrees that the specified time period for completion stated above is a reasonable time for the completion of the Work. All time limits shall be binding.

12. BID ACCEPTANCE:

A. All Bids as stated above are effective and open for acceptance by the Owner for a period of ninety (90) days after date set for opening of Bids.

FIRM NAME Southport Engineered Systems

BY SIGNATURE



TITLE Chief Financial Officer

DATED March 1, 2023

TELEPHONE 262-515-3422

FAX NBR 262-835-9750

EMAIL ADDRESS: cjohnson@southportengsys.com

If a corporation, answer the following:

Incorporated under laws of what state?

SEAL _____ (If Bid is by Corporation)

New Berlin Safety Boiler Project

Company	Base Bid	Bid Bond	Addendum 1	Addendum 2	Alt 1	Alt 2	Alt 3	Alt 4
Southport Heating	\$874,000.00	X	X	X	\$4,400	\$24,900	\$5,000	No Bid

Alt 1 - Remove abandoned fan coils and condensing units

Alt 2 - Replace VAV Control valves

Alt 3 - Repace/Install insulation

Alt 4 - 10 year warranty on mechanically grooved couplings and gaskets



REQUESTED ACTION STATEMENT

DATE: March 7, 2023

TO: Mayor
Common Council
Parks, Buildings and Grounds Commission

FROM: Josh Radomski – Director of Public Works

ISSUE: Safety Building Boiler Replacement

REQUESTED:

Recommend Council to award the Safety Building Boiler Replacement Project to the lowest, responsive and responsible bidder, Southport Engineered Systems, Inc.

FISCAL IMPACT:

Monies to come from the Safety Building Boiler Project account #04251300-61507-C2021 for the contract amount of \$908,300 including Alternates 1, 2 and 3 with a 2% contingency of \$15,700 for a total construction cost of \$926,000. We are working with the contractor on a couple of potential cost saving options which will increase our total contingency to a more reasonable amount.

RATIONALE:

Southport Engineered Systems, Inc. was the lowest, responsive and responsible bidder for this project.

***GENERAL INSTRUCTIONS TO BIDDERS
AND
SPECIFICATIONS FOR
ROOF PROJECT***



***2023 SAFETY BUILDING & FIRE STATION 1
BUILDING ENVELOPE PROJECT***

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INVITATION TO BID

Project: **2023 Safety Building & Fire Station 1 Building Envelope Project**
16300 W National Ave, New Berlin, WI 53151

1. Bids will be prepared in accordance with Contract Documents prepared by *The Garland Company*, Phone (920) 309-2179, 6710 W Wisconsin Ave, Wauwatosa, WI, and dated February 8th, 2023.
2. Notice is hereby given that sealed Bids are due in the New Berlin City Hall – City Clerk office, by 10:00 A.M. CST/CDT on March 2nd, 2023. (Reference Bid Form, Item 2)
3. Bids will be publicly read at 10:00 A.M. on March 2nd, 2023 in the Council Chambers at New Berlin City Hall located at 3805 S. Casper Drive, New Berlin, WI.
4. Oral, faxed or e-mailed Bids will be rejected.
5. All blanks on the Bid Form shall be filled in by typewriter print or manually in ink. If the filled areas are illegible, the Bid shall be rejected. The Bidder shall make no additional stipulations on the Bid Form or qualify the Bid in any manner.
6. Where so indicated on the Bid Form, the values shall be expressed in both words and figures. In the event of discrepancy between the words and figures, the amount written in words shall govern.
7. Bids will be submitted using the Bid Forms provided herein. Bid security shall be by a qualified surety in the form of a bid bond, in the amount of five percent (5%) of Bid amount, and shall be submitted with the Bid. Bidders shall agree to not withdraw the Bid for a period of ninety (90) days after due date of Bids.
8. Accepted Bidders will be required, as a condition precedent to award of Contract, to furnish in the amount of 100% of the contract prices, satisfactory Performance Bond, Labor and Material Payment Bond and Certificate of Insurance.
9. Bidding Documents will be available on February 8th, 2023. Bidders may obtain Bidding Documents only from the following site: Quest ebid doc #8382867 – Bid/RFP Listing. Documents will be available for download. Documents will not be mailed. **It is the responsibility of prospective Bidders to check this website for any future amendments, questions, revisions, etc., prior to the opening date. All addenda must be acknowledged on the signature page in the area provided. Failure to do so may result in your response being rejected.**

10. Pre-Bid meeting and walkthrough on February 22nd, 2023 at 10:00 AM. Meeting location is New Berlin Safety Building, 16300 W National Ave, New Berlin, WI 53151. Parking is available in the side parking lot. **Please be on time as no accommodations will be made for late arrivals, this is a Mandatory Pre-Bid Meeting. NOTE: This will be the only opportunity for a walk through, therefore, be sure to bring all potential subcontractors. Vendors are also reminded to review all Bid Documents, etc. prior to arrival.**
12. The right to reject any or all Bids, either in whole or in part, or to waive any informalities or irregularities is reserved by City of New Berlin.

Published by Order of:
City of New Berlin
Buildings and Grounds
(262) 786-8610
3805 S Casper Dr
New Berlin, WI 53151

Statement of General Purpose and Intent

These General Instructions to Bidders and Specifications for Roof Project are intended to set forth the terms and specifications that will be the basis for a contract for the described project based on the competitive bidding procedures described herein. All qualified contractors are invited to participate in the bidding process.

General Project Requirements & Information

The Owner, the Owner's Representatives, and the Contractor shall be indicated as such throughout these documents. The term Contractor as used herein shall designate the successful bidder to whom the project Contract is awarded. The Contract Documents consist of these General Instructions to Bidders and Specifications for Roof Project, Drawings, Addenda issued prior to bid opening, and written modifications issued after bid opening.

1. Owner's Representative

The Owner's Representative is the agent of the Owner in all matters pertaining to the work as provided in the Contract Documents. **Bob Loochauis, Facilities Supervisor** will serve as the Owner's Representative. The owner's representative, among other rights, have the authority to stop the work whenever such stoppage may be necessary to insure the proper execution of the Contract and also have the authority to reject any and all materials, whether applied or not applied, if such materials are not in accordance with the Contract Documents.

2. Permits and Licenses

All permits and licenses of a temporary or permanent nature necessary to the lawful execution of the work shall be secured by the Contractor. Contractor must supply a copy of all permits to the Owner. All permits shall be given to the Owner at the Mandatory Preconstruction meeting held prior to the beginning of construction.

3. Local Rules and Regulations

The Owner or local governing body has certain rules and regulations, which are set as a standard for their operation or location. All such regulations shall be followed by the Contractor and Contractor's personnel at all times. The Contractor shall contact the Owner's Representative for specific information regarding the rules governing all operations of this project.

- 3.1 The Contractor's attention is directed to the fact that all applicable Federal Laws, State Laws, Municipal Ordinances, and the rules and regulations of all authorities having jurisdiction over construction of the project, shall apply to the Contract throughout, and they will be deemed to be included in the Contract the same as though herein written out.

4. Temporary Utilities

- 4.1 The Owner shall, where possible, provide existing electricity, lighting, water, and other utilities necessary for construction purposes. When this is not possible, the Contractor shall provide utilities at no additional cost to the Owner. The Contractor will furnish all connections to the electrical system. The Contractor shall furnish any temporary lights necessary for the work.
- 4.2 Subject to paragraph 4.1 above, water for concrete, mortar, washing and drinking purposes will be furnished by the Owner. The Contractor shall complete any connections to the water system.

- 4.3 At the completion of the work, or when the above connections are no longer required, the Contractor shall remove all connections and leave the facilities in a condition at least as satisfactory as prior to the commencement of Contractor's work.
- 4.4 The Contractor will provide toilet facilities. Temporary toilets shall be the responsibility of the Contractor. The Contractor shall provide suitable facilities at the job site with the location of said facilities to be determined by the Owner's Representative. The Contractor's workmen shall gain access to the roof from the exterior only, unless otherwise directed by the Owner's Representative.

5. Condition of the Site

The Contractor shall visit the job-site before submitting a bid to determine the field conditions affecting his/her work. The Owner will assume that Contractor is aware of all items pertinent to the work and has made allowance for the same in its bid.

6. Verification of Dimensions & Core Cut Data

Dimensions and core cut data indicated in all drawings, in reference to existing structures or utilities, are the best available data obtainable but are not guaranteed by the Owner and the Owner will not be responsible for their accuracy.

- 6.1 Before bidding on any work dependent upon the data involved, the Contractor shall field check and verify all dimensions, core cuts, grades, line levels, or other conditions of limitations at the site to avoid construction errors.
- 6.2 If any work is performed by the Contractor or any of his Sub-contractors prior to adequate verification or applicable data, any resultant extra cost for adjustment of work as required to conform to the specification requirements shall be assumed by the Contractor without reimbursement or compensation by the Owner.

7. Description of Work

The work called for in the Contract Documents shall include the furnishing and installation of all roofing materials, insulation, fasteners, metal work, and other materials deemed to be a part of the overall system as specified in the Contract Documents.

8. Foreman Requirements

- 8.1 The Contractor shall keep a competent foreman, satisfactory to the Owner, on the job at all times when work is in progress. The foreman shall not be changed without notifying the Owner.
- 8.2 The foreman shall represent the Contractor and all directions and instructions given to the foreman shall be as binding on the Contractor.
- 8.3 The foreman shall be responsible for the conduct of all the Contractor's employees on the premises and shall promptly take necessary measures to correct any abuses called to his/her attention by the Owner.
- 8.4 The Contractor, or his foreman, is responsible for daily communication with the Owner's Representative, about relevant areas of work in order that the Owner may protect goods, property, and personnel against possible damage or injury. The foreman shall have a complete copy of Contract Documents on the job site at all times.

9. Workmanship

All workman shall be thoroughly experienced in the particular class of work in which they are employed. The Owner's Representative reserves the right to reject any workmen who do not have available skill(s) necessary to properly complete any job they are so assigned.

10. Continuation of Owner's Operations

- 10.1 The Contractor shall be required to erect such barriers, tarpaulins, doors, etc. as may be necessary to protect the Owner's operations while work is in progress. Any openings that are essential to carrying on the work shall be securely closed by the Contractor when not in use to protect the Owner's operations.
- 10.2 Because other activities of the Owner will be proceeding at the same time as the work covered by the Contract Documents, the Contractor shall cooperate with the Owner's Representative to insure that all Contract work progresses in a manner which does not conflict with other activities.

11. Protection of Work and Property

The Contractor shall maintain adequate protection for all of their work to prevent damage, and shall protect the Owner's property and any adjacent property from injury or loss arising from this Contract.

- 11.1 The Contractor shall provide and maintain at all times any danger signs, guards and/or obstructions necessary to protect the public and Contractor's workers from any dangers inherent with, or created by, the work in progress. OSHA guidelines must be followed at all times on the Owner's property.
- 11.2 The Contractor shall save the Owner harmless from any loss arising due to injury or accident to the public, or Contractor's workers, or from theft of materials stored at the job site.
- 11.3 All materials will be stored in locations other than on roof surfaces, except as necessary, and shall then be placed on wood pallets to protect roof surfaces at all times.
- 11.4 Before starting any work, Contractor shall protect all grounds, copings, paving, and the exterior of all building surfaces where work will be performed. Any damage to the existing building or grounds shall be repaired to original condition at no additional cost to the owner.
- 11.5 In those areas where materials and/or hot asphalt will be raised to the roof area, a protective covering shall be placed from the base of the wall extending up and over the top edge of the roof. This covering shall be wide enough to assure that the exterior walls do not become stained or soiled during roofing operations.
- 11.6 Any areas of the building or grounds, which have become stained or damaged in any way, shall be repaired or replaced prior to the final inspection. The method of repair used must be acceptable to Owner.
- 11.7 **At no time will any equipment, materials or any other items be set on or stored on a new or completed roofing section.**

12. Delivery and Storage of Material

The delivery of all materials shall have the Manufacturer's label intact and Legible Labels should be affixed to the outside of the package stating the type of product, name and address of the Manufacturer, and the job on which it is to be used. All materials shall be stored with as much protection as possible against weather, vandalism and theft. When such materials are purchased directly by the Contractor for said project, it shall be Contractor's responsibility to replace all damaged or missing materials.

13. Material Storage and Cleanup

The Contractor shall keep the premise free from rubbish at all times and shall arrange Contractor's material storage so as not to interfere with the Owner's operations.

- 13.1 All damages caused by water infiltration resulting from the failure of the Contractor to secure each day's work in a watertight manner, or as a result of any procedure or practice, will be corrected at the Contractor's expense. Included as damages, will be all labor costs incurred by the Owner as a result of such water

infiltration.

- 13.2 The Contractor will also be liable for any damage to the building and grounds, any "roof top equipment," any parked or passing vehicles, or any other item permanently or temporarily related to the facility, as a result of the roofing project and the actions of the Contractor, or its personnel; including, but not limited to, electrical, plumbing and adjacent roofs.

14. Work In Progress/Changes

Contractor shall take reasonable steps to detect existing deficiencies prior to the start of work. Should a structural deficiency be detected during the project, it shall be reported to the Owner, with advice concerning to what degree it will affect the long-term performance of the new roof repair. At the request of the Owner, such a deficiency shall be properly corrected, at an additional cost to the Owner.

- 14.1 The Contractor remains responsible to maintain a completely watertight condition of any roof area, which is so designated in the Contract Documents. Should progress be halted because of any changes, as determined by the Owner, the Contractor shall be responsible for providing a watertight condition until such time as the changes are approved.
- 14.2 Furthermore, the Owner reserves the right, should additional materials and/or labor be necessary for compliance with said recommendations, to request competitive bids from at least two (2) independent contractors qualified to perform work in such related areas. The Owner reserves the right to hold in abeyance the progress of any project until such time as said additional work had been properly completed.
- 14.4 The Owner may, without invalidating the original Contract, order such changes or additions as may from time to time be deemed desirable. In so doing, the Contract price shall be adjusted as stated below with all work being done under the conditions of the original Contract except for such adjustments in the extension of time, as may be acceptable to the Owner. The value of such extra work shall be determined in one of the following ways:
1. By final price adjustment
 2. By cost plus a guaranteed maximum
 3. By cost with a fixed fee
 4. By unit cost
- 14.5 If agreement is reached that the extra cost shall be handled as per methods 2, 3, or 4, the Contractor shall keep and compile a correct amount of the cost, together with such vouchers, etc., as may be necessary to substantiate same for presentation to the Owner's Representative. The Owner's Representative shall have the authority to make minor job changes or additions as may be necessary to expedite the job providing such changes do not involve additional material cost. No major change or addition shall be made except upon receipt by the Contractor of a signed order from the Owner authorizing such a change. No claims for an extra to the Contract price shall be valid unless so authorized.

15. Separate Contracts

- 15.1 The Owner reserves the right to do work or to allow other contracts in connection with the work. The Contractor shall afford other such contractors a reasonable opportunity to store their material and shall cooperate with them to the best of Contractor's ability to expedite the rapid completion of the work.

- 15.2 If any portion of the Contractor's work depends upon the Owner's or other contractor's work, the Contractor shall inspect and approve such work before proceeding with its own. The Contractor shall notify the Owner of any defects in such work that will render subsequent work unsuitable. The Contractor's failure to inspect and report shall constitute an acceptance of the other contractor's work as fit and proper for the execution of Contractor's work, except as to defects that were not at that time observable and subsequently developed.

16. Correction of Work Prior to Final Payment

Once the project is complete, a final inspection will be completed by the roof coating Manufacturer. All items that require repair or change will be addressed in written format (i.e., a punch list), with copies being delivered to the Contractor and Owner's Representative. The Contractor shall promptly remove any work, according to this punch list, that does not meet the requirements of the Contract Documents, or is incorrectly installed or otherwise disapproved by the roof system manufacturer, as failing to meet the intention of the Contract Documents. The Contractor shall promptly replace any such work, without expense to the Owner, and shall bear the cost of making good all work of other contractors, or the Owner, destroyed or damaged by such removal or replacement. **The Contractor has 30 Calendar days to complete such work as noted on the final punch list.** After such point if all items are not corrected the Owner reserves the right to have all required work completed and bill the Contractor.

17. Correction of Work After Final Payment

The Contractor shall guarantee all materials and workmanship for two (2) years from date of final payment of the Contract by the Owner. Any defects, which arise during this period, shall be promptly repaired by the Contractor including any damage done to the Owner's property due to such defects.

18. Deduction for Uncorrected Work

If the Owner's Representative deems it unnecessary to have the Contractor correct work, which has been incorrectly done, a deduction from the Contract price shall be agreed upon therefore. Such a deduction from the Contract price shall in no way affect the Contractor's responsibility for defects, which may occur, nor Contractor's liability for correcting them, and damage caused by them, as specified above in paragraph 17.

19. Safety Regulations

The Contractor shall comply with all applicable provisions of *Occupational Safety and Health Act* throughout the duration of the work. All Local and State safety regulations shall be followed in addition to but not limited to the following:

- 19.1 Set up area shall be on firm ground, reasonably level, and clear of wires and overhead obstructions. Locate all equipment away from areas where fumes and dust would enter fresh air intakes and windows.
- 19.2 Proper clothing shall be worn at all times. A long sleeved shirt, properly fitted pants without cuffs, and high-top shoes laced to the top will be considered to be the standard dress. Hard hats shall be used when there are hazards above.
- 19.3 All equipment will be checked prior to the project to insure that it is properly assembled and in safe operating condition. All hand tools shall also be inspected for safe operation, and where applicable, shall be properly grounded.
- 19.4 Ladders must be properly tied at the top and firmly placed at the bottom. Side rails of the ladder shall extend a minimum of three (3) feet above the roof top. All ladders must be kept away from power lines and used exclusively for the transportation of persons only.
- 19.5 Safety flags (perimeter lines) shall be placed in any area the distance from the

roof top to the ground exceeds six (6) feet. These flags are to be placed in those areas where work is in progress.

- 19.6 Proper first aid kits will be located in the set-up area of each job site. These kits shall contain the proper materials for the treatment of burns, fractures, etc. and shall be an approved kit. The Foreman of each project should have training in the application of first aid and knowledge of the nearest medical facilities and phone numbers of emergency personnel.
- 19.7 The Contractor shall be responsible for guarding against fires. Fire extinguishers shall be present on the job site at all times. All extinguishers should be checked no less than once a month and serviced by qualified personnel on a yearly basis. There shall be one (1) fire extinguisher present for each torch unit being used on the project. Said extinguisher will be located within twenty-five (25) feet of the torch being used. There will be at least one (1) serviceable, full sized extinguisher located at each kettle location.
- 19.8 Competent operators shall be in attendance at all times while equipment is in use.
- 19.9 Any loads placed on the roof at any point shall not exceed the safety load for which the roof is designed.
- 19.10 Pumping equipment shall be located on the ground at a safe distance from the building; the location being subject to approval from the Owner's Representative.

General Instructions to Bidders

Owner expressly reserves the right to reject any or all bids, to investigate the qualifications and experience of any bidder, and to waive informalities, minor irregularities and discrepancies. Owner may cancel the bidding process at any time. Owner is not responsible for any costs incurred by bidders in the preparation and presentation of bids. The Owner reserves the right to reject any bid if the evidence submitted by, or investigation of such bidder fails to satisfy the Owner that such bidder is properly qualified to carry out the obligations of the Contract and to complete the work contemplated herein.

1. Conference for Bidding Contractors

All Contractors must attend a Mandatory Pre-bid Conference to inspect the job site and to insure comprehension of the Contract Documents. There shall be only one (1) Pre-Bid Conference for this project. **Contractors who do not attend the Pre-bid Conference shall be disqualified from bidding.** The Pre-Bid Meeting for bidding Contractors will be held on Wednesday, February 22nd, 2023 at 10:00 A.M. Bidding contractors shall meet at the front door of the **City of New Berlin Safety Building** located at **16300 W National Ave, New Berlin, WI 53151**. Additional information about bidding dates, the times and dates for submittal of all bids, are described under "Preparation of the Bid".

2. Subcontractors

The Contractor, prior to award of the Contract, shall furnish in writing to the Owner the names of persons or entities proposed as subcontractors for each principal portion of the Work. Owner, after due investigation, may object to any such proposed person or entity on reasonable grounds. The Contractor shall not contract with a proposed person or entity which the Owner has made objection.

3. Competency of Bidder

To enable the Owner to evaluate the qualifications and financial responsibility of the Contractor, the successful bidder shall, when requested by the Owner, furnish the following information, which shall be sworn to under oath by the bidder or by a properly authorized Representative of the bidder:

- 3.1 How many years has your organization been in business as a Contractor? Has your organization changed names or declared bankruptcy for any reason within the last fifteen (15) years? If so, please fill out all information requirements under Section 4. for each organization.
- 3.2 How many years has your organization been in business under its present business name? Under what other or former names has your organization operated?
- 3.3 If your organization is a corporation, answer the following:
 - 4.3.1 Date of incorporation:
 - 4.3.2 State of incorporation:
- 3.4 If your organization is a partnership, answer the following:
 - 4.4.1 Date of organization:
 - 4.4.2 Type of partnership (if applicable):
 - 4.4.3 Name(s) of general partner(s):
- 3.5 If your organization is individually owned, answer the following:
 - 4.5.1 Date of organization and Name of Owner:
- 3.6 If the form of your organization is other than those listed above, describe it and name the principals:
- 3.7 Is your organization legally qualified to do business in Wisconsin?

- 3.8 Claims and Suits. (If the answer to any of the questions below is yes, please attach details.)
 - 3.8.1 Are there any judgments, claims, arbitration proceedings or suits pending or outstanding against your organization or its officers?
- 3.9 On a separate sheet, list major projects in Wisconsin your organization has in progress, giving the names of the project, owner, architect, contract amount, percent complete and scheduled completion date.
- 3.10 On a separate sheet, list the major projects your organization has completed in Wisconsin in the past five years, giving the name of the project, owner, architect, contract amount, date of completion and percentage of the cost of the work performed with your own forces.
- 3.12 Surety:
 - 4.12.1 Name of the bonding company:
 - 4.12.2 Name and address of agent:
- 3.13 Financial Statement.
 - 4.13.1 Attach an audited financial statement with your organization's balance sheet and income statement.

4. Disqualification of Bidders

Any one (or more) of the following causes may be considered to be sufficient for disqualification of a bidder and the rejection of his/her bid:

- 4.1 The failure to attend the pre-bid meeting at the time and place so described under Bidding Dates.
- 4.2 Any evidence of collusion among bidders.
- 4.3 Incorrect use of the "Proposal" as provided by the Owner. Incorrect use shall be defined as the changing or deleting of any part shown on said Proposal. The Proposal is designed to afford all bidding contractors an equal format from which to present their bidding amounts. Any additions to or changes in said format shall disqualify the contractor's bid.
- 4.4 Direct contact, in any form, between the Owner and bidding Contractor after the bid opening and prior to the award of said Contract, must be initiated by the Owner's Representative. Changes in the Proposal after the opening of the bids will not be accepted. Any questions regarding the progress of Contract award shall be referred to the Owner's Representative.
- 4.5 Lack of expertise as shown by past work or incomplete work under other Contracts, which in the judgment of the Owner, might hinder or prevent the prompt completion of additional work if so awarded.
- 4.6 Lack of responsibility as revealed by either financial, experience, or equipment statements, as submitted.

5. Responsibility of Measurements, Quantities and Labor

The bidding contractors shall be solely responsible for the accuracy of all measurements and for estimating the initial quantities required to satisfy these Specifications. Each bidder must inform himself fully of the condition relating to construction of the project and the employment of labor thereon. Failure to do so will not relieve a successful bidder of his obligation to furnish all material and labor necessary to carry out the provisions of his Contract.

6. Discrepancies and Addendum

Should a bidder find any discrepancies in the drawing and/or Specifications, or if any items are in doubt as to their meaning, the bidder shall notify the Owner at once, who will send a written addendum to all bidders concerned. Oral instructions, or decisions, unless confirmed by an addendum, will not be considered valid, legal or binding. All

discrepancies must be submitted to the Owner no less than forty-eight (48) hours prior to the opening of the bids. No extras will be canceled because of the failure of the Contractor to include work called for in the addendum in his bid. Failure of any bidder to receive any such addendum or interpretation of said discrepancies shall not relieve such bidder from any obligation under his/her bid as submitted. Any addenda so issued shall become part of the Contract Documents.

7. Notification of Changes

The Change Notice form, as provided in the Contract Documents, shall constitute the only approved form for requesting additions or deletions from the base Specification as proposed. Failure to properly complete and submit this form prior to the actual change will void any responsibility on the part of the Owner to compensate the Contractor or Subcontractor for any additional work completed.

8. Substitution of Specified Material

A request for substitution will only be considered if submitted by a bidding contractor who was present at the mandatory pre-bid meeting. Whenever a particular make of material or trade name is specified herein it shall be regarded as being indicative of the standard required. Any request for substitution must be delivered to the owner's representative 72 Hours before Bid Due date. Any approved substitutions for materials shall be via addenda only.

All items listed under Engineering Services, Manufacturer Services and Material Samples must be delivered to the owner's representative by the time/date listed above. No exceptions. The "Manufacturer's Check List" form (pages 20-24) must also be included.

Engineering Services - Any material substitution request must be accompanied by a report signed and sealed by a professional engineer licensed in the state in which the installation is to take place. The report must contain the following documents.

- 8.1 Material Certification - This report must show that the requested material(s) meet or exceed all aspects of the design and performance criteria in this specification. Substitution requests submitted without licensed engineer approval will be rejected.
- 8.2 Design Certification – The party requesting a substitution must also have the written specification and detailed drawings certified, stamped and signed by a professional engineer licensed in the state in which the installation is to take place. The licensed professional will assume complete liability for the work to be completed, and that all the work will be completed in strict tolerances set forth in the bidding documents. Substitution requests submitted without licensed engineer approval will be rejected.

Manufacturer Services - Any material substitution request must be accompanied by a report signed and notarized from the manufacturer's president illustrating the following services to be provided to the owner during the specified project.

- 8.3 Manufacturer's representative – List a minimum of two representatives that will be monitoring the roof project, including contact information. Each representative must have a minimum of 1 years experience with the company.
- 8.4 Electronic Reporting Format – Show information for the manufacturer's electronic reporting format. Give the access information for the owner to go on-line and view a sample progress report including job-site photos. All job progress reports must be obtainable via the internet.
- 8.5 Preconstruction Meeting – The manufacturer's representative will be responsible to schedule and coordinate the formal preconstruction meeting with all relative

- trades. Include a document illustrating all items to be covered during the preconstruction meeting.
- 8.6 Routine Job-site inspections – The manufacturer's representative must perform a minimum of three job-site inspections each week.
 - 8.7 Weekly progress report – The manufacturer's representative must post a weekly progress report (including construction photos) on the internet for the owner to review.
 - 8.8 Final Inspection - The manufacturer's representative must complete a final inspection once the contractor has completed all work in relation to the contract documents. A copy of this report must be delivered to the owner's representative. The manufacturer's representative must also field verify that all punch list items have been completed. Inform the owner of such completion.
 - 8.9 Warranty Hard Copy – Deliver a copy of the warranty to the owner within 30 calendar days of job completion (see 11. Manufacturer's Guarantee/Responsibilities). A written and publicly notarized statement from the manufacturer stating to the Owner all of the associated requirements according to paragraph 11 below, Manufacturer's Guarantee/Responsibilities.
 - 8.10 Annual inspections – The manufacturer's representative must also perform annual inspections of the job site at no cost to the owner throughout the life of the warranty.

Material Samples - Any substitution request must include the following material samples and/or supporting documentation. During the course of the work, the Owner's Representative may secure samples of the materials being used from the containers at the job site, and submit them to an independent testing laboratory for comparison. If the results of the independent testing laboratory prove that the materials are not comparable and equal to the specified materials, the Contractor shall pay for the testing and the Owner reserves the right to an equitable adjustment of its contract price.

- 8.11 A written application for approval of the proposed material, an explanation of where it is to be applied, and in what quantities.
- 8.12 A twelve inch by twelve inch (12" x 12") sample of coating that meets or exceeds the listed performance criteria in this specification. Material samples that do not meet or exceed the listed performance criteria will not be approved. All data sheets and MSDS sheets must accompany the material samples.
- 8.13 A quart sample of all adhesives or liquid materials to be used on the project. All data sheets and MSDS sheets must accompany the material samples.
- 8.14 A certificate from an accredited testing laboratory comparing the physical and performance attributes of all proposed materials with those of the specified materials.
- 8.15 A list of at least five (5) jobs where the proposed alternate material was used under similar conditions. These jobs must be located within a two hundred (200) mile radius of the project site. Each job must be at least five (5) years old and each must be available for inspection by the Owner's Representative. A list of contact names and phone numbers must also be included as well as the executed warranties.
- 8.16 A sample "mock-up" of the proposed roof system. The sample shall be at least 18" x 18" and include all associated roofing components from the deck up to the final aggregate surfacing.
- 8.17 The Manufacturer's Checklist filled out in its entirety. All required references and representatives must also be included.

9. Start Date and Completion Dates

The following regulations shall be implemented by the Contractor when requested by the Owner's Representative:

- 9.1 Contractor shall be prepared to begin and completely finish work as listed below:
Start Date: April 1st, 2023
Completion Date: October 30th, 2023

or as soon as weather conditions permit. Contractor shall advise the Owner and Owner's Representative in writing within three (3) days of the anticipated start date. Should the Contractor be unable to meet the scheduled start date(s) the Owner reserves the right to cancel all pending Contracts with said Contractor.

10. Manufacturer's Guarantee/Responsibilities

References to the "Manufacturer" herein mean the original manufacturer of the roofing membrane to be provided under Section 07550 of the technical specifications. The Contractor shall be required to furnish a **5** year Labor guarantee to the Owner when the project is complete. The Manufacturer's guarantee shall consist of a minimum 30 year warranty or 40 year warranty, depending on roof system selected by owner. The entire warranty will be required to cover all labor and materials for the entire roof system and all of it's components from the roof deck up through the entire assembly of the roof system. The guarantee will be issued only upon completion of all the guarantee requirements by an approved Contractor. Contractors not approved by such manufacturers will be required to fulfill all obligations deemed necessary by that manufacturer. Such guarantees cannot be altered or amended, nor may any other warranties, guarantees, or representations be made by any agent or employee of the Manufacturer unless such alterations, amendment, or additional representation is issued in writing and is signed by a duly authorized officer of the installed Manufacturer and sealed with the corporate seal.

- 10.1 The Manufacturer shall submit directly to the Owner's Representative the original guarantee within sixty (60) days from the date of final inspection. No guarantee shall be issued until such time as all invoices pertaining to materials have been properly paid.
- 10.2 The Owner reserves the right, if necessary, to withhold five percent (5%) of the Original Contract price until such time as all warranties have been properly received.
- 10.3 All items noted during the final inspection shall be completed within thirty (30) calendar days from date of inspection.
- 10.4 The Owner reserves the right to withhold final payment until such time as all items are completed to the satisfaction of the Manufacturer and its representative and the Owner's Representative.
- 10.5 It is the intent of the specifications that, when the work is completed, there should be no reason based on the work by the Contractor that the Contractor will not be able to obtain the Manufacturer's guarantee. The contractor must be an approved applicator of the manufacturer prior to bidding such project. In furtherance of that intent, Contractor shall be required to arrange for and coordinate inspection of the roof system as the work progresses by a qualified representative of the Manufacturer three times per week. The inspector shall observe the work, spending at least one hour per visit, and shall note any deficiencies in the work or failure to perform the work in accordance with the Manufacturer's requirements and the Contract Documents. Upon request, the Manufacturer shall provide a job progress report at least one per week to the Owner's Representative from the start of the work to its completion.

11. Schedule of Payments

All payment requests for material on site, change notices, work in progress, or job completion shall be approved by the Owner's Representative prior to the issuance of payment. Accordingly, Contractor shall establish with Owner, the Owner's procedure for payment and retainer prior to the commencement of work on this project.

- 11.1 The Contractor has the option upon delivery of materials to the job site, to submit the proper invoice for payment in final (100%) for all such materials.
- 11.2 When the job is in progress, the Owner agrees to pay, upon the request of the Contractor, no more than Ninety-Five percent (95%) of the total Contract price equivalent to the percentage of work completed at that time. Payment is to be made within 30 days of invoicing, but no more than one pay request may be made within a 30 day period.
- 11.3 Partial or progress payments shall not relieve the Contractor of performance obligations under this Contract, nor shall such payments be viewed as approval or acceptance of the work performed.
- 11.4 Partial waiver of lien from all major Suppliers and Subcontractors, where applicable, as requested by the Owner, shall accompany each payment request to confirm and acknowledge disbursement of the payment. Partial waivers of lien shall be properly completed and shall list the cumulative amount of payment received by the date of the waiver. This requirement shall not be waived unless agreed upon in writing by the Surety and/or Owner.
- 11.5 Owner reserves the right to issue Joint Checks to the Contractor and other suppliers for materials, if deemed in their best interest.
- 11.6 Final payment shall be withheld until all provisions of Specifications are met, including all necessary clean-up, and Owner has written verification of completion from Owners Representative.

12. Liens

The Contractor shall, if required by the Owner, furnish the Owner a release in full of all liens arising out of this Contract or in lieu thereof, receipts in full for all materials and labor on the job. In either case, the Contractor shall furnish an affidavit that the liens or receipts involving all the labor and material for which a lien could be filed. In lieu of the above, the Contractor may at his/her option furnish a bond to indemnify the Owner against all hazards of liens. Neither part nor final payment shall in any way release the Contractor from the above obligation and in the event that part or full payment has been made and any lien; remains, the Contractor shall refund to the Owner necessary funds to discharge such a lien including all cost and attorney fees.

13. Pre-Construction Meeting

The pre-construction meeting shall be held prior to the start of each project. This meeting shall include the Contractor, the Owner's Representative, and the Manufacturer. The condition of the buildings and grounds areas shall be recorded, and the Contractor shall be responsible for the correction and/or repair of any additional damage to the facilities resulting from the related project. Any existing conditions shall be so noted during this meeting and shall be submitted by the Owner's Representative in writing.

14. Contractor Questions

Questions regarding this bid should be directed to the Owner's Representative. It is the Contractor's responsibility during the course of the work to bring to the attention of the Owner's Representative any defective membrane, insulation, or decking discovered where not previously identified.

15. Standardized Procedures

Procedures not itemized in these specifications, but reasonably inferable, shall be included in the work and should be reflected in the bidders' quotation. These procedures will be done in accordance with the Manufacturer's directions or according to the latest publication of the NRCA Manual, whichever is applicable.

16. Hazardous Materials

Do not bid or provide or install hazardous materials or products containing asbestos, polychlorinated biphenyl (PCB), lead in water piping, etc

SUPPLEMENTARY INSTRUCTIONS TO BIDDERS

GENERAL:

Carefully review Project Manual, including Bidding Requirements, General Requirements, Specifications, Alternates, and Amendments, all of which contain provisions applicable to all Bidders. Successful Bidder will be required to execute all Work belonging to their Contract which is stated in the Specifications, or reasonably implied as necessary to complete their Contract, including removal of existing work and preparing present work to receive new, if such be the requirements of actual job conditions.

Visit site to become acquainted with: Adjacent areas; means of approach to the site; present conditions of project site; and facilities for delivering, storing, placing and handling of materials and equipment. Compare Specifications with existing work in place, inspect demolition requirements and inform yourself of all conditions affecting execution of Work, including other new work, if any, being performed.

WORKSITE AVAILABILITY:

A specific window of opportunity exists for completion of the Work, therefore Work shall commence on the date noted in the Bid Form. Construction activities may take place between **7:00 AM and 7:00 PM Monday through Friday, 8:00 AM – 5:00 PM on Saturday and no work will be allowed on Sundays.**

DOCUMENTS:

Bidders shall be familiar with all Bidding Requirements and proposed Contract Documents. See General Conditions for definition of Contract Documents.

BID FORM:

Alterations of or amendments to Bid Form, attachments thereto, or inclusion of any correspondence, or other written or printed matter or details of any nature other than that specifically called for may disqualify Bid. No e-mailed alterations to the Bid will be accepted.

Only Bids which are made on regular Bid Form will be considered. No Bids for any arbitrary subdivision or sub classification of Work required by requested Bid(s) will be accepted.

Requirements of Signing: Include with each Bid full business address of Bidder. Bids by corporations shall be executed in the full legal name of the corporation, giving State of incorporation and be signed by an authorized officer or officers, who shall, in each case, type or print name and corporate title beneath the signature. Partnership Bids shall state the full name of all partners, e.g., “Smith and Jones, a partnership of John S. Smith and William B. Jones”. Such Bids must also be signed by an authorized partner or other representative, typing or printing the name and title of the signer beneath the signature. Individuals operating as a business shall sign Bids, typing or printing the individuals name followed by the words “Sole Proprietor” beneath the signature. When requested by Owner, furnish satisfactory evidence of agency or authority of any person signing on behalf of another.

Submission of Bids: Reference Bid Form, Section 2.

CONTRACT AND CONTRACT DOCUMENTS:

The Contract into which successful Bidder will be required to enter is based on City of New Berlin General Terms and Conditions of Service (as modified by Owner). Familiarize yourself with the provisions of this document.

ACCEPTANCE OF BID (AWARD):

It is the intent of the Owner to award a Contract or accept any Bid which will be in the best interests of the Owner, provided the Bid has been submitted in accordance with the requirements of the Bidding Documents and does not exceed the funds available. The Owner reserves the right to waive informalities or irregularities in a Bid received and to accept the Bid, which in the Owner's judgment, is in the Owner's best interests.

The Owner reserves the right to accept Alternates in any order or combination, unless otherwise specifically provided in the Bidding Documents, and to determine the lowest responsible Bidder on the basis of the Base Bid and Alternates accepted.

WITHDRAWAL OF BIDS:

Matters pertaining to the withdrawal of a Bid and to claims of error, omission or mistake in preparing or submitting a Bid shall be governed by Section 66.0901 of the Wisconsin Statutes.

All Bids shall be effective and open for acceptance for a period of ninety (90) days after date set for opening of Bids.

RESERVATION:

Owner reserves the right to: reject any or all Bids, reject a Bid not accompanied by a required bid security or by other data required by the Bidding Documents, reject a Bid which is in any way incomplete or irregular, waive any irregularities in any Bid, accept any Bid which will be in best interests of Owner.

INADEQUACIES AND OMISSIONS:

Failure to request timely clarification or interpretation of Bidding Documents shall not relieve Bidder/Contractor of responsibility to execute the Work in accordance with the intent of the Contract Documents. Signing of Contract means that the Contractor has thorough comprehension of full intent and scope of Contract Documents.

The Owner and his consultants are not responsible for oral instructions.

INTERPRETATIONS AND CORRECTIONS:

Carefully review and compare all parts of the Bidding Documents with each other, and with other work being bid concurrently or presently under construction to the extent that it relates to the Work for which the Bid is being submitted. Examine the site and local conditions, and immediately report to the Owner errors, inconsistencies or ambiguities discovered.

Bidders and Sub-bidders requiring clarification or interpretation of the Bidding Documents shall submit a written request to the Owner, received in Owner's office at least seven (7) days prior to the date set for receipt of Bids.

Interpretations and corrections of and changes to the Bidding Documents will be made in writing by Addendum only. Interpretations and corrections made in any other manner are not binding. Bidders shall not rely upon verbal instructions or information.

POWER OF ATTORNEY AND BOND REQUIREMENTS:

Submit with each Bid a bond executed by an attorney-in-fact, including a certified and effectively dated copy of his power of attorney. Where the certification is by facsimile, or otherwise does not bear an original signature, the bonding company must be qualified for recognition under facsimile execution.

**CITY OF NEW BERLIN
GENERAL TERMS and CONDITIONS
FOR THE 2023 SAFETY BUILDING AND FIRE STATION 1 BUILDING ENVELOPE
PROJECT**

1. Introduction. This document (hereinafter referred to as “Terms and Conditions”) is hereby incorporated and part of the contract between the City of New Berlin (hereinafter referred to as “City”) and the vendor identified below (hereinafter referred to as “Vendor”). These Terms and Conditions, along with the Bid Instructions, Bid Forms, Specification, City of New Berlin Insurance Requirements, Certificates of Insurance and Policy Endorsements, shall constitute the entire contract for materials, work and other goods and services, collectively referred to as the “Contract” between the City and the Vendor. The work that is being performed herein shall collectively be referred to as the “Project”. It is expressly agreed that no statement, arrangement, warranty or understanding, oral or written, expressed or implied, will be recognized unless it is stated in or otherwise permitted by these Terms and Conditions, and the aforementioned invoices and specifications. These Terms and Conditions are solely for the benefit of the City and the Vendor, and are not intended for the benefit of any other party.

2. Goods and/or Equipment. The goods and materials being furnished under this contract shall be as identified in Bid Instructions, Bid Forms and Specifications that are incorporated herewith.

The City shall not be deemed to have accepted the Goods until they have been provided the opportunity to inspect them and to acknowledge, in writing, that they are in accordance with the specifications/invoice and without damage or defect.

3. Contract Time. Time is of the essence with respect to all time limits, milestones (if any), as well as deadlines for substantial completion and completion of the work provided for in the specifications.

The work will be substantially completed on or before March 31, 2022, and completed and ready for final acceptance and payment in accordance with this Agreement on or before April 15, 2022, subject to conditions beyond the control of the Contractor, such as labor or material shortages, weather conditions, strikes, civil unrest or wars. The Owner shall make the final decision as to the adequacy of the justification for the delay. Contractor and Owner recognize that time is of the essence and that the Owner will suffer financial and other losses if the work is not completed and the milestones are not achieved within the time limits specified above. The parties also recognize that delays, expense and difficulties involved in proving, in a legal or arbitration proceedings, of the actual loss suffered by the Owner if not completed on time. As a consequence and not as a penalty, but rather to cover the City’s costs if the milestones are not achieved and the work causing baseball games to be moved or cancelled is not completed by the completion date, the parties agree that the City shall be entitled to liquidated damages in the sum of \$500.00 (five hundred dollars) per day as to when substantial completion is delayed.

4. Contract Price. The City shall pay the Vendor for the completion of the work in accordance with the Contract in the amounts that follow, subject to any applicable adjustments under the Contract:

- a. For all unit price work in an amount equal to the sum of the established unit prices for each separately identified item of unit price work times the actual quantity of that time.
- b. The estimated total of all unit price work for the base bid is \$ _____. These prices are based on estimated quantities.
- c. These quantities shall be adjusted based upon the actual work performed.
- d. For all work at the price as stated in the Contract Bid attached hereto as Exhibit A.

5. Payment Procedures. Contractors shall submit applications for payments in accordance with the terms of this Agreement upon final completion and acceptance of the work. Owner shall have thirty (30) days after receipt of such request to review the request for correctness and to obtain approval for such payment by its Common Council. The Owner may withhold payment for any portion of the work which is not completed in accordance with the specifications, and shall pay for the work related to any undisputed charges. Upon the successful completion of the work and the acceptance of that work as provided for hereunder, the Owner shall pay the remainder of the contract price.

Upon substantial completion of the work, the owner shall pay an amount sufficient to increase the total payments to the Contractor to one hundred (100%) percent of the work completed, but less such amount set off by Owner as provided for herein, less two hundred (200%) percent of the estimated value of the work to be completed or corrected in accordance with a punch list to be completed prior to final payment. Upon the successful completion of the work and the acceptance of that work as provided for hereunder, the Owner shall pay the remainder of the contract price.

6. Vendor's Representations. In order to induce the City to enter into this Contract, the Vendor makes the following representations:

- a. The Vendor has examined and carefully studied the Contract documents and any data and referenced items included in the Contract documents.
- b. The Vendor has visited the site, conducted a thorough visual examination of the site and adjacent areas, and has become familiar with and is satisfied as to the general, local and site conditions that may affect cost, progress and performance of the work.
- c. The Vendor is familiar with and is satisfied as to all laws and regulations that may affect cost, progress and performance of the work.
- d. The Vendor has carefully studied all reports and expirations and tests related to the conditions in which the work will be performed, as well as reports and drawings related to the work and technical data in such reports and drawings.

- e. The Vendor has considered the information known to the Vendor itself, including information commonly known to vendors doing business in the Milwaukee metropolitan area, as well as information and observations obtained from visits to the site; the Contract documents; site related reports and drawings in the Contract documents with respect to the impact of such information; observations and documents on the cost, progress and performance of the work; the means, methods, techniques, sequences and procedures of construction; and the Vendor's safety, precautions and programs.

Based on the information and observation referred to in the preceding paragraph, Vendor agrees that no further examinations, investigations, explorations, tests, studies or data are necessary for the performance of the work of the Contract price within the Contract times in accordance with the other terms and conditions of the Contract.

The Vendor has given the City written notice of all conflicts, errors, ambiguities or discrepancies which the Vendor has discovered in the Contract documents and the Vendor certifies that the written resolution there by the City is acceptable to the Vendor.

The Contract documents are sufficient to indicate and convey understanding of all terms and conditions for performance in the furnishing of the work.

The Vendor is entering into this Contract constitutes an incontrovertible representation by the Vendor that, without exception, all prices in the Contract are premised upon performing and furnishing the work requirement by the Contract documents.

7. Assignment of Contract. Unless expressly agreed to by the City, no assignment may be made of the rights and responsibilities of the Vendor under this agreement.

8. Successors and Assigns. The City and Vendor each binds themselves, their successors, agents, legal representatives and assigns with respect to all covenants, agreements and obligations contained in the Contract documents.

9. Severability. Any provision or part of the Contract documents held to be void or unenforceable under any law or regulation shall be deemed stricken and all remaining provisions shall continue to be valid and binding upon the City and Vendor, which do hereby agree that the Contract documents shall be performed or replaced as to such stricken revision or part thereof with a valid and enforceable provision that comes as close as possible to expressing the intention of the stricken provision.

10. Taxes, Social Security and Government Reporting. Personal income tax payments, social security contributions, insurance, payroll taxes and all other governmental reporting and contributions required as a consequence of the Contract or receiving payment for this Contract shall be the sole responsibility of the Vendor.

11. Advertising. The Vendor shall not identify the City as a client or customer of the Vendor or utilize the name of the City or its logo in any advertisements or other documents placed in the public domain without the express written consent of the City.

12. Modification. In the event that the parties determine that a modification to the Terms and Conditions of the providing of these goods are necessary, such change shall not be effective unless executed by authorized representatives of both parties.

13. Delivery. The goods provided hereunder shall be delivered to the City within the number of working days set forth in the contract or otherwise as soon as reasonably practicable unless delay occurs due to work stoppage, adverse weather conditions, labor disputes or modifications to the Terms and Conditions of the contract. In the event that the goods are not delivered within a reasonable period of time, the City shall have the right to cancel this contract without fee or penalty.

14. Insurance. Vendor shall maintain workers compensation, automobile liability and commercial general liability insurance coverage with carriers licensed to do business in the State of Wisconsin, and with such limits as the City may establish and require from time to time:

- a. General Aggregate: \$2,000,000.00
- b. Personal Advertising Injury: \$1,000,000.00
- c. Each occurrence: \$1,000,000.00
- d. Fire damage: \$50,000.00
- e. Medical Expense, any one person: \$5,000.00
- f. Automobile liability: CSL \$1,000,000.00
- g. Excess liability umbrella form: \$1,000,000.00 per occurrence
- h. Excess liability umbrella form: \$2,000,000.00 in the aggregate with a self-insured retention limit of not greater than \$10,000.00
- i. Professional Liability, General Aggregate: \$2,000,000.00
- j. Professional Liability, Each Occurrence: \$1,000,000.00

Vendor shall furnish a Certificate of Insurance evidencing the types and amounts of coverage. Said coverage shall be on an occurrence basis and the limits identified in the general liability coverage shall be for this project and not the policy as a whole. Vendor agrees to require that the insurer list the City as an Additional Insured and to provide adequate evidence of said status through the liability insurance endorsement. Vendor shall further obtain an endorsement from the insurance carrier indicating that any material changes to the policy or any cancellation of the coverage subsequent to the issuance of the Certificate, and until the completion of the services hereunder, shall necessitate that the insurer provide not less than thirty (30) days notice to the City of said fact. Clauses such as that the insurer will endeavor to notify the City are unacceptable and will be rejected.

15. Dispute. These Terms and Conditions shall be deemed to have been made and governed by the laws of the State of Wisconsin. Any legal suit or action with regard to these Terms and Conditions or the project as a whole shall be venued in the Waukesha County Circuit

Courts, Waukesha County, Wisconsin, unless the parties mutually agree to arbitration and/or mediation in place of civil litigation.

16. Limitation on Liability. The City's liability to the Vendor shall not exceed the sums paid by the City to the Vendor under this contract. In addition, to the extent that the Vendor seeks indemnification from the City, that indemnity shall be subject to the limitations set forth herein. No indemnity provided under any contract hereinunder shall be construed to be a waiver or estoppel of the City of New Berlin or its insureds' ability to rely upon the limitations, defenses and immunities contained within Wisconsin law, including, but not limited to those set forth in Wisconsin Statute §893.80, §895.52 and §345.05. To the extent indemnification is available and enforceable, the City of New Berlin or its insured shall not be liable in indemnity or contribution for any amount greater than the limits of liability for municipal claims established by Wisconsin law. The City's obligations to indemnify hereunder are further subject to the availability limits of applicable insurance coverage. Under no circumstances shall the City be required to indemnify the Vendor for its own negligence or intentional conduct.

17. Protection of the Project Site. Vendor agrees to post signage and to appropriately guard the area in which the contract work is being performed, and to take all other steps that may be necessary in accordance with requirements of OSHA and/or other governmental agencies with jurisdiction to ensure that the project site is maintained in a safe manner to as to prevent workers and passersby from entering the project site.

18. Warranty. Vendor warrants and guarantees to City that all goods and/or equipment to be supplied hereunder will be of good quality and free from faults and defects. This warranty shall cover materials for the manufacturer stated warranty period and workmanship for two (2) year from the date of substantial completion or as provided in the specifications/invoice attached hereto, whichever is greater.

19. Conflicts. If there is any inconsistency between these Terms and Conditions and the specifications/invoice or any attachments thereto, these Terms and Conditions shall apply.

20. Hold Harmless. The Vendor shall indemnify and hold harmless the City and its agents, employees, elected officials, representatives and assigns (hereinafter referred to as the "Indemnified Parties") as and against any and all claims, demands, actions, causes of action, losses, costs, expense, including, but not limited to actual attorney fees, arising out of or resulting from the performance of the work. Said indemnity shall include both the Vendor, as well as any subcontractors working under them, regardless of whether or not such claims, demands, losses or expenses are caused in whole, or in part, by the parties that are being indemnified. Such obligation shall not be considered to negate, abridge or reduce other rights or obligations of indemnity which would otherwise exist as to a party or persons described in this paragraph. To the extent that the Vendor retains subcontractors for the performance of the work, or any portion thereof, the Vendor and/or subcontractors shall provide evidence of the insurance coverages set forth above, as well as the terms of this indemnification provision shall be applicable to such Vendor and/or subcontractors.

21. Modification and Assignability. This contract, including all documents incorporated by reference herein, may not be enlarged, modified or altered except upon written agreement signed by both parties. The Vendor may not subcontract or assign its rights, including rights to compensation, or terms of performance arising hereunder without the prior written consent of the City. Any subcontractor or assignee shall be bound by all of the terms and conditions of the contract, and will be required to enter into a written agreement with the City.

22. Termination of Contract. This contract may be terminated as follows:

- a. *Termination for Convenience.* City may terminate this contract in whole or in part for the convenience of the City when the City determines that the continuation of the project is not in the best interests of the City. Vendor shall be entitled to payment for all of the services performed at the date of the termination, together with its direct costs of termination. Under no circumstances shall the Vendor be entitled to any penalty for the termination nor shall the Vendor be entitled to any payment for lost profits.
- b. *Termination for Cause.* If the City determines that the Vendor has failed to comply with any of the terms and conditions of the contract and the scope of services and related documents thereto, the City may give written notice to the Vendor of any such deficiency and in the event that the Vendor fails to cure said deficiency within ten (10) days of the notice of such failure, the City may, with no further notice, declare this contract to be terminated. Vendor will therefore be entitled to receive payment for those services performed at the date of termination, plus the amount of reasonable damages suffered by the City by reason of the Vendor's failure to comply with the terms of the contract. Under no circumstances shall the Vendor be entitled to any lost profits arising from the contract.

23. Ongoing Services. This is also a contract for ongoing preventative maintenance services, as provided for in the Project Specifications. The parties agree that these Terms and Conditions shall be applicable to these ongoing Services.

24. Relationship of the Parties. The Vendor agrees to perform the services as provided for hereunder as an independent contractor, not as an employee of the City. The Vendor shall furnish all services, labors, materials and equipment necessary to conduct and complete the work. The work shall be performed in accordance with the specifications subject to the satisfaction of the City.

25. Delay. The Contractor shall not be liable for delays or failure to perform the services necessary to complete the work which are caused directly or indirectly by circumstances beyond the Contractor's control, including but limited to, acts of God, fire, flood, war, sabotage, accident, labor dispute, material shortage, governmental action, including regulatory requirements, change conditions, delays resulting from actions of the Owner or third parties not under control of the Contractor, site inaccessibility or inability of others to obtain materials, labor, equipment or transportation. Should any of the above occur, then the date for completion of the services shall be adjusted for such delay, provided that the Contractor reports the delay, both verbally and in

writing, to the Owner within a reasonable time of its discovery. The Owner shall determine whether or not the cause of delaying or not completing a duty or obligation under this Agreement is under the control of the Contractor.

The Contractor acknowledges that in December of 2019 a novel strain of the Coronavirus (now referenced as COVID-19) was detected and has now spread throughout many countries, including the United States. Based upon this, the World Health Organization has declared a Public Health Emergency of international concern; and the United States Department of Health and Human Services has declared a Public Health Emergency. The Contractor further acknowledges that it is aware of the COVID-19 pandemic and that the existence of said pandemic will not constitute a force majeure or otherwise preclude the Contractor's ability to perform the terms of this agreement absent the issuance of any Order by a governmental entity with jurisdiction that would preclude such performance

The Contractor acknowledges that it must perform the work and services hereunder, pursuant to the terms and conditions of this Agreement and that such work shall conform to the recognized standards in the Milwaukee Metropolitan Area for the performance of this work as are prevalent in this field of endeavor and like services. Also, its work shall be performed in a good and workmanlike manner.

26. Regulations. The Vendor agrees to comply with all the requirements of applicable federal, state and local laws, as well as Codes and Specification requirements related to the performance of the work under this Contract.

27. Records and Reports. Records relating to the performance of the services under this Contract must be retained for seven (7) years after final disposition. However, if any litigation claim or audit has started before the expiration of the seven (7) year period, then records shall be retained for five (5) years after the litigation or audit is resolved. Notwithstanding any other clause written herein, Vendor understands and agrees that the City is a municipal entity and therefore, is subject to the Open Records Law of the State of Wisconsin. Wisconsin Statute §19.36(3) requires governmental entities to make available for inspection a copy of any records produced or collected under a contract entered into by the municipal entity to the same extent as if the record were maintained by the municipality. Therefore, in the event there is a request for any other documentation pertaining to this Contract, Vendor shall provide the information as requested and charge no more than the cost to copy said information. The parties agree that upon completion or termination of this Contract, all project contract documents or instruments of service, including electronic files of computer-aided record drawings and field inspection reports shall be delivered to and shall become the property of the City. These records, drawings, reports, etc. may be used without restriction by the City for any public purpose and to implement construction and use of the project. Any such use or reuse of these documents outside the scope of the project shall be without compensation or liability to the Vendor, excepting for errors and omissions associated with the completed project, services and documents performed under this Contract.

28. Governing Law; Entire Agreement. This Contract shall be governed and construed in accordance with the laws of the State of Wisconsin. These Contract documents represent the

complete understanding of the parties with respect to the subject matter set forth herein and may only be amended in a subsequent agreement executed by all parties.

29. Relationship of the Parties. The contractor agrees to perform the services as provided for hereunder as an independent contractor, not as an employee of the owner. The contractor shall furnish all services and labors and materials and equipment necessary to conduct and complete the work. The work shall be performed in accordance with the specifications subject to the satisfaction of the owner.

CITY:
City of New Berlin

VENDOR:

[Insert Vendor Name]

By: _____

[Print Name & Title]

By: _____

[Print Name & Title]

ADDENDUM TO CITY OF NEW BERLIN CONTRACTS

This Addendum is made and entered into and shall be considered an attachment to all contracts entered into by the City of New Berlin for so long as the City of New Berlin is subject to the U.S. Department of Treasury Restrictions, as well as other federal regulations related to the City's receipt of American Rescue Plan Act Funds. The following Terms and Conditions shall be included in each such agreement and are incorporated as though fully set forth in the original contract.

1. The contractor agrees to comply with the applicable requirements of Section 603 of the American Rescue Plan Act (hereinafter referred to as the "Act") regulations adopted by the US Department of Treasury (hereinafter referred to as the "Treasury") pursuant to Section 603(f) of the Act and the guidance issued by the Treasury regarding the foregoing. The contractor also agrees to comply with all other applicable federal statutes, regulations and executive orders and shall provide for such compliance by other parties, including subcontractors in any agreements it enters into with other parties related to this award.
2. Statutes and regulations prohibiting discrimination and applicable to this contract include, but are not limited to the following:
 - a. Title VI of the Civil Rights Act of 1964 (42 USC, §2000 D, et. seq.) and Treasury's implementing regulations at 31 CFR, Part 22, which prohibit discrimination on the basis of race, color or national origin under programs or activities receiving federal financial assistance.
 - b. Fair Housing Act. Title VIII of the Civil Rights Act of 1968 (42 USC, §3601, et. seq.) which prohibits discrimination in housing on the basis of race, color, religion, national origin, sex, familial status or disability.
 - c. Section 504 of the Rehabilitation Act of 1973, as amended, (29 USC, §794), which prohibits discrimination on the basis of disability under any program or activity receiving federal financial assistance.
 - d. The Age Discrimination Act of 1975, as amended (42 USC, §6101, et. seq.) and Treasury's implementing regulations at 31 CFR, Part 23, which prohibit discrimination on the basis of age and programs or activities receiving federal financial assistance; and
 - e. Title II of the Americans with Disabilities Act of 1990, as amended (42 USC, §12, 12101 et. seq.), which prohibits discrimination on the basis of disability under programs, activities and services provided or made available by state and local governments or instrumentalities or agencies thereto.
3. Equal Employment Opportunity. During the performance of the contract, the contractor will be required to comply with Equal Opportunity Employment Statutes as outlined in 47 CFR, §90.168.
4. Copeland Anti-Kickback Act. The contractor shall comply with 18 USC, § 874, 40 USC, §3145 and the requirements of 29 CFR, Part 3, as may be applicable, which are incorporated by reference into this contract.

5. Contract Work Hours of the Safety Standards Act.

- a. Overtime Requirements. No contract or subcontract contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any work week in which he/she is employed on such work to work in excess of 40 hours in such work week unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of 40 hours in such work week.
 - b. Violation. Liability for unpaid wages; liquidated damages: In the event a violation of the clause set forth in (a) above, the contractor or any subcontractor responsible therefore shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards employed in violation of this section.
 - c. Withholding fund paid wages and liquidated damages: The City of New Berlin shall, upon its own action or upon written request of an authorized representative of the US Department of Labor, withhold or cause to be withheld from any monies payable on account of work performed by the contractor or subcontractor under any such contract or any other federal contract with the same contractor or any other federally assisted contract subject to the contract work hours and Safety Standards Act, which is held by the same contractor such sums as may be determined to be necessary to satisfy any liabilities of such contractors or subcontractors or unpaid wages and liquidated damages as provided in the clause set forth in this section.
 - d. Subcontract. The contractors or subcontractors shall insert in any contract the clauses set forth in Paragraph B, 1-4 of 29 CFR §5.5 and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in Paragraphs B, 1-4 of 21 CFR, §5.5.
6. Clean Air Act and Federal Water Pollution Control Act. Contractor needs to comply with all applicable standards, orders or regulations issued pursuant to the Clean Air Act, as amended, 42 USC, §7401, et. seq.
7. Debarment and Suspension. This award is a covered transaction for purposes of 2 CFR, Part 180 and 2 CFR, Part 3000. As such, the contractor is required to verify that none of the contractors principals (defined in 2 CFR, §180.995) or its affiliate (defined in 2 CFR, §180.1.905) are excluded (defined in 2 CFR, §180.940) or disqualified (defined in 2 CFR, §180.935). Selected contractors must comply with 2 CFR, Part 180, Subpart C and 2 CFR, Part 3000, Subpart C, and must include a requirement to comply with these regulations in any lower tier covered transaction it enters into. This certification is a material representation of fact relied upon by the City of New Berlin. If it is later determined that the contractor did not comply with 2 CFR, Part 180, Subpart C and 2 CFR, Part 3000, Subpart C, in addition to remedies available to the City of New Berlin, the federal government may pursue available remedies including, but not limited to, suspension and/or

disbarment. The contractor and the bidder or proposer agree to comply with the requirements of 2 CFR, Part 180, Subpart C and 2 CFR, Part 3000, Subpart C, while this offer is valid and throughout the period of any contract that may arise from this offer. This contractor and the bidder or proposer further agrees to provide a provision requiring such compliance in its lower tier covered transactions.

8. Byrd Anti-Lobbying Amendment. The contractor shall file the required certification. The contractor and all subcontractors certify that they will not and have not used federal appropriated funds to pay any person or organization for influencing or attempting to influence an officer or employee of any agency, a member of Congress, officer or employee of Congress or an employee of a member of Congress, or employees of the City of New Berlin in connection with obtaining any federal contract, grant or any award covered by 31 USC, §1352. Each tier, including the contractor and all subcontractors, shall also disclose any lobbying with non-federal funds that takes place in connection with obtaining any federal award. Such disclosures are forwarded from tier to tier up to the recipient, who in turn will forward the certifications to the awarding agency. If the agreement exceeds \$100,000.00, the contractor must certify compliance with the Byrd Anti-Lobbying Amendment.
9. Procurement of Recovered Materials. Contractor shall comply with 2 CFR, §200.323 as applicable.
10. Prohibition on Certain Telecommunications and Video Surveillance Services or Equipment. Contractor shall comply with 2 CFR, §200.216, as applicable.
11. Domestic Preferences for Procurements. Contractor shall comply with 2 CFR, §200.322.
12. This Exhibit A is intended to incorporate those federal laws and regulations that apply to this contract. If the contractor believes that any law or regulation described herein is not applicable in this contract per the terms of the federal law or regulation, the contractor shall present their position in that regard to the City of New Berlin with a written change order request. The laws cited herein shall be followed by the contractor and all subcontractors unless the municipality agrees that the cited federal law or regulation does not apply, and the change order is approved by the City of New Berlin Common Council.

ADDENDUM TO CITY OF NEW BERLIN CONTRACTS

This Addendum is made and entered into and shall be considered an attachment as Exhibit B to all contracts entered into by the City of New Berlin for so long as the City of New Berlin is subject to the U.S. Department of Treasury Restrictions, as well as other federal restrictions related to the City's receipt of Federal Funds. The following Terms and Conditions shall be included in each such agreement and are incorporated as though fully set forth in the original contract.

1. No City contractor or employee shall operate any machinery or vehicle while utilizing a smart phone, including, but not limited to, the use of any cellular phone or texting.
2. All City employees and contractors, while engaged in the performance of City business or acting consistent with the performance of services under a contract with the City shall utilize seatbelts and any other safety devices related to the operation of a motor vehicle.
3. City employees or contractors whose duties and responsibilities are funded through the Coronavirus State and Local Fiscal Recovery Funds agree that they will not engage in any lobbying activities while in the course of providing services on behalf of the City of New Berlin, as restricted under the Hatch Act, 5 USC Sec. 1501-1508. No funds appropriated under the Coronavirus State and Local Fiscal Recovery Act shall be utilized for lobbying, and no political payments shall be made through the use of said funds.
4. All City employees and contractors, while in the performance of duties on behalf of the City shall abide by all local, state and federal regulations concerning the ingestion of controlled substances and shall not violate such Statutes or Ordinances. The City shall enforce drug free workplace standards and provide awareness programs for Staff. The City shall further agree to take action regarding individuals using drugs in the workplace according to law.
5. All City employees and contractors, in the course of performing of their duties on behalf of the City, shall, to the extent applicable, comply with the provisions in Wisconsin Statute §19.59 regarding conflicts of interest, as well as City of New Berlin Municipal Code Chapter 28 regarding ethics. Specifically, no City employee or contractor shall accept or solicit money or tangible personal property or otherwise receive consideration in exchange for the agreement to enter into a contract with a third party.
6. City employees shall avoid the acquisition of unnecessary items or property on behalf of the City.
7. City employees shall, to the extent applicable, engage in value engineering as part of any construction work performed on behalf of the City.
8. Contracts shall only be awarded to responsible contractors with experience in performing the services being contracted for.

9. City contracts shall avoid compensating for contractor work performed on a time and material basis and, to the extent practicable, shall have fixed-price contracts.
10. The selection of a contractor by the City should be done in an atmosphere of open and honest competition.
11. In the course of public bidding involving the purchase of equipment, the City shall not specify only a brand name for the purpose of limiting potential contracting parties. The City may include a clause, however, that any equipment being supplied under a City contract must interface well and be compatible with existing equipment utilized by the City of New Berlin, which is identified as the following: _____.
12. The City shall verify that any entity with which it is contracting has not been excluded for contracting pursuant to 2 CFR §180.
13. City contractors do hereby certify that they are not designated by the federal government as being precluded from engaging in federal contracts.
14. The City of New Berlin, its employees, officers, agents, contractors and assigns may not discharge, demote or otherwise discriminate against an employee in reprisal for disclosing information that the employee reasonably believes is evidence of gross mismanagement of a Federal, State or City contract or grant; a gross waste of Federal, State or City funds; an abuse of authority relating to Federal, State or Local Contractor Grant; a substantial and specific danger to public health, safety or welfare; or a violation of law, rule or regulation related to a Federal, State or City contract (including, but not limited to, the competition for or negotiation of a contract) or Grant. The entities to which disclosure of such information includes, but is not limited to the following entities:
 - a. A member of Congress or a representative of a committee of Congress;
 - b. An Inspector General;
 - c. The Government Accountability Office;
 - d. A Treasury employee responsible for contract grant oversight or management;
 - e. An authorized official of the Department of Justice or other law enforcement agency;
 - f. A Court or Grand Jury;
 - g. A management official or other employee of the City;
 - h. A contractor of the City;
 - i. A subcontractor of the City, which has the responsibility to investigate, discover or address misconduct;
 - j. An official of the State of Wisconsin, or other employee, agent or contractor of the State who has the responsibility to investigate, discover or address misconduct.
15. This Policy shall be disclosed to all City officers, agents, contractors or assigns and shall be included as part of the City's Addendum for City contract.
16. The City shall engage in a cost and price evaluation analysis to include independent estimates of the cost of the equipment or service before placing the matter out for bid.

17. When the City is engaged in negotiating purchase of goods and services, the profit in the contract shall be negotiated independently from the materials and labor. In any contract entered into by the City of New Berlin for the acquisitions of goods and services shall require remedies in the event of a breach of the agreement and shall include provisions for termination as to cause.

City of New Berlin
2023 Safety Building & Fire Station 1 Building Envelope Project
16300 W National Ave, New Berlin, WI 53151

BID FORM

1. **GENERAL DIRECTIONS TO BIDDERS**

- A. All Bids must be submitted on these standard form sheets inclusive without modification. Fill out all blanks on the Bid Form by typing or writing in ink. Sign in ink. Erasures or other changes in Bid must be explained or noted over signature of Bidder. Enter Bid amount in both written words and printed figures in spaces provided on Bid Form. In case of conflict, amount given in written words will govern.
- B. Base Bid(s) must be for Work bid in strict accordance with the Drawings and Specifications. **INCLUDE BOND(s) COSTS IN THE BASE BID(S)**. All requested Alternates must be bid. If no change to the Base Bid applies, enter “No Change.”
- C. Bid Forms containing qualifications, conditions, omissions, unexplained erasures, alterations or items not called for in Bid Form or other irregularities of any kind may be rejected at the discretion of the Owner.
- D. Bidders shall examine the provisions of the Project Manual thoroughly to ensure compliance with all bidding requirements.
- E. Bidders shall only submit the Bid Forms included in the Project Manual – DO NOT return the Project Manual.
- F. Bidders shall ensure that all items in the Bid Form such as Work Schedule, Bidders Official Title and Signature, and Proof of Responsibility are properly executed.
- G. A bid must be accompanied by a bid security made payable to Owner in an amount of 5% of bidder’s maximum bid price (determined by adding the base bid and all alternates), and in the form of a certified check, bank money order or a bid bond issued by a surety acceptable to the City. The bid security will be retained by the City until the City awards the contract to such bidder and such bidder has executed the contract documents and met the other conditions of the Notice of Award, where upon the bid security will be released. If the successful bidder fails to execute and deliver the contract documents and furnish the requirements contract security within 15 days after the Notice of Award, the Owner may consider the bidder to be in default and annul the Notice of Award and the bid security of that bidder will be forfeited. Such forfeiture shall be the Owner’s exclusive remedy if the bidder defaults.

- H. The Bidder shall be required to identify any subcontractor, suppliers, individuals or entities to be submitted to the Owner 14 days in advance of the City's acceptance of the agreement. The apparent successful bidder shall, within 5 days after the bid opening, submit to the Owner a list of all such subcontractors, suppliers, individuals or other entities that will be utilized in the completion of the work. An experience statement with pertinent information regarding similar projects and other evidence of qualification for the work that the subcontractor will be performing is required. If the Owner, after review of such information, determines, in its sole discretion, that such subcontractor, supplier, individual or entity is not satisfactory, the Owner, prior to the Notice of Award, shall give notice to the successful bidder requiring that an acceptable substitute be provided. In the event there is any adjustment to the cost as a result of said substitution, Owner may take that into consideration in making the contract award. In the event that the contractor fails to make the substitution requested, the Owner may award the contract to the next lowest responsive responsible bidder.
- I. Bids not conforming to the above directions may be declared irregular and are subject to disqualification at the discretion of the Owner.

THE BIDDER HEREBY AGREES THAT THIS BID IS INVALID WITHOUT BIDDER'S SIGNATURE APPEARING IN THE SIGNATURE BLOCK ON THE LAST PAGE OF THIS BID FORM.

2. BID SUBMITTAL PROCEDURE

In submitting a Bid, the Bidder represents that:

- He/She thoroughly reviewed and understood the Bidding and Contract Documents and the Bid is made in full accordance with these documents and amendments issued thereto.
- He/She has thoroughly reviewed and understands the Bidding and Contract Documents related to the Work of other portions of the Project, if any, being bid concurrently or presently under construction.
- He/She has thoroughly reviewed informational reports and documents available to him/her, visited the project site, become familiar with actual local conditions under which the Work is to be performed and has correlated his/her evaluations and personal observations with the requirements of the Bidding and Contract Documents.
- The contract for the work, if awarded, will be on the basis of materials and equipment specified or described in the bidding documents, and those or equal or substitute or materials and equipment subsequently approved by the Owner prior to the submittal of bids and identified by addendum. No item of material or equipment will be considered by Owner as an or equal or substitute unless written requests for approval has been submitted by the bidder and has been received by the Owner at least 10 days prior to the date of receipt of bids in the case of a proposed substitute. The burden of proof on the merit of the proposed item is upon the bidder. The Owner's decision of approval or disapproval of a proposed item will be final. If the Owner approves any such proposed items, such approval will be set forth as an addendum issued to all

perspective bidders. Bidder shall not rely upon approvals made in any other manner. All prices that Bidder sets forth in this bid shall be based on the presumption that the contractor will furnish the materials and equipment specified or described in the bidding documents as supplemented by any addenda.

- A. After Bid Forms are completed, place one (1) set of signed originals and the Bid Bond in a sealed envelope. Oral, telephonic, e-mailed, or faxed Bids are invalid and will not be considered.
- B. Address the envelope to:
City of New Berlin
Attn: City Clerk's Office
3805 S Casper Dr
New Berlin, WI 53151
- C. Bidders shall affix their name and address to the front upper left-hand corner of the envelope with the words "Sealed Bid Enclosed" written on the outside. Identified in lower left corner should be: Bid number, project name and opening date.

3. BID CLOSING

- A. Bids must be received on or before 10:00 a.m. on March 2nd, 2023. The Bidder assumes full responsibility for timely delivery at the location designated for receipt of Bids. **Bids received after the time and date for receipt of Bids will be rejected and returned unopened.**

4. BID OPENING

- A. Bids will be publicly read at 10:00 a.m. on March 2nd, 2023 in the New Berlin City Hall – Common Council Chambers.

(a corporation)

We _____ (a partnership)
_____ (an individual)
(Cross out inapplicable)

Of _____
Street City County State Zip

hereby agree to execute the proposed Contract and to furnish a satisfactory Public Improvement Performance/Labor and Material Payment Bond, in the amount of one hundred percent (100%), and to provide all labor and material required for the construction of the designated Work, for the prices hereinafter set forth, in strict accordance with the Construction Documents released by: **City of New Berlin**, address: 3805 S. Casper Dr, New Berlin, WI dated February 8th, 2023.

Including Amendment Nbr(s)._____ dated_____.

5. BASE BID 1 – Safety Building (Roof Sections 1, 2, 3, 4 & 5)

Base Bid 1 includes all work required to complete the Project, including Building Permits, General Conditions, overhead, profit, insurance, bonds, taxes, and all other expenses. Bid Guarantee ten percent (10%) Bid Bond Cost, Public Improvement Performance Bond and Labor and Materials Payment Bond Cost one hundred percent (100 %) for the sum of:

_____ Dollars (\$ _____)

BASE BID 2 – Fire Station 1 (Roof Sections 1, 2, 3, & 4)

Base Bid 2 includes all work required to complete the Project, including Building Permits, General Conditions, overhead, profit, insurance, bonds, taxes, and all other expenses. Bid Guarantee ten percent (10%) Bid Bond Cost, Public Improvement Performance Bond and Labor and Materials Payment Bond Cost one hundred percent (100 %) for the sum of:

_____ Dollars (\$ _____)

BASE BID 1 & 2 - Safety Building (Roof Sections 1, 2, 3, 4, & 5) & Fire Station 1 (Roof Sections 1, 2, 3, & 4)

Base Bid 1 & 2 includes all work required to complete the Project, including Building Permits, General Conditions, overhead, profit, insurance, bonds, taxes, and all other expenses. Bid Guarantee ten percent (10%) Bid Bond Cost, Public Improvement Performance Bond and Labor and Materials Payment Bond Cost one hundred percent (100 %) for the sum of:

_____ Dollars (\$ _____)

ALTERNATE BID 1 – Safety Building (Roof Sections 1, 2, 3, 4, & 5)

Alternate Bid 1 includes all work required to complete the Project, including Building Permits, General Conditions, overhead, profit, insurance, bonds, taxes, and all other expenses. Bid Guarantee ten percent (10%) Bid Bond Cost, Public Improvement Performance Bond and Labor and Materials Payment Bond Cost one hundred percent (100 %) for the sum of:

_____ Dollars (\$ _____)

ALTERNATE BID 2 – Fire Station 1 (Roof Sections 1, 2, 3, & 4)

Alternate Bid 2 includes all work required to complete the Project, including Building Permits, General Conditions, overhead, profit, insurance, bonds, taxes, and all other expenses. Bid Guarantee ten percent (10%) Bid Bond Cost, Public Improvement Performance Bond and Labor and Materials Payment Bond Cost one hundred percent (100 %) for the sum of:

_____ Dollars (\$ _____)

ALTERNATE BID 1 & 2 – Safety Building (Roof Section 1, 2, 3, 4, & 5) & Fire Station 1 (Roof Sections 1, 2, 3, & 4)

Alternate Bid 1 & 2 includes all work required to complete the Project, including Building Permits, General Conditions, overhead, profit, insurance, bonds, taxes, and all other expenses. Bid Guarantee ten percent (10%) Bid Bond Cost, Public Improvement Performance Bond and Labor and Materials Payment Bond Cost one hundred percent (100 %) for the sum of:

_____ Dollars (\$ _____)

6. SCHEDULE OF VALUES

- A. Submit schedule of standard rates for all personnel, including personnel of subcontractors, involved with project.
- B. Include schedule of standard markups.

7. COMMENCEMENT, PROGRESS AND COMPLETION OF WORK

- A. If written Notice of Intent to Award Contract is issued not later than March 31st, 2023 with a Project commencement of April 1st, 2023, can you complete the Work in compliance with the requirements of the Contract Documents by October 31st, 2023, in full cooperation and coordination with other Contractors, if any.

Yes ___ No ___ .

If “No”, state additional calendar days required _____.

- B. The undersigned understands that time is of the essence and agrees that the specified time period for completion stated above is a reasonable time for the completion of the Work. All time limits shall be binding.

8. BID ACCEPTANCE:

- A. All Bids as stated above are effective and open for acceptance by the Owner for a period of ninety (90) days after date set for opening of Bids.
- B. One contractor will be selected for the project

FIRM NAME _____

BY SIGNATURE _____

TITLE _____

DATED _____

TELEPHONE _____

FAX NBR _____

EMAIL ADDRESS: _____

If a corporation, answer the following:

Incorporated under laws of what state?

SEAL _____ (If Bid is by Corporation)

CHANGE NOTICE

The following information must be completed and signed prior to any work being done which varies in any way from the Contract Documents as submitted. Failure to properly complete this form shall void any subsequent requests for payments which may be made in addition to the submitted bidding documents.

Name of Account:_____

Project Name:_____

Name of Contractor:_____

Proposed Changes:

Amount Not To Exceed: \$_____

Submitted By: _____ **Title**_____

Approved By: _____ **Title**_____

Date Approved: _____/_____/_____

Copy To: 1) Owner and/or Owner's Representative.
 2) Contractor
 3) Sub-Contractor

[Type here]

SECTION 07550
MODIFIED BITUMINOUS MEMBRANE ROOFING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Hot Applied 3-Ply Asphalt Roofing (Base Bid 1 & 2 / Alternate Bid 1 & 2)
- B. Accessories. (2.19)

1.2 REFERENCES

- A. ASTM D 41 - Standard Specification for Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing.
- B. ASTM D 312 - Standard Specification for Asphalt used in Roofing.
- C. ASTM D 451 - Standard Test Method for Sieve Analysis of Granular Mineral Surfacing for Asphalt Roofing Products.
- D. ASTM D 1970 - Specification for Sheet Materials, Self-Adhering Polymer Modified Bituminous, Used as Steep Roofing Underlayment for Ice Dam Protection.
- E. ASTM D 1079 Standard Terminology Relating to Roofing, Waterproofing and Bituminous Materials.
- F. ASTM D 1227 Standard Specification for Emulsified Asphalt Used as a Protective Coating for Roofing.
- G. ASTM D 1863 Standard Specification for Mineral Aggregate Used as a Protective Coating for Roofing.
- H. ASTM D 2178 Standard Specification for Asphalt Glass Felt Used in Roofing and Waterproofing.
- I. ASTM D 2824 Standard Specification for Aluminum-Pigmented Asphalt Roof Coating.
- J. ASTM D 4586 Standard Specification for Asphalt Roof Cement, Asbestos-Free.
- K. ASTM D 4601 Standard Specification for Asphalt Coated Glass Fiber Base Sheet Used in Roofing.
- L. ASTM D 5147 Standard Test Method for Sampling and Testing Modified Bituminous Sheet Materials.
- M. ASTM D 6162 Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using a Combination of Polyester and Glass Fiber Reinforcements.
- N. ASTM D 6163 Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Glass Fiber Reinforcements.
- O. ASTM D 6164 - Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Polyester Reinforcements.
- P. ASTM D 6754 - Standard Specification for Ketone Ethylene Ester (KEE) Sheet Roofing.
- Q. ASTM D 6757 - Standard Specification for Underlayment Felt Containing Inorganic Fibers Used in Steep-Slope Roofing.
- R. ASTM E 108 - Standard Test Methods for Fire Test of Roof Coverings
- S. Factory Mutual Research (FM): Roof Assembly Classifications.
- T. National Roofing Contractors Association (NRCA): Roofing and Waterproofing Manual.

[Type here]

- U. Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA) - Architectural Sheet Metal Manual.
- V. Underwriters Laboratories, Inc. (UL): Fire Hazard Classifications.
- W. Warnock Hersey (WH): Fire Hazard Classifications.
- X. ANSI-SPRI ES-1 Wind Design Standard for Edge Systems used with Low Slope Roofing Systems.
- Y. ASCE 7, Minimum Design Loads for Buildings and Other Structures
- Z. UL - Fire Resistance Directory.
- AA. FM Approvals - Roof Coverings and/or RoofNav assembly database.
- BB. FBC - Florida Building Code.
- CC. Miami-Dade Building Code Compliance - N.O.A. (Notice of Acceptance).
- DD. California Title 24 Energy Efficient Standards.

1.3 DESIGN / PERFORMANCE REQUIREMENTS

- A. Perform work in accordance with all federal, state and local codes.
- B. Exterior Fire Test Exposure: Roof system shall achieve a UL, FM or WH Class rating for roof slopes indicated on the Drawings as follows:
 - 1. Factory Mutual Class A Rating.
 - 2. Underwriters Laboratory Class A Rating.
 - 3. Warnock Hersey Class A Rating.

1.4 SUBMITTALS

- A. Submit under provisions of Section 01300.
- 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. Installation instructions.
- C. Shop Drawings: Submit shop drawings including installation details of roofing, flashing, fastening, insulation and vapor barrier, including notation of roof slopes and fastening patterns of insulation and base modified bitumen membrane, prior to job start.
- D. Design Pressure Calculations: Submit design pressure calculations for the roof area in accordance with ASCE 7 and local Building Code requirements. Include a roof system attachment analysis report, certifying the system's compliance with applicable wind load requirements before Work begins.
- E. Manufacturer's Certificates: Provide to certify products meet or exceed specified requirements.
- F. Test Reports: Submit test reports, prepared by an independent testing agency, for all modified bituminous sheet roofing, indicating compliance with ASTM D5147. Testing must be performed at 77 deg. F. Tests at 0 deg. F will not be considered.
- G. Closeout Submittals: Provide manufacturer's maintenance instructions that include recommendations for periodic inspection and maintenance of all completed roofing work. Provide product warranty executed by the manufacturer. Assist Owner in preparation and submittal of roof installation acceptance certification as may be necessary in connection with fire and extended coverage insurance on roofing and associated work.

1.5 QUALITY ASSURANCE

[Type here]

- A. Perform Work in accordance with NRCA Roofing and Waterproofing Manual.
- B. Manufacturer Qualifications: Company specializing in manufacturing products specified with documented ISO 9001 certification and minimum of twelve years of documented experience and must not have been in Chapter 11 bankruptcy during the last five years.
- C. Installer Qualifications: Company specializing in performing Work of this section with minimum five years documented experience.
- D. Installer's Field Supervision: Maintain a full-time Supervisor/Foreman on job site during all phases of roofing work while roofing work is in progress.
- E. Product Certification: Provide manufacturer's certification that materials are manufactured in the United States and conform to requirements specified herein, are chemically and physically compatible with each other, and are suitable for inclusion within the total roof system specified herein.
- F. Source Limitations: Obtain all components of roof system from a single manufacturer. Secondary products that are required shall be recommended and approved in writing by the roofing system Manufacturer. Upon request of the Architect or Owner, submit Manufacturer's written approval of secondary components in list form, signed by an authorized agent of the Manufacturer.

1.6 PRE-INSTALLATION MEETINGS

- A. Convene minimum two weeks prior to commencing Work of this section.
- B. Review installation procedures and coordination required with related Work.
- C. Inspect and make notes of job conditions prior to installation:
 - 1. Record minutes of the conference and provide copies to all parties present.
 - 2. Identify all outstanding issues in writing designating the responsible party for follow-up action and the timetable for completion.
 - 3. Installation of roofing system shall not begin until all outstanding issues are resolved to the satisfaction of the Architect.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store products in manufacturer's unopened packaging with labels intact until ready for installation.
- B. Store all roofing materials in a dry place, on pallets or raised platforms, out of direct exposure to the elements until time of application. Store materials at least 4 inches above ground level and covered with "breathable" tarpaulins.
- C. Stored in accordance with the instructions of the manufacturer prior to their application or installation. Store roll goods on end on a clean flat surface except store KEE-Stone FB 60 rolls flat on a clean flat surface. No wet or damaged materials will be used in the application.
- D. Store at room temperature wherever possible, until immediately prior to installing the roll. During winter, store materials in a heated location with a 50 degree F (10 degree C) minimum temperature, removed only as needed for immediate use. Keep materials away from open flame or welding sparks.
- E. Avoid stockpiling of materials on roofs without first obtaining acceptance from the Architect/Engineer.
- F. Adhesive storage shall be between the range of above 50 degree F (10 degree C) and below 80 degree F (27 degree C). Area of storage shall be constructed for flammable storage.

1.8 COORDINATION

- A. Coordinate Work with installing associated metal flashings as work of this section proceeds.

1.9 PROJECT CONDITIONS

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- 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.

1.10 WARRANTY

- A. Upon completion of the work, provide the Manufacturer's written and signed NDL Warranty, warranting that, if a leak develops in the roof during the term of this warranty, due either to defective material or defective workmanship by the installing contractor, the manufacturer shall provide the Owner, at the Manufacturer's expense, with the labor and material necessary to return the defective area to a watertight condition.
 - 1. Warranty Period:
 - a. Base Bid - 30 years from date of acceptance. Requires mid period inspection.
 - b. Alternate Bid - 40 years from date of acceptance. Requires mid period inspection.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Design based on materials manufactured by The Garland Company, Inc. (The); 3800 E. 91st St., Cleveland, OH 44105. ASD. Toll Free: 800-321-9336. Phone: 216-641-7500. Fax: 216-641-0633. Web Site: www.garlandco.com. Alternative manufacturers will be considered in accordance with provisions of Section 01600.
- B. Requests for substitutions will be considered in accordance with provisions of Section 01600.
- C. The Products specified are intended and the Standard of Quality for the products required for this project. If other products are proposed the bidder must disclose in the bid the manufacturer and the products that they intend to use on the Project. If no manufacturer and products are listed, the bid may be accepted only with the use of products specified.
 - 1. Bidder will not be allowed to change materials after the bid opening date.
 - 2. If alternate products are included in the bid, the products must be equal to or exceed the products specified. Supporting technical data shall be submitted to the Architect/ Owner for approval prior to acceptance.
 - 3. In making a request for substitution, the Bidder/Roofing Contractor represents that it has:
 - a. Personally investigated the proposed product or method, and determined that it is equal or superior in all respects to that specified.
 - b. Will provide the same guarantee for substitution as for the product and method specified.
 - c. Will coordinate installation of accepted substitution in work, making such changes as may be required for work to be completed in all respects.
 - d. Will waive all claims for additional cost related to substitution, which consequently become apparent.
 - 4. Owner reserves the right to be the final authority on the acceptance or rejection of any or all bids, proposed alternate roofing systems or materials that has met ALL specified requirement criteria.
 - 5. Failure to submit substitution package, or any portion thereof requested, will result in immediate disqualification and consideration for that particular contractors request for manufacturer substitution.

2.2 HOT APPLIED 3-PLY ASPHALT ROOFING – Base Bid & Alternate Bid

- A. Base (Ply) Sheet: Two plies bonded to the prepared substrate with Interply Adhesive.
- B. Modified Cap (Ply) Sheet: One ply bonded to the prepared substrate with interply Adhesive.
- C. Interply Adhesive: (1, 2 and 3) Generic Type III Asphalt.
- D. Flashing Base Ply: One ply bonded to the prepared substrate with Interply Adhesive
- E. Flashing Cap (Ply) Sheet: One ply bonded to the prepared substrate with Interply Adhesive

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F. Flashing Ply Adhesive: Generic Type III Asphalt.

G. Surfacing: Cold Process Flood Coat and Gravel.

2.3 ACCESSORIES:

A. Pitch Pocket Sealer – Two part, 100% solids, self-leveling, polyurethane sealant for filling pitch pans as recommended and furnished by the membrane manufacturer.

1. Durometer, ASTM D 2240: 40-50 Shore

2. Elongation, ASTM D 412: 250%

3. Tensile Strength, ASTM D 412: 200 @ 100 mil

PART 3 EXECUTION (BASE BID & ALTERNATE BID)

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. Inspect and approve the deck condition, slopes and fastener backing if applicable, parapet walls, expansion joints, roof drains, stack vents, vent outlets, nailers and surfaces and elements.

C. Verify that work penetrating the roof deck, or which may otherwise affect the roofing, has been properly completed.

D. If substrate preparation and other conditions are the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. General: Clean surfaces thoroughly prior to installation.

1. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

2. Fill substrate surface voids that are greater than 1/4 inch wide with an acceptable fill material.

3. Roof surface to receive roofing system shall be smooth, clean, free from loose gravel, dirt and debris, dry and structurally sound.

4. Wherever necessary, all surfaces to receive roofing materials shall be power broom and vacuumed to remove debris and loose matter prior to starting work.

5. Do not apply roofing during inclement weather. Do not apply roofing membrane to damp, frozen, dirty, or dusty surfaces.

6. Fasteners and plates for fastening components mechanically to the substrate shall provide a minimum pull-out capacity of 300 lbs. (136 k) per fastener. Base or ply sheets attached with cap nails require a minimum pullout capacity of 40 lb. per nail.

7. Prime decks where required, in accordance with requirements and recommendations of the primer and deck manufacturer.

3.3 INSTALLATION - GENERAL

A. Install modified bitumen membranes and flashings in accordance with manufacturer's instructions and with the recommendations provided by the National Roofing Contractors Association's Roofing & Waterproofing Manual, the Asphalt Roofing Manufacturers Association, and applicable codes.

B. General: Avoid installation of modified bitumen membranes at temperatures lower than 40-45 degrees F. When work at such temperatures unavoidable use the following precautions:

1. Take extra care during cold weather installation and when ambient temperatures are affected by wind or humidity, to ensure adequate bonding is achieved between the surfaces to be joined. Use extra care at material seam welds and where adhesion of the applied product to the appropriately prepared substrate as the substrate can be affected by such temperature constraints as well.

2. Unrolling of cold materials, under low ambient conditions must be avoided to prevent the likelihood of unnecessary stress cracking. Rolls must be at least 40 degrees F at the time of application. If the membrane roll becomes stiff or difficult to install, it must be replaced with roll from a heated storage area.

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- C. Commence installation of the roofing system at the lowest point of the roof (or roof area), working up the slope toward the highest point. Lap sheets shingle fashion so as to constantly shed water
- D. All slopes greater than 2:12 require back-nailing to prevent slippage of the ply sheets. Use ring or spiral-shank 1 inch cap nails, or screws and plates at a rate of 1 fastener per ply (including the membrane) at each insulation stop. Place insulation stops at 16 ft o.c. for slopes less than 3:12 and 4 feet o.c. for slopes greater than 3:12. On non-insulated systems, nail each ply directly into the deck at the rate specified above. When slope exceeds 2:12, install all plies parallel to the slope (strapping) to facilitate backnailing. Install 4 additional fasteners at the upper edge of the membrane when strapping the plies.

3.4 INSTALLATION HOT APPLIED ROOF SYSTEM

- A. Base/Felt Ply(s): Install base sheet or felt plies in twenty five (25) lbs (11.3kg) per square of bitumen shingled uniformly to achieve one or more plies over the entire prepared substrate. Shingle in direction of slope of roof to shed water on each area of roof. Do not step on base rolls until asphalt has cooled, fish mouths should be cut and patched.
 - 1. Lap ply sheet ends 8 inches (203 mm). Stagger end laps 2 inches (304mm) minimum.
 - 2. Install base flashing ply to all perimeter and projection details after membrane application.
 - 3. Extend plies 2 inches beyond top edges of cants at wall and projection bases.
 - 4. Install base flashing ply to all perimeter and projection details.
 - 5. Allow the one ply of base sheet to cure at least 30 minutes before installing the modified membrane. However, the modified membrane must be installed the same day as the base plies.
- B. Modified Cap Ply(s): Solidly bond the modified membrane to the base layers with specified material at the rate of 25 to thirty 30 lbs. (11-13kg) per 100 square feet.
 - 1. Roll must push a puddle of hot material in front of it with material slightly visible at all side laps. Use care to eliminate air entrapment under the membrane. Exercise care during application to eliminate air entrapment under the membrane.
 - 2. Apply pressure to all seams to ensure that the laps are solidly bonded to substrate.
 - 3. Install subsequent rolls of modified membrane as above with a minimum of 4 inch (101 mm) side laps and 8 inch (203 mm) end laps. Stagger end laps. Apply membrane in the same direction as the previous layers but stagger the laps so they do not coincide with the laps of the base layers.
 - 4. Apply hot material no more than 5 feet (1.5 m) ahead of each roll being embedded.
 - 5. Extend membrane 2 inches (50 mm) beyond top edge of all cants in full moppings of the specified hot material.
- C. Fibrous Cant Strips: Provide non-combustible perlite or glass fiber cant strips at all wall/curb detail treatments where angle changes are greater than 45 degrees. Cant may be set in approved cold adhesives, hot asphalt or mechanically attached with approved plates and fasteners.
- D. Wood Blocking, Nailers and Cant Strips: Provide wood blocking, nailers and cant strips as specified in Section 06114.
 - 1. Provide nailers at all roof perimeters and penetrations for fastening membrane flashings and sheet metal components.
 - 2. Wood nailers should match the height of any insulation, providing a smooth and even transition between flashing and insulation areas.
 - 3. Nailer lengths should be spaced with a minimum 1/8 inch gap for expansion and contraction between each length or change of direction.
 - 4. Nailers and flashings should be fastened in accordance with Factory Mutual "Loss Prevention Data Sheet 1- 49, Perimeter Flashing" and be designed to be capable of resisting a minimum force of 200 lbs/lineal foot in any direction.
- E. Metal Work: Provide metal flashings, counter flashings, parapet coping caps and thru-wall flashings as specified in Section 07620 or Section 07710. Install in accordance with the SMACNA "Architectural Sheet Metal Manual" or the NRCA Roofing Waterproofing manual.
- F. Termination Bar: Provide a metal termination bar or approved top edge securement at the terminus of all flashing sheets at walls and curbs. Fasten the bar a minimum of 8 inches (203 mm) o/c to achieve constant compression. Provide suitable, sealant at the top edge if required.

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- G. Flashing Base Ply: Install flashing sheets by the same application method used for the base ply.
1. Seal curb, wall and parapet flashings with an application of mastic and mesh on a daily basis. Do not permit conditions to exist that will allow moisture to enter behind, around or under the roof or flashing membrane.
 2. Prepare all walls, penetrations, expansion joints and surfaces to be flashed with required primer at the rate of 100 square feet per gallon. Allow primer to dry tack free.
 3. Adhere to the underlying base flashing ply with specified hot material unless otherwise noted in these specifications. Nail off at a minimum of 8 inches (203 mm) o.c. from the finished roof at all vertical surfaces.
 4. Solidly adhere the entire sheet of flashing membrane to the substrate.
 5. Seal all vertical laps of flashing membrane with a three-course application of trowel-grade mastic and mesh.
 6. Coordinate counter flashing, cap flashings, expansion joints, and similar work with modified bitumen roofing work as specified.
 7. Coordinate roof accessories, miscellaneous sheet metal accessory items, including piping vents and other devices with the roofing system work.
- H. Flood Coat/Aggregate:
1. Install after cap sheets and modified flashing, tests, repairs and corrective actions have been completed and approved.
 2. Apply flood coat materials in the quantities recommended by the manufacturer.
 3. Uniformly embed aggregate in the flood coat of cold adhesive at a rate recommended by the manufacturer.
 4. Aggregate must be dry and placed in a manner required to form a compact, embedded overlay. To aid in embedment, lightly roll aggregate.
- I. Flashing Cap Ply: Install flashing cap sheets by the same application method used for the cap ply.
1. Seal curb, wall and parapet flashings with an application of mastic and mesh on a daily basis. Do not permit conditions to exist that will allow moisture to enter behind, around or under the roof or flashing membrane.
 2. Prepare all walls, penetrations, expansion joints and where shown on the Drawings to be flashed with required primer at the rate of 100 square feet per gallon. Allow primer to dry tack free.
 3. Adhere to the underlying base flashing ply with specified flashing ply adhesive unless otherwise specified. Nail off at a minimum of 8 inches (203 mm) o.c. from the finished roof at all vertical surfaces.
 4. Coordinate counter flashing, cap flashings, expansion joints and similar work with modified bitumen roofing work as specified.
 5. Coordinate roof accessories, miscellaneous sheet metal accessory items with the roofing system work.
 6. All stripping shall be installed prior to flashing cap sheet installation.
 7. Heat and scrape granules when welding or adhering at cut areas and seams to granular surfaces at all flashings.
 8. Secure the top edge of the flashing sheet using a termination bar only when the wall surface above is waterproofed, or nailed 4 inches on center and covered with an acceptable counter flashing.

3.5 CLEANING

- A. Clean-up and remove daily from the site all wrappings, empty containers, paper, loose particles and other debris resulting from these operations.
- B. Remove asphalt markings from finished surfaces.
- C. Repair or replace defaced or disfigured finishes caused by Work of this section.

3.6 PROTECTION

- A. Provide traffic ways, erect barriers, fences, guards, rails, enclosures, chutes and the like to protect personnel, roofs and structures, vehicles and utilities.
- B. Protect exposed surfaces of finished walls with tarps to prevent damage.

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- C. Plywood for traffic ways required for material movement over existing roofs shall be not less than 5/8 inch (16 mm) thick.
- D. In addition to the plywood listed above, an underlayment of minimum 1/2 inch (13 mm) recover board is required on new roofing.
- E. Special permission shall be obtained from the Manufacturer before any traffic shall be permitted over new roofing.

3.7 FIELD QUALITY CONTROL

- A. Inspection: Provide manufacturer's field observations at start-up and at intervals of approximately 30 percent, 60 percent and 90 percent completion. Provide a final inspection upon completion of the Work.
 - 1. Warranty shall be issued upon manufacturer's acceptance of the installation.
 - 2. Field observations shall be performed by a Sales Representative employed full-time by the manufacturer and whose primary job description is to assist, inspect and approve membrane installations for the manufacturer.
 - 3. Provide observation reports from the Sales Representative indicating procedures followed, weather conditions and any discrepancies found during inspection.
 - 4. Provide a final report from the Sales Representative, certifying that the roofing system has been satisfactorily installed according to the project specifications, approved details and good general roofing practice.

3.8 SCHEDULES (BASE BID 1& 2)

- A. Base (Ply) Sheet:
 - 1. ASTM D 2178 Type IV, Asphalt saturated fiberglass felt.
 - a. Meets or Exceeds ASTM D 2178 Type IV Performance Criteria.
- B. Thermoplastic/Modified Cap (Ply) Sheet:
 - 1. 145 mil SBS and SIS (Styrene-Butadiene-Styrene and Styrene-Isoprene-Styrene) rubber modified membrane incorporating post-consumer recycled rubber and reinforced with a fiberglass and polyester composite scrim. ASTM D 6162, Type III Grade G
 - a. Tensile Strength, ASTM D 5147
 - 1) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 1,000 lbf/in XD 1,000 lbf/in
 - 2) 50 mm/min. @ 23 +/- 2 deg. C MD 175 kN/m XD 175 kN/m
 - b. Tear Strength, ASTM D 5147
 - 1) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 1,600 lbf XD 1,500 lbf
 - 2) 50 mm/min. @ 23 +/- 2 deg. C MD 7,117.1 N XD 6,672.3 N
 - c. Elongation at Maximum Tensile, ASTM D 5147
 - 1) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 16.0% XD 16.0%
 - 2) 50 mm/min. @ 23 +/- 2 deg. C MD 16.0% XD 16.0%
 - d. Low Temperature Flexibility, ASTM D 5147, Passes -40 deg. F (-40 deg. C)
- C. Interply Adhesive:
 - 1. Type III Asphalt, Hot Bitumen, ASTM D 312, Type III steep asphalt having the following characteristics:
 - a. Softening Point 185 deg. F - 205 deg. F
 - b. Flash Point 500 deg. F
 - c. Penetration @ 77 deg. F 15-35 units
 - d. Ductility @ 77 deg. F 2.5 cm
- D. Flashing Base Ply:
 - 1. ASTM D 2178 Type IV, Asphalt saturated fiberglass felt.
 - a. Meets or Exceeds ASTM D 2178 Type IV Performance Criteria.
- E. Flashing Ply Adhesive:
 - 1. Type III Asphalt, Hot Bitumen, ASTM D 312, Type III steep asphalt having the following characteristics:
 - a. Softening Point 185 deg. F - 205 deg. F

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- b. Flash Point 500 deg. F
- c. Penetration @ 77 deg. F 15-35 units
- d. Ductility @ 77 deg. F 2.5 cm

F. Surfacing:

1. Flood Coat/Aggregate:

- a. Asphalt protective roof coating, heavy-bodied, fiber reinforced, cold process roof coating having the following characteristics:
 - 1) Weight/Gallon 9.1 lbs./gal. (1.1 g/cm³)
 - 2) Non-Volatile % (ASTM D 4479) Typical 75
 - 3) Viscosity Brookfield RVT;
 - 4) Spindle #5; 10RPM @ 71 deg. F 20,000-25,000 cPs
 - 5) Roofing Aggregate: ASTM D 1863
 - a) Pea gravel.

2. Flashing Cap (Ply) Sheet:

- a. 145 mil SBS and SIS (Styrene-Butadiene-Styrene and Styrene-Isoprene-Styrene) rubber modified membrane incorporating post-consumer recycled rubber and reinforced with a fiberglass and polyester composite scrim. ASTM D 6162, Type III Grade G
 - 1) Tensile Strength, ASTM D 5147
 - a) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 1,000 lbf/in XD 1,000 lbf/in
 - b) 50 mm/min. @ 23 +/- 2 deg. C MD 175 kN/m XD 175 kN/m
 - 2) Tear Strength, ASTM D 5147
 - a) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 1,600 lbf XD 1,500 lbf
 - b) 50 mm/min. @ 23 +/- 2 deg. C MD 7,117.1 N XD 6,672.3 N
 - 3) Elongation at Maximum Tensile, ASTM D 5147
 - a) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 16.0% XD 16.0%
 - b) 50 mm/min. @ 23 +/- 2 deg. C MD 16.0% XD 16.0%
 - 4) Low Temperature Flexibility, ASTM D 5147, Passes -40 deg. F (-40 deg. C)

3.9 SCHEDULES (ALTERNATE BID 1 & 2)

A. Base (Ply) Sheet:

- 1. 80 mil SBS (Styrene-Butadiene-Styrene) rubber modified roofing base sheet reinforced with a fiberglass and polyester composite scrim, performance requirements according to ASTM D 5147.
 - a. Tensile Strength, ASTM D5147
 - 1) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 310 lbf/in XD 310 lbf/in
 - 2) 50 mm/min. @ 23 +/- 2 deg. C MD 54.25 kN/m XD 54.25 kN/m
 - b. Tear Strength, ASTM D 5147
 - 1) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 500 lbf XD 500 lbf
 - 2) 50 mm/min. @ 23 +/- 2 deg. C MD 2224 N XD 2224 N
 - c. Elongation at Maximum Tensile, ASTM D5147
 - 1) 2 in/min. @ 73.4 +/- 3.6F MD 8% XD 8%
 - 2) 50 mm/min. @ 23 +/- 2 deg. C MD 8% XD 8%
 - d. Low Temperature Flexibility, ASTM D 5147, Passes -30 deg. F (-34.4 deg. C)

B. Thermoplastic/Modified Cap (Ply) Sheet:

- 1. 80 mil mineral surfaced, polyurethane modified roofing membrane with fire retardant characteristics, and dual fiberglass reinforced scrim. ASTM D 6163, Type III Grade S
 - a. Tensile Strength, ASTM D 5147
 - 1) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 215 lbf/in XD 225 lbf/in
 - 2) 50 mm/min. @ 23 +/- 2 deg. C MD 38.0 kN/m XD 39 kN/m
 - b. Tear Strength, ASTM D 5147
 - 1) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 300 lbf XD 300 lbf
 - 2) 50 mm/min. @ 23 +/- 2 deg. C MD 1334 N XD 1334 N
 - c. Elongation at Maximum Tensile, ASTM D 5147
 - 1) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 4.7% XD 5.0%
 - 2) 50 mm/min. @ 23 +/- 2 deg. C MD 4.7% XD 5.0%

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- d. Low Temperature Flexibility, ASTM D 5147, Passes 0 deg. F (-18 deg. C)
- C. Interply Adhesive:
- 1. Type III Asphalt, Hot Bitumen, ASTM D 312, Type III steep asphalt having the following characteristics:
 - a. Softening Point 185 deg. F - 205 deg. F
 - b. Flash Point 500 deg. F
 - c. Penetration @ 77 deg. F 15-35 units
 - d. Ductility @ 77 deg. F 2.5 cm
- D. Flashing Base Ply:
- 1. 80 mil SBS (Styrene-Butadiene-Styrene) rubber modified roofing base sheet reinforced with a fiberglass and polyester composite scrim, performance requirements according to ASTM D 5147.
 - a. Tensile Strength, ASTM D5147
 - 1) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 310 lbf/in XD 310 lbf/in
 - 2) 50 mm/min. @ 23 +/- 2 deg. C MD 54.25 kN/m XD 54.25 kN/m
 - b. Tear Strength, ASTM D 5147
 - 1) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 500 lbf XD 500 lbf
 - 2) 50 mm/min. @ 23 +/- 2 deg. C MD 2224 N XD 2224 N
 - c. Elongation at Maximum Tensile, ASTM D5147
 - 1) 2 in/min. @ 73.4 +/- 3.6F MD 8% XD 8%
 - 2) 50 mm/min. @ 23 +/- 2 deg. C MD 8% XD 8%
 - d. Low Temperature Flexibility, ASTM D 5147, Passes -30 deg. F (-34.4 deg. C)
- E. Flashing Ply Adhesive:
- 1. Type III Asphalt, Hot Bitumen, ASTM D 312, Type III steep asphalt having the following characteristics:
 - a. Softening Point 185 deg. F - 205 deg. F
 - b. Flash Point 500 deg. F
 - c. Penetration @ 77 deg. F 15-35 units
 - d. Ductility @ 77 deg. F 2.5 cm
- F. Surfacing:
- 1. Flood Coat/Aggregate:
 - a. Asphalt protective roof coating, heavy-bodied, fiber reinforced, cold process roof coating having the following characteristics:
 - 1) Weight/Gallon 9.1 lbs./gal. (1.1 g/cm³)
 - 2) Non-Volatile % (ASTM D 4479) Typical 75
 - 3) Viscosity Brookfield RVT;
 - 4) Spindle #5; 10RPM @ 71 deg. F 20,000-25,000 cPs
 - 5) Roofing Aggregate: ASTM D 1863
 - a) Pea gravel.
 - 2. Flashing Cap (Ply) Sheet:
 - a. 145 mil mineral surfaced, polyurethane modified roofing membrane with fire retardant characteristics, and dual fiberglass reinforced scrim. ASTM D 6163, Type III Grade G
 - 1) Tensile Strength, ASTM D 5147
 - a) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 205 lbf/in XD 215 lbf/in
 - b) 50 mm/min. @ 23 +/- 2 deg. C MD 36.0 kN/m XD 38 kN/m
 - 2) Tear Strength, ASTM D 5147
 - a) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 300 lbf XD 300 lbf
 - b) 50 mm/min. @ 23 +/- 2 deg. C MD 1334 N XD 1334 N
 - 3) Elongation at Maximum Tensile, ASTM D 5147
 - a) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 4.7% XD 5.0%
 - b) 50 mm/min. @ 23 +/- 2 deg. C MD 4.7% XD 5.0%
 - 4) Low Temperature Flexibility, ASTM D 5147, Passes 0 deg. F (-18 deg. C)

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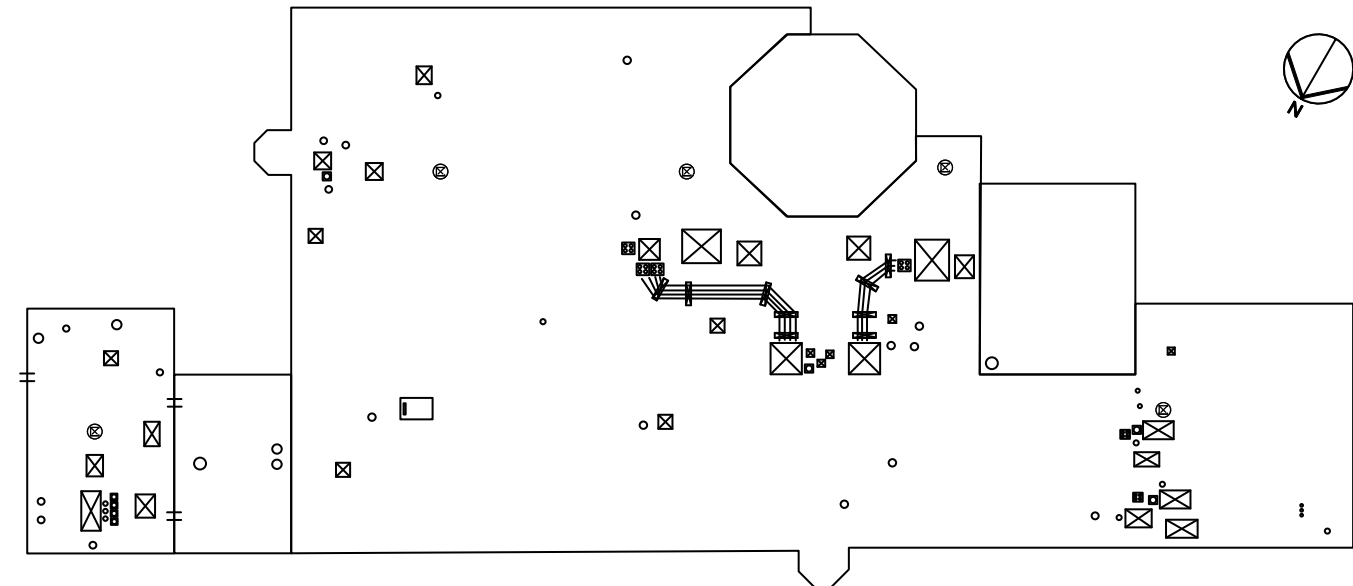
City of **New Berlin**

2023 Safety Building & Fire Station 1 Building Envelope Project



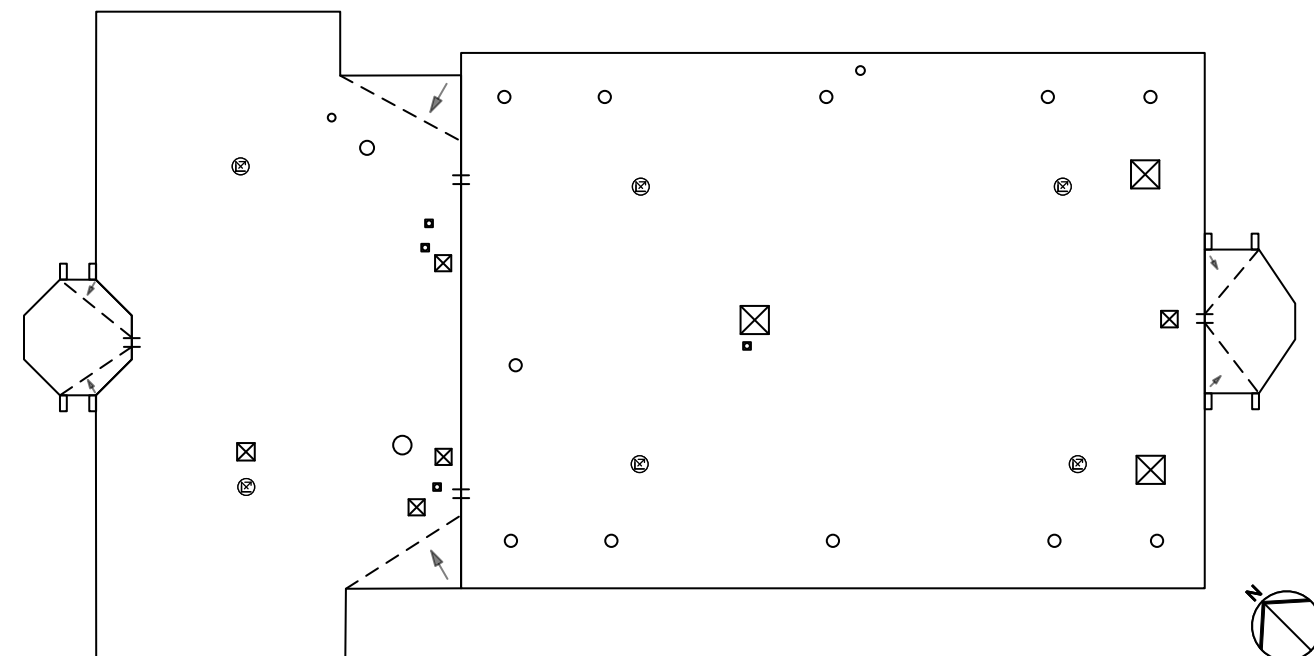
Safety Building

1 6300 W National Ave, New Berlin, WI 53151



Fire Station 1

1 6260 W National Ave, New Berlin, WI 53151



The Garland Company
3800 E. 91st Street
Cleveland, OH 44105

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City of New Berlin
2023 Safety Building and Fire Station 1
Building Envelope Project

SHEET TITLE:

COVER PAGE

SHEET NO.

A-1

Safety Building
Roof Plan



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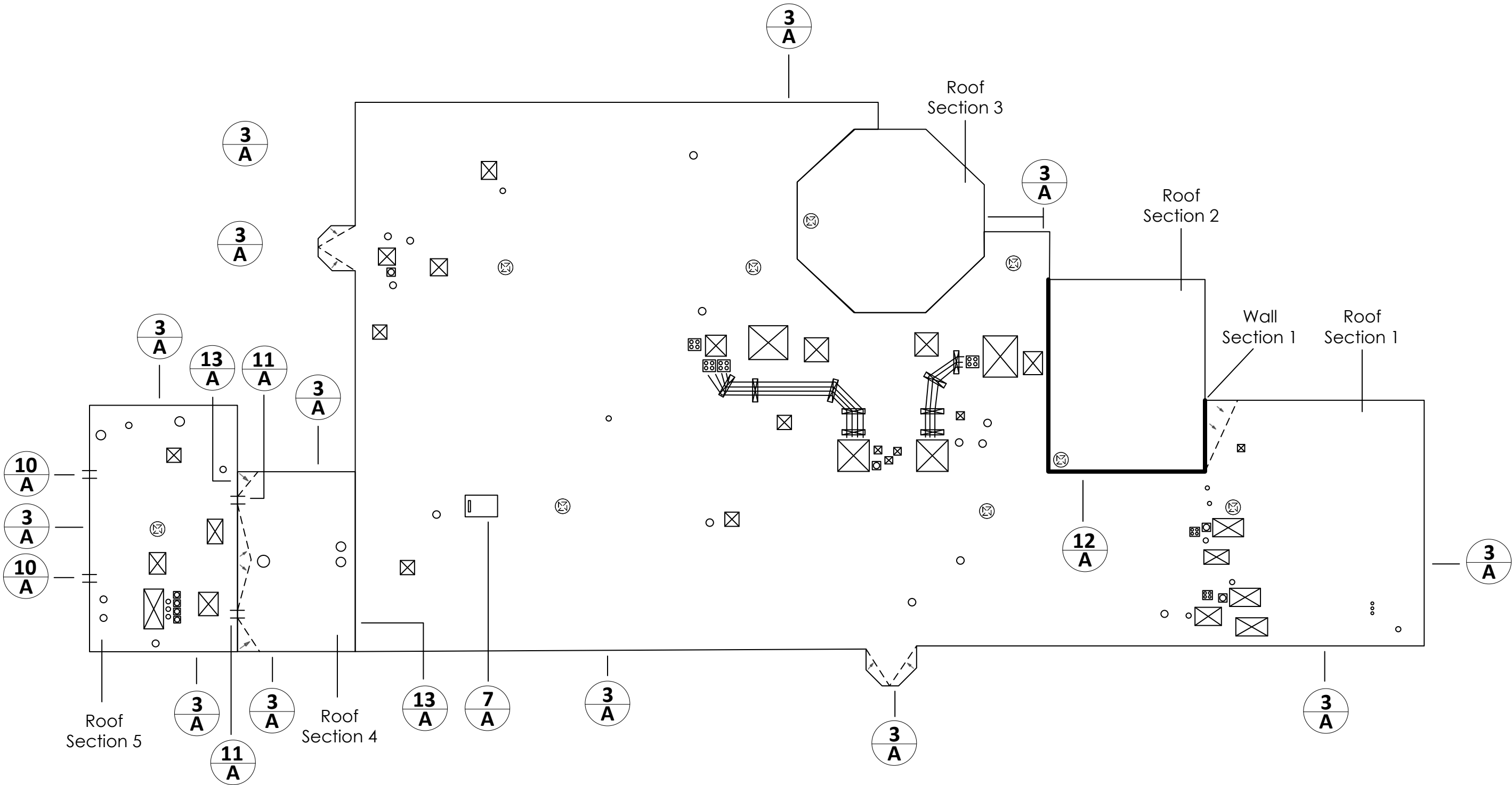
City of New Berlin
2023 Safety Building and Fire Station 1
Building Envelope Project

SHEET TITLE:

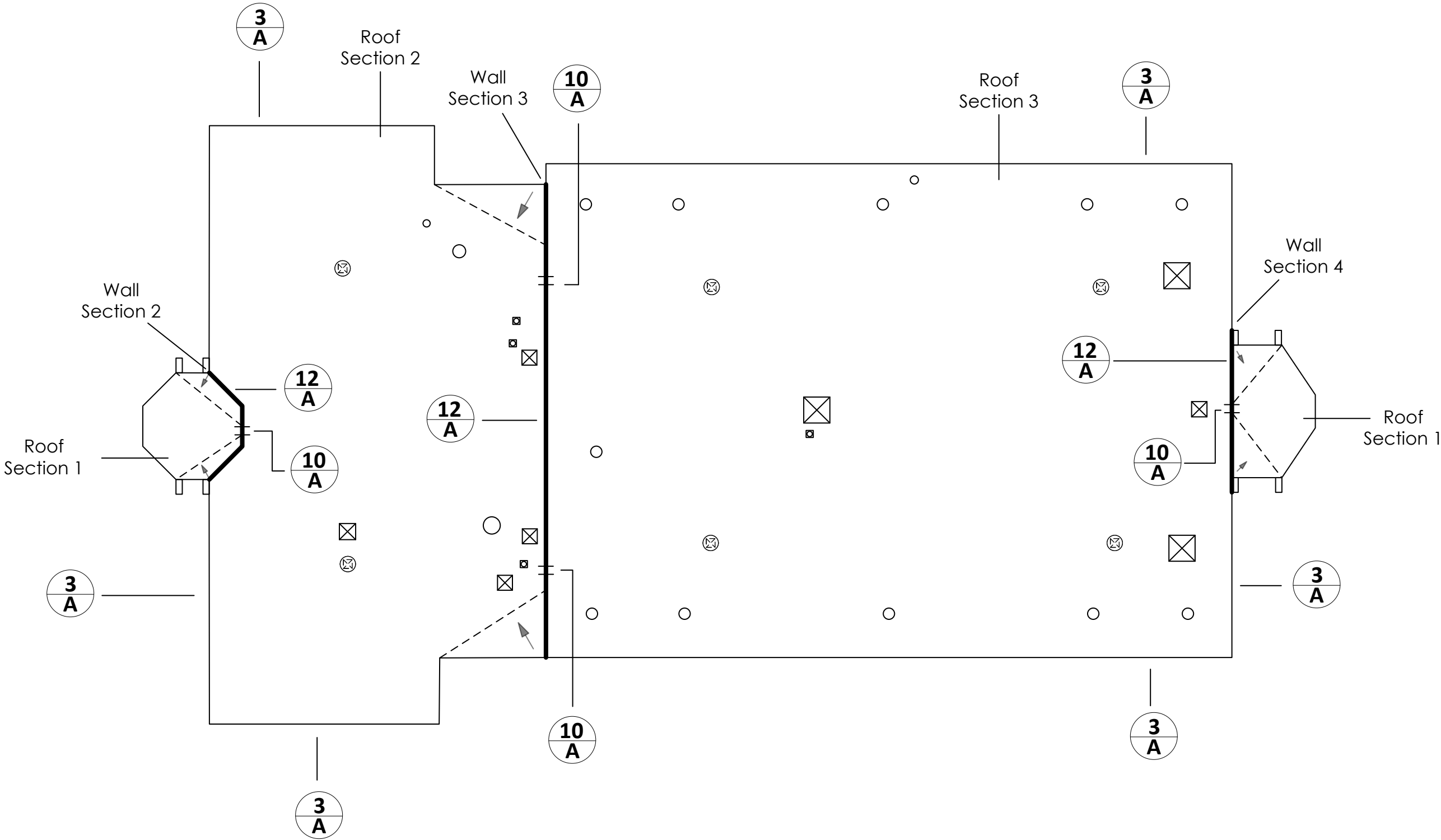
SAFETY BLDG
ROOF PLAN

SHEET NO.

A-2



Fire Station 1
Roof Plan



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2023 Safety Building and Fire Station 1
Building Envelope Project

SHEET TITLE:

**FIRE STATION
1 ROOF PLAN**

SHEET NO.

A-3

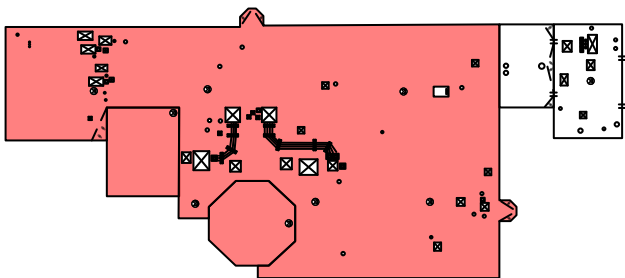
Base Bid 1 - Safety Building - Roof Sections 1, 2, & 3 – Polyester/Fiberglass Modified Asphaltic Roof System

Roof Preparation & Installation

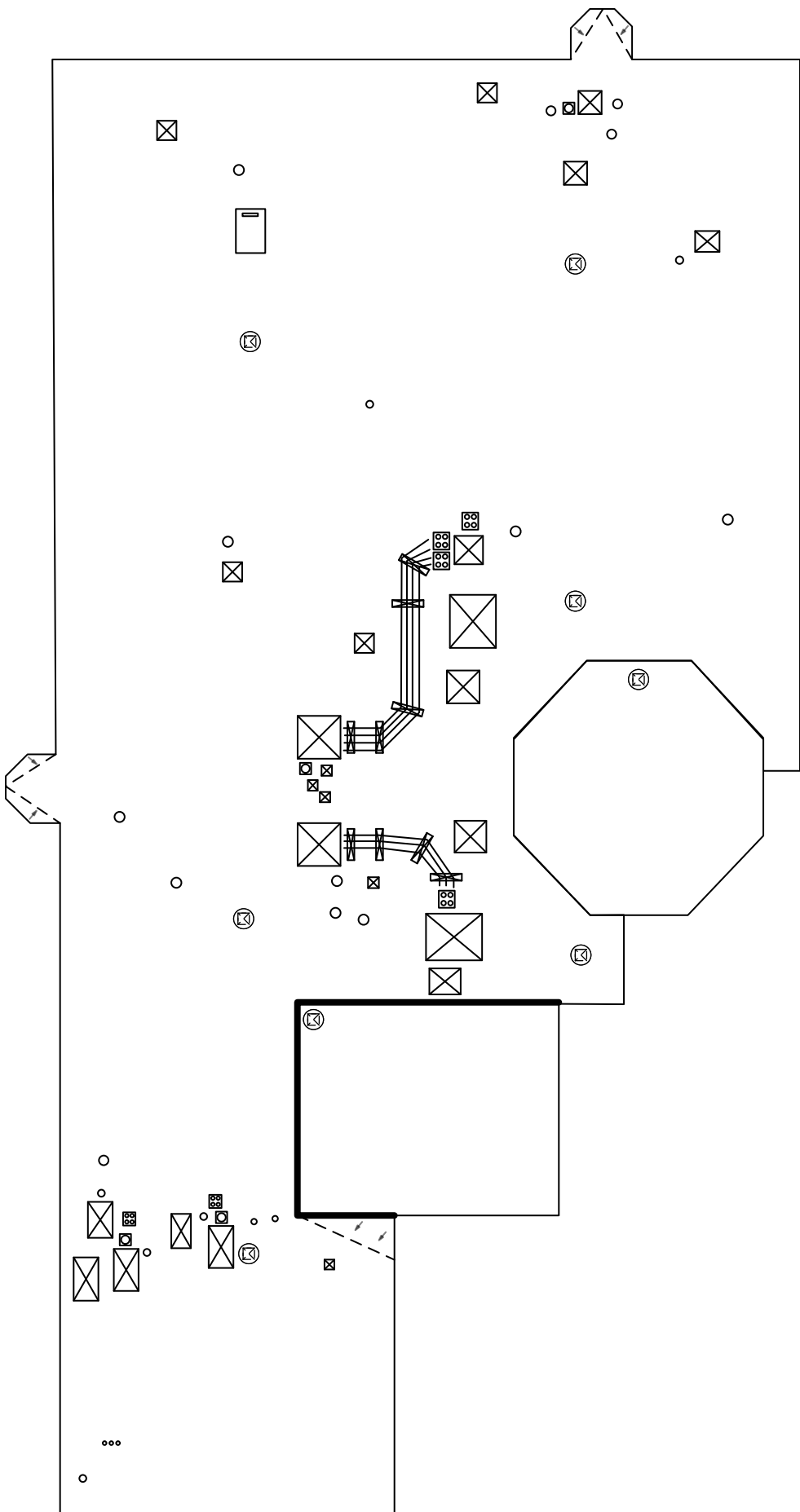
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- 9. Install New Pitch Pockets with Umbrellas and Plumbing Stack Lead Flashings
- 10. Install New Cast Iron Drains, sump into roof with 8' x 8' sumps
- 11. Over Wall Section 1, install Peel and Stick Underlayment from Coping Cap of top roof, down to lower metal counter flashing. Install Hat Channels into masonry wall and install flush seam metal panels over top, per details

Project Notes

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- 7. Any electrical lines or pipes are to be painted yellow.
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	Roof Curb		Throughwall Scupper
	Roof Drain		Penetration Box
	Pitch Pocket		Insulation Slope
	Plumbing Stack		Insulation Cricket
	Roof Hatch		Heat Stack



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2023 Safety Building and Fire Station 1
Building Envelope Project

SHEET TITLE:

SAFETY BLDG
SCOPE OF
WORK

SHEET NO.

A-4

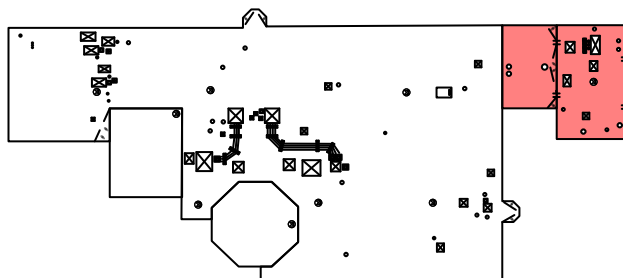
Base Bid 1 - Safety Building - Roof Sections 4 & 5 - Polyester/
Fiberglass Modified Asphaltic Roof System

Roof Preparation & Installation

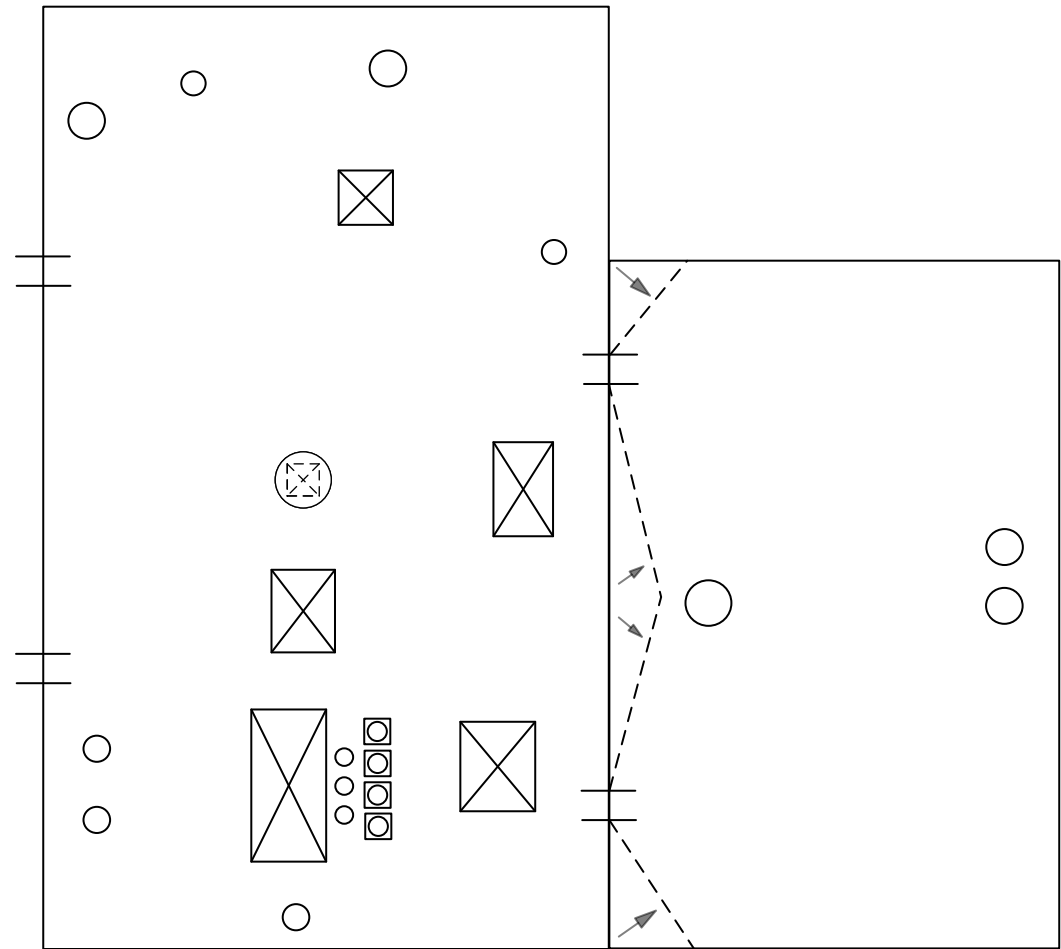
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	Roof Curb		Throughwall Scupper
	Roof Drain		Penetration Box
	Pitch Pocket		Insulation Slope
	Plumbing Stack		Insulation Cricket
	Roof Hatch		Heat Stack



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2023 Safety Building and Fire Station 1
Building Envelope Project

SHEET TITLE:

SAFETY BLDG
SCOPE OF
WORK

SHEET NO.

A-5

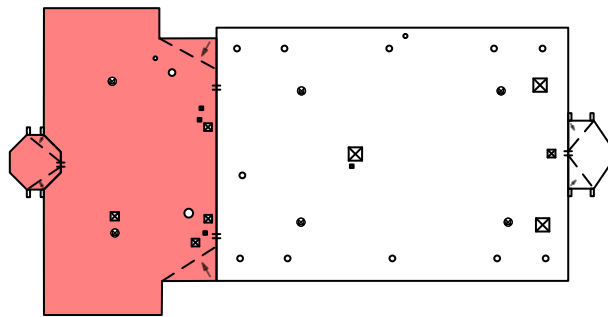
Base Bid 2 - Fire Station 1 - Roof Sections 1 & 2 - Polyester/
Fiberglass Modified Asphaltic Roof System

Roof Preparation & Installation

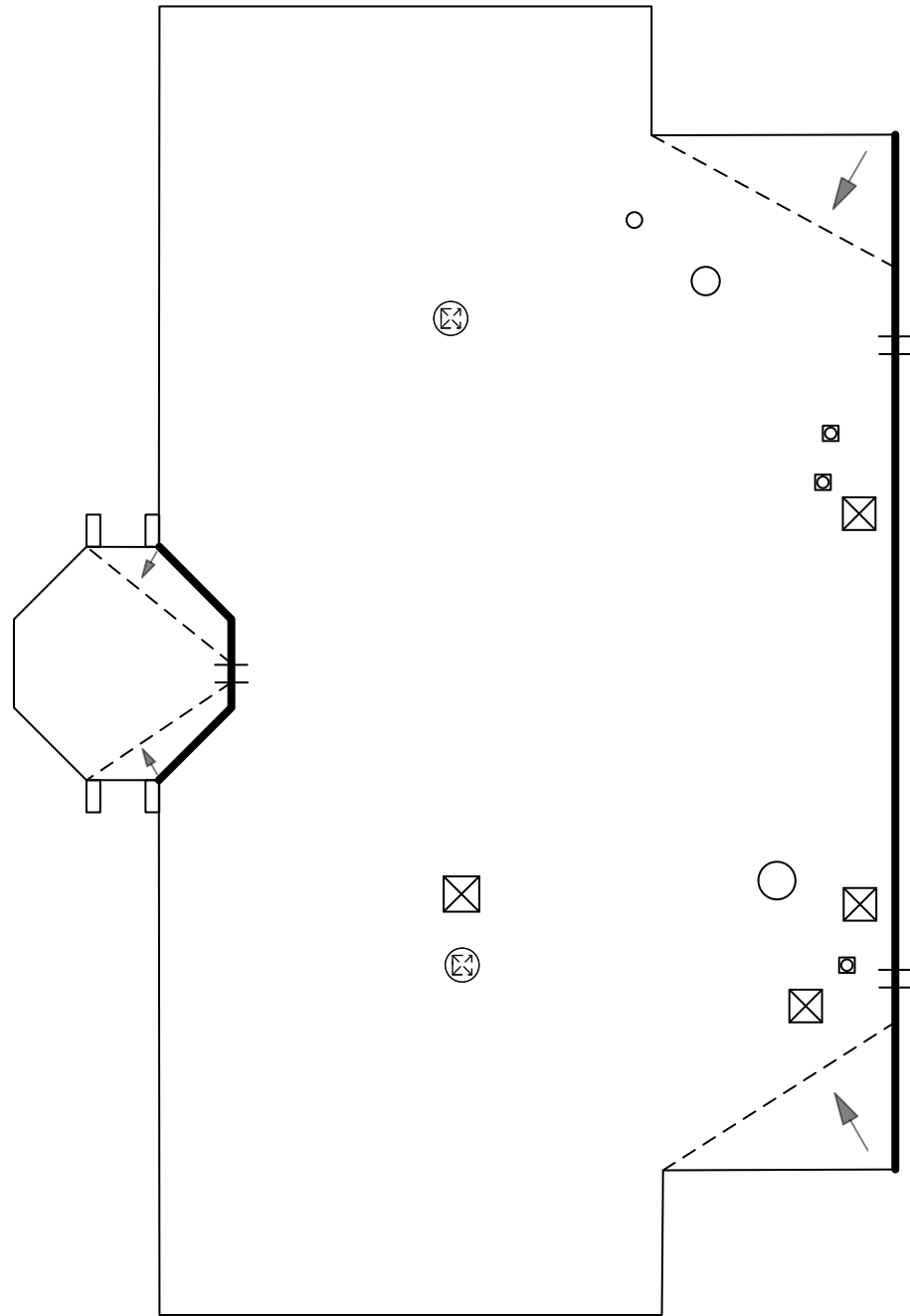
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	Roof Curb		Throughwall Scupper
	Roof Drain		Penetration Box
	Pitch Pocket		Insulation Slope
	Plumbing Stack		Insulation Cricket
	Roof Hatch		Heat Stack



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2023 Safety Building and Fire Station 1
Building Envelope Project

SHEET TITLE:

FIRE STATION
1 SCOPE OF
WORK

SHEET NO.

A-6



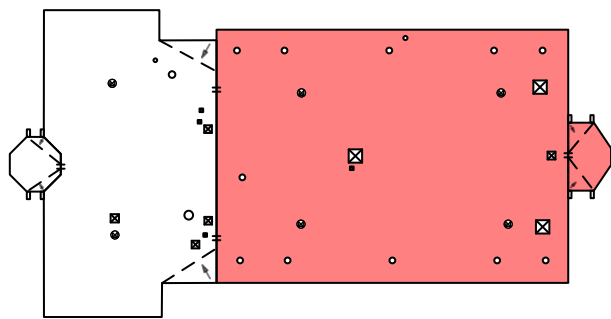
Base Bid 2 - Fire Station 1 - Roof Sections 3 & 4 - Polyester/
Fiberglass Modified Asphaltic Roof System

Roof Preparation & Installation

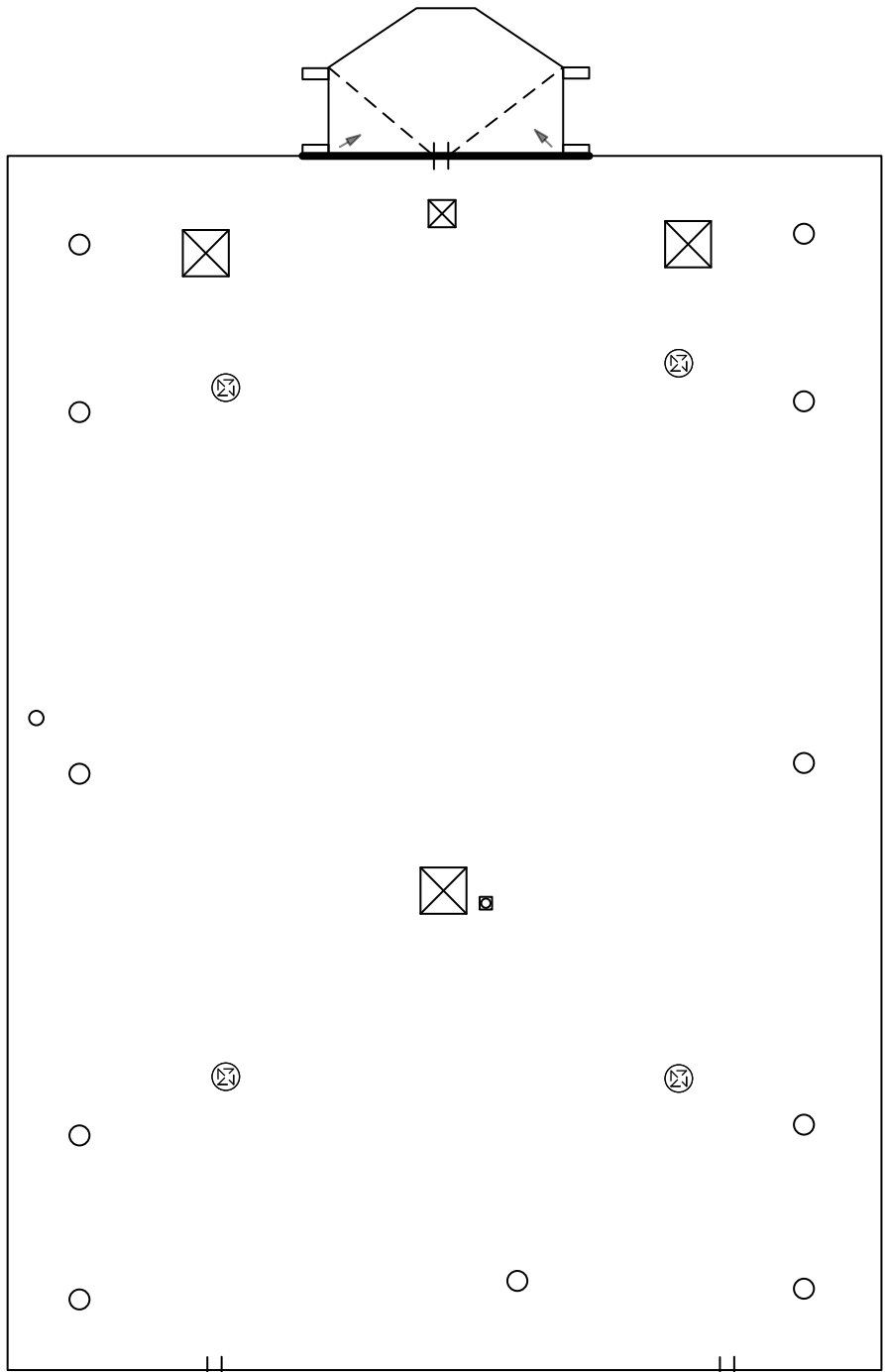
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	Roof Drain		Penetration Box
	Pitch Pocket		Insulation Slope
	Plumbing Stack		Insulation Cricket
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2023 Safety Building and Fire Station 1
Building Envelope Project

SHEET TITLE:

FIRE STATION
1 SCOPE OF
WORK

SHEET NO.

A-7

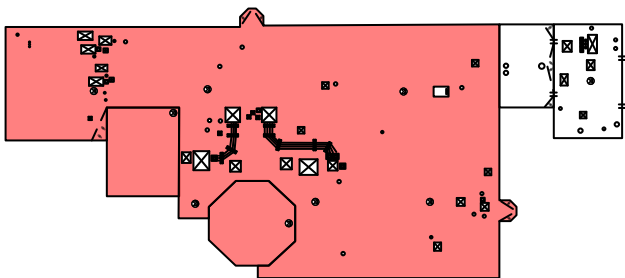
Alternate Bid 1 - Safety Building - Roof Sections 1, 2, & 3 - Polyester/Fiberglass Urethane Modified Asphaltic Roof System

Roof Preparation & Installation

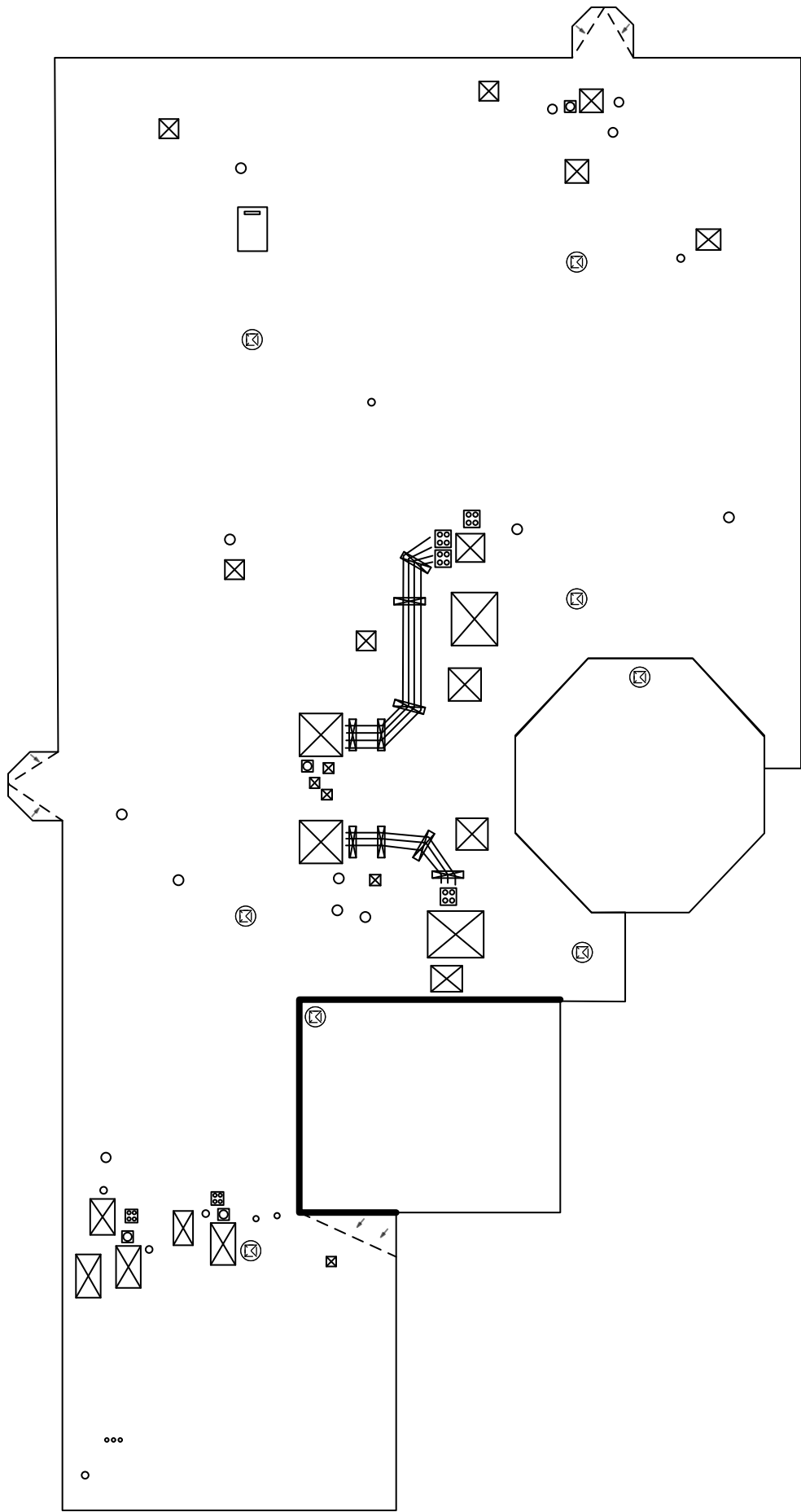
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2023 Safety Building and Fire Station 1
Building Envelope Project

SHEET TITLE:

SAFETY BLDG
SCOPE OF
WORK

SHEET NO.

A-8

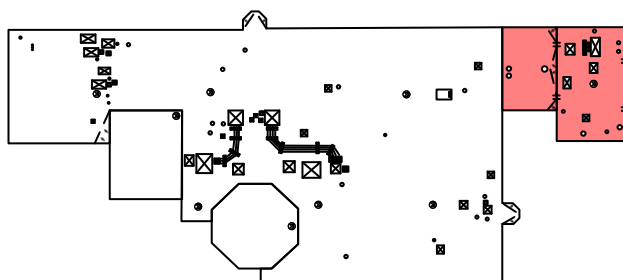
Alternate Bid 1 - Safety Building - Roof Sections 4 & 5 - Polyester/Fiberglass Urethane Modified Asphaltic Roof System

Roof Preparation & Installation

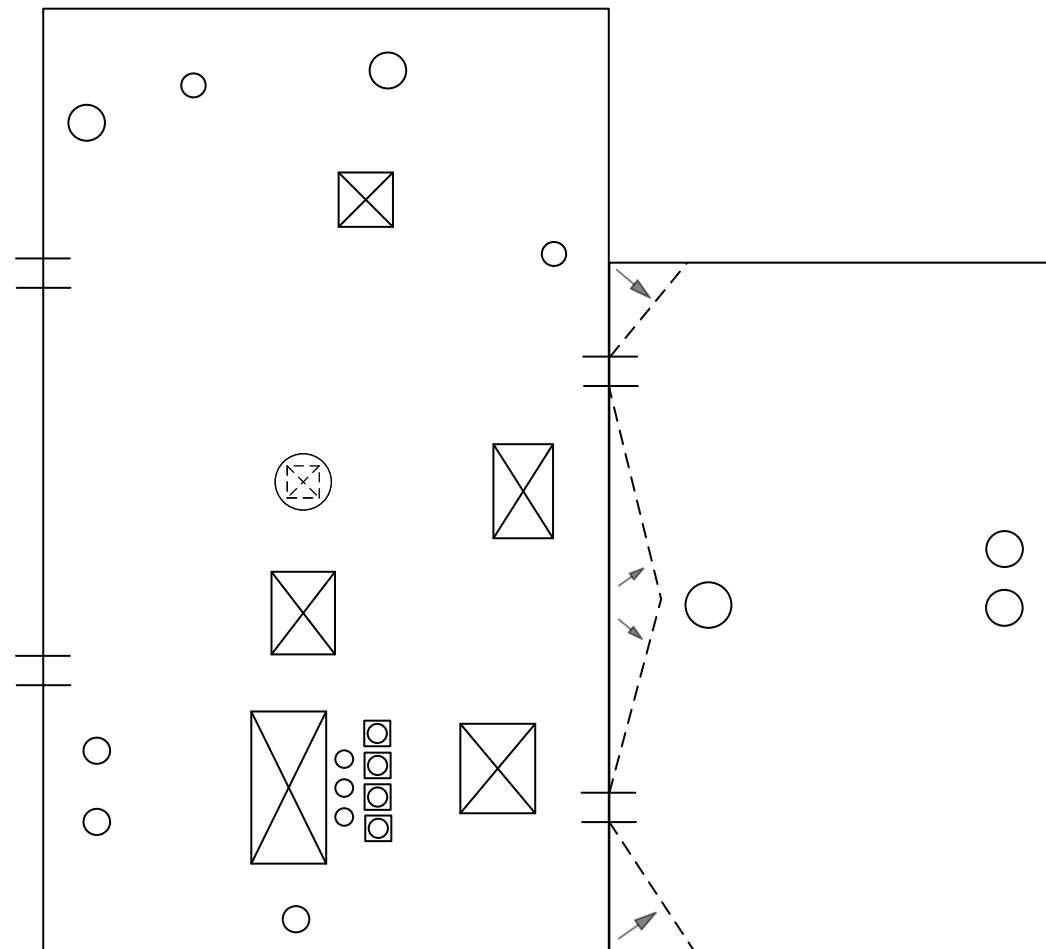
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2023 Safety Building and Fire Station 1
Building Envelope Project

SHEET TITLE:

SAFETY BLDG
SCOPE OF
WORK

SHEET NO.

A-9



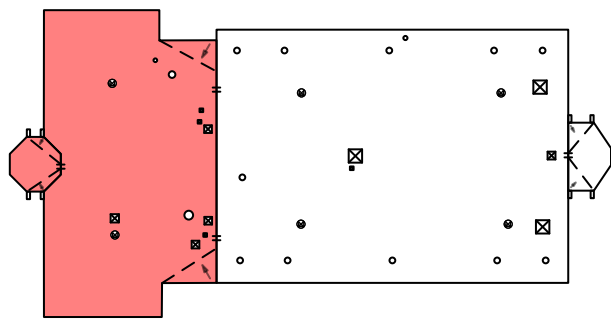
Alternate Bid 2 - Fire Station 1 - Roof Sections 1 & 2 - Polyester/
Fiberglass Urethane Modified Asphaltic Roof System

Roof Preparation & Installation

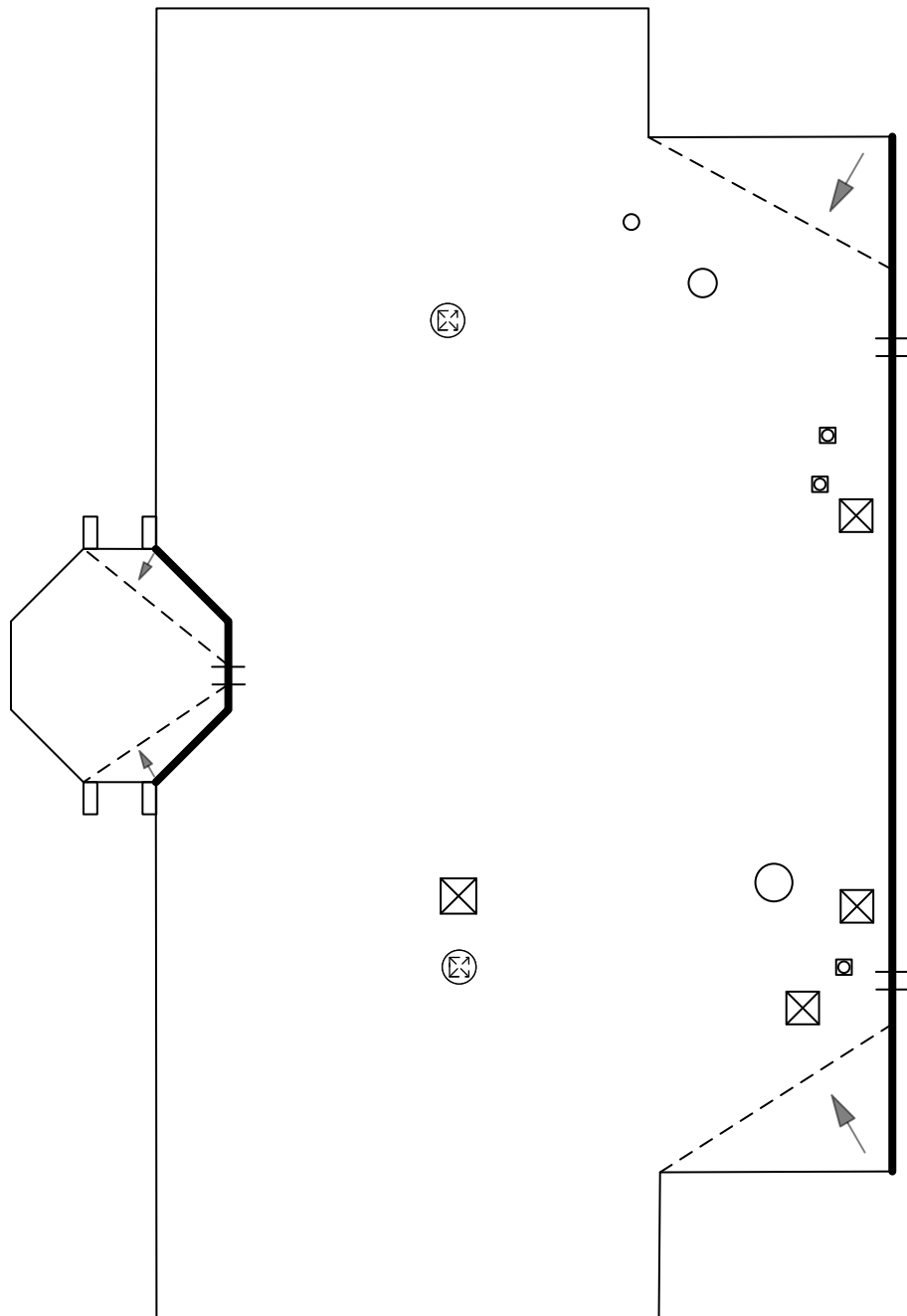
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2023 Safety Building and Fire Station 1
Building Envelope Project

SHEET TITLE:

FIRE STATION
1 SCOPE OF
WORK

SHEET NO.

A-10



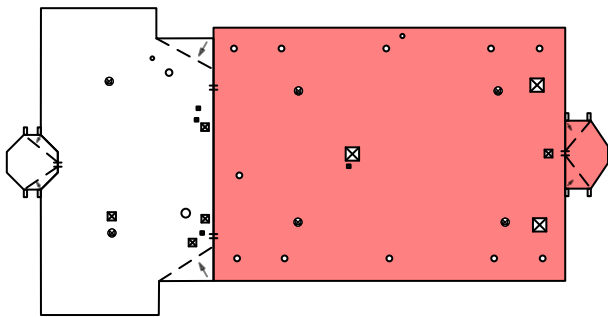
Alternate Bid 2 - Fire Station 1 - Roof Sections 3 & 4 - Polyester/
Fiberglass Urethane Modified Asphaltic Roof System

Roof Preparation & Installation

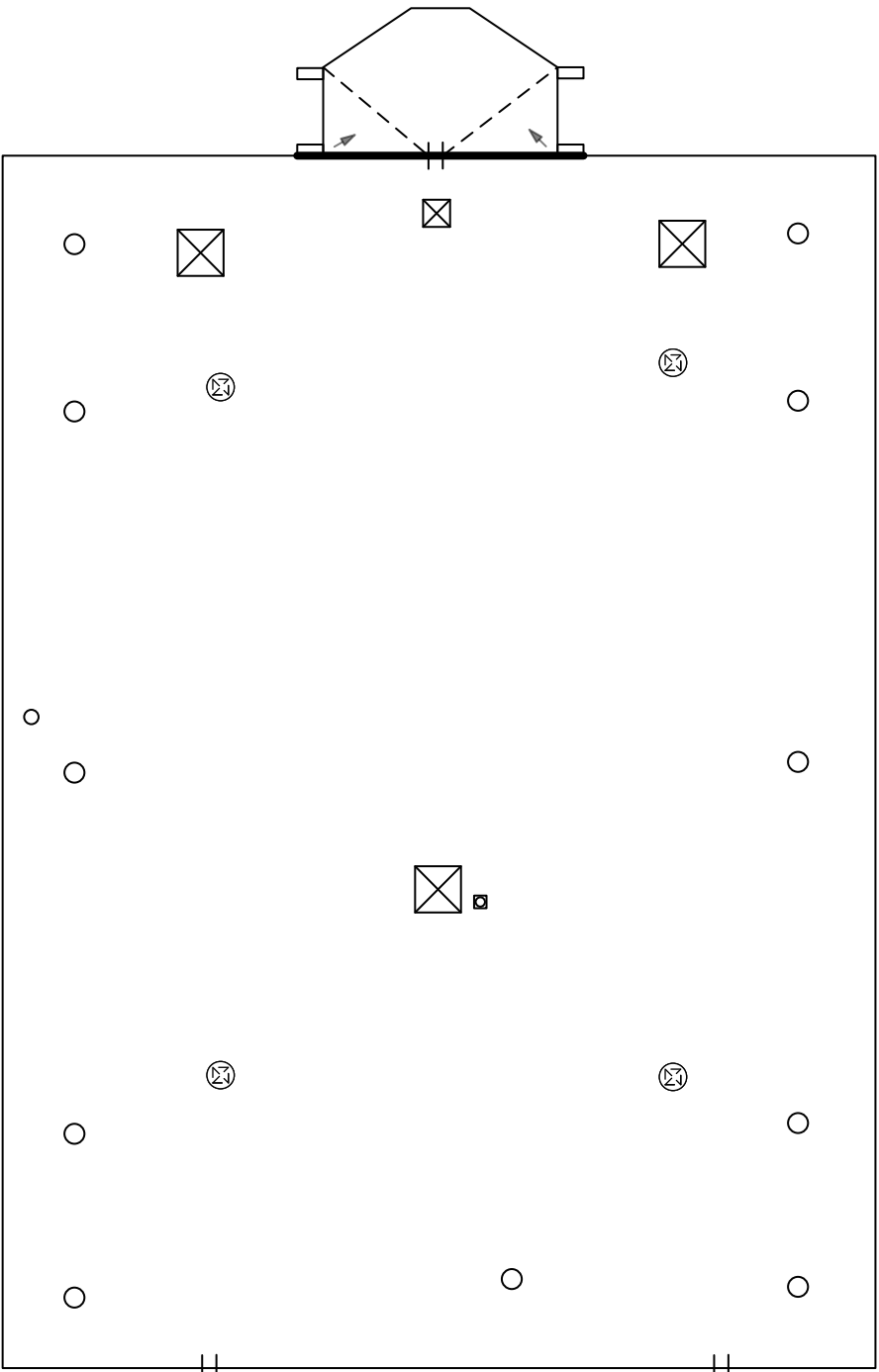
1. Remove Existing Roof System down to Existing Insulation surface
2. Clean Existing Insulation Surface of all Dirt and Debris before installing new roof system. Remove and replace all wet insulation with like material.
3. Install Securerock Recovery Board, mechanically fastened
4. Install 2 (Two) Layers of Modified Base Sheet in Hot Asphalt for field and flashings
5. Install 1 (One) Layer of Smooth Surface Modified Cap Sheet in Hot Asphalt for field of roof and 1 (One) Layer of Mineral Surface Modified Cap Sheet in Hot Asphalt for roof flashings
6. Install Cold Applied Flood and Gravel Surface over field of roof
7. Install New 24ga Sheet Metal to Perimeters, Flashings, Counter Flashings, Coping Caps, etc
8. Install New Pitch Pockets with Umbrellas and Plumbing Stack Lead Flashings
9. Install New Cast Iron Drains, sump into roof with 8' x 8' sumps
10. Over Wall Section 4, install Peel and Stick Underlayment from Coping Cap of top roof, down to lower metal counter flashing. Install Hat Channels into masonry wall and install flush seam metal panels over top, per details

Project Notes

1. Existing roof membrane and all materials removed are to be disposed off-site by Roofing Contractor.
2. All roof penetrations shall have a min. of 8" flashing heights.
3. All Electrical, Plumbing, and HVAC Disconnect/Reconnects shall be provided by the "Contractor".
4. Field of roof is to be uniform and will ensure positive water flow to roof drains.
5. All penetrations and perimeters shall receive new 24 ga. Prefinished sheet metal extended down to the field of roof. NO EXPOSED FLASHINGS ALLOWED. Owner to approve color.
6. **Contractor to provide tapered insulation drawings for approval.** Crickets to be installed at Corners, Penetrations, Etc as Required.
7. Any electrical lines or pipes are to be painted yellow.
8. Replace all Electrical and/or Plumbing Line supports with Roller and/or Rubber Supports



	Roof Curb		Throughwall Scupper
	Roof Drain		Penetration Box
	Pitch Pocket		Insulation Slope
	Plumbing Stack		Insulation Cricket
	Roof Hatch		Heat Stack



The Garland Company
3800 E. 91st Street
Cleveland, OH 44105

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NOT
APPROVED
FOR
BIDDING

City of New Berlin
2023 Safety Building and Fire Station 1
Building Envelope Project

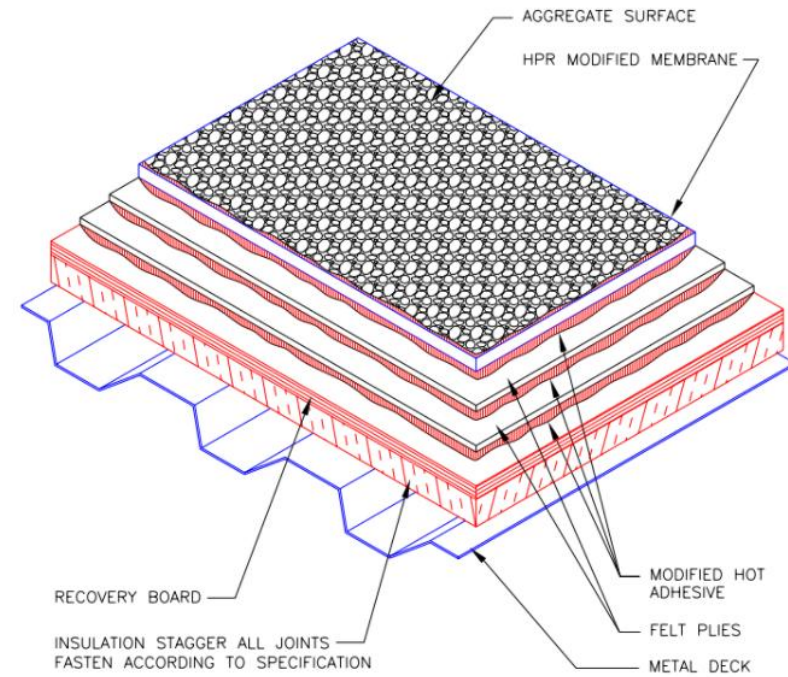
SHEET TITLE:

FIRE STATION
1 SCOPE OF
WORK

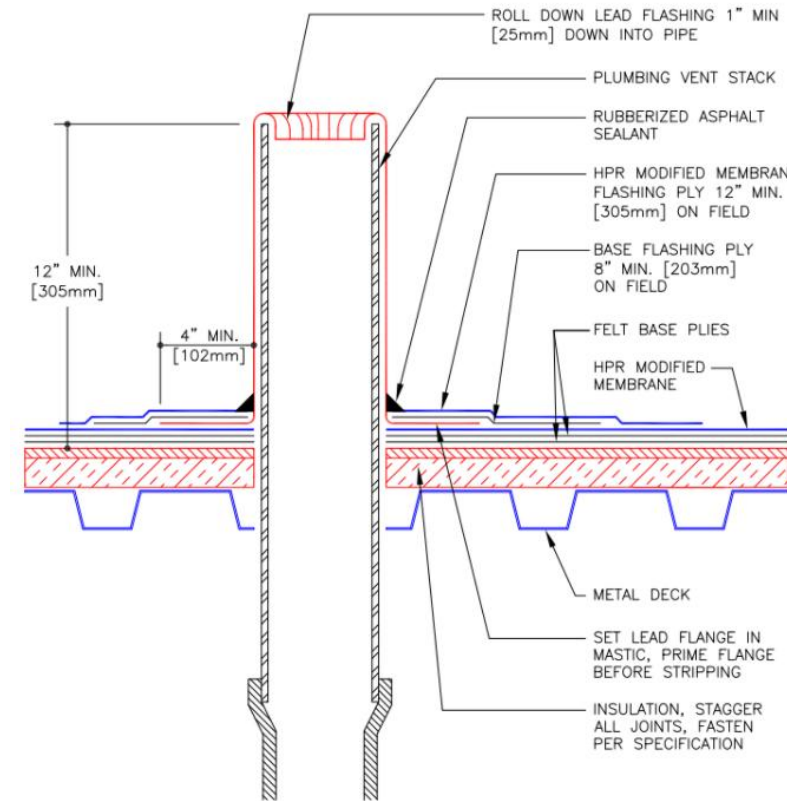
SHEET NO.

A-11

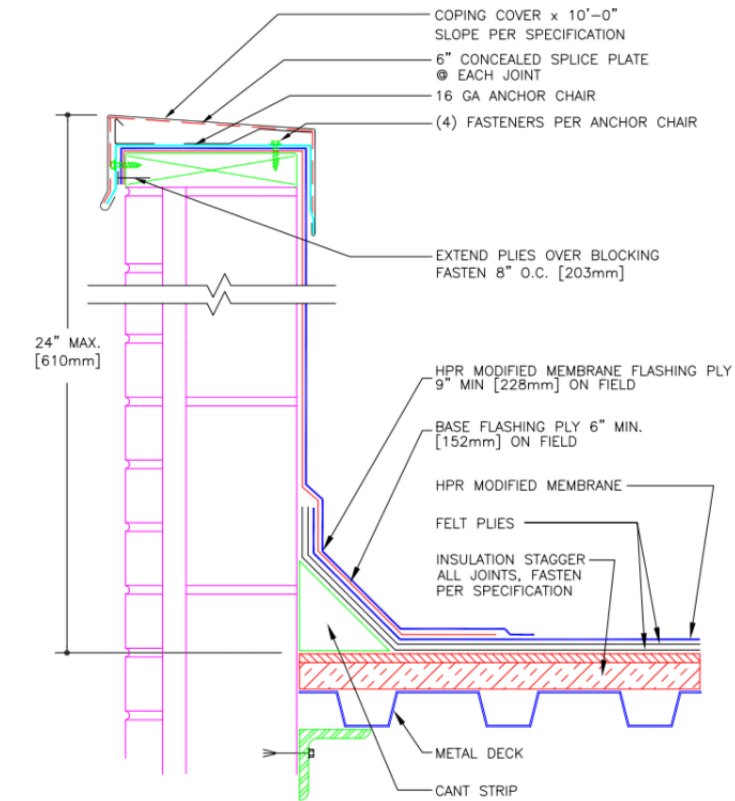




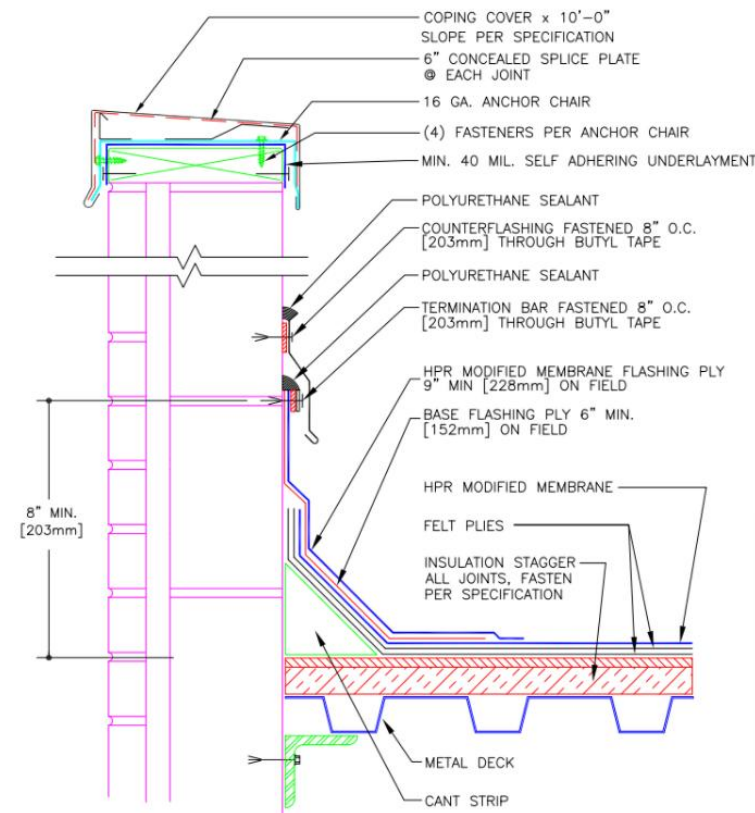
1
A FIELD OF ROOF
CITY OF NEW BERLIN



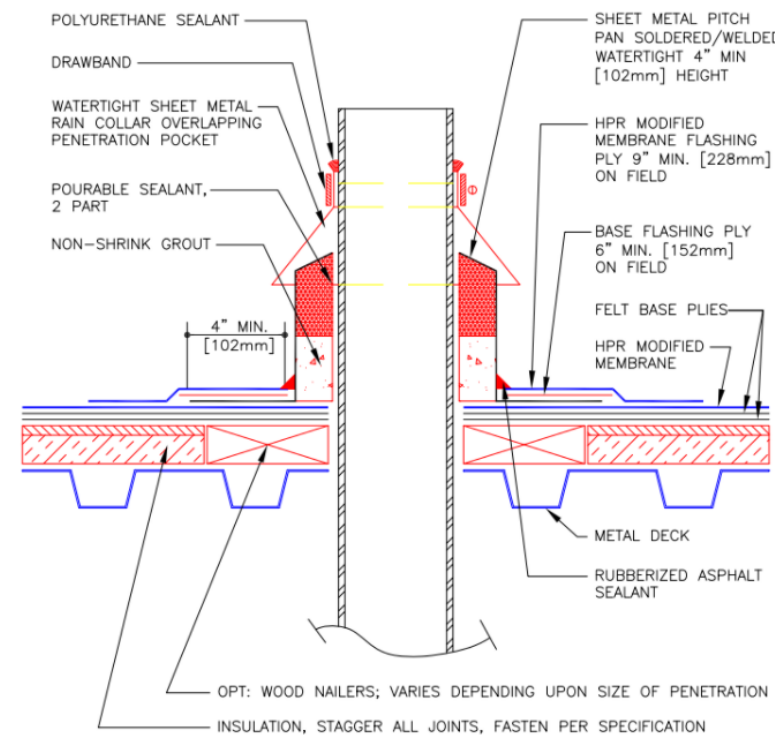
2
A PLUMBING STACK
CITY OF NEW BERLIN



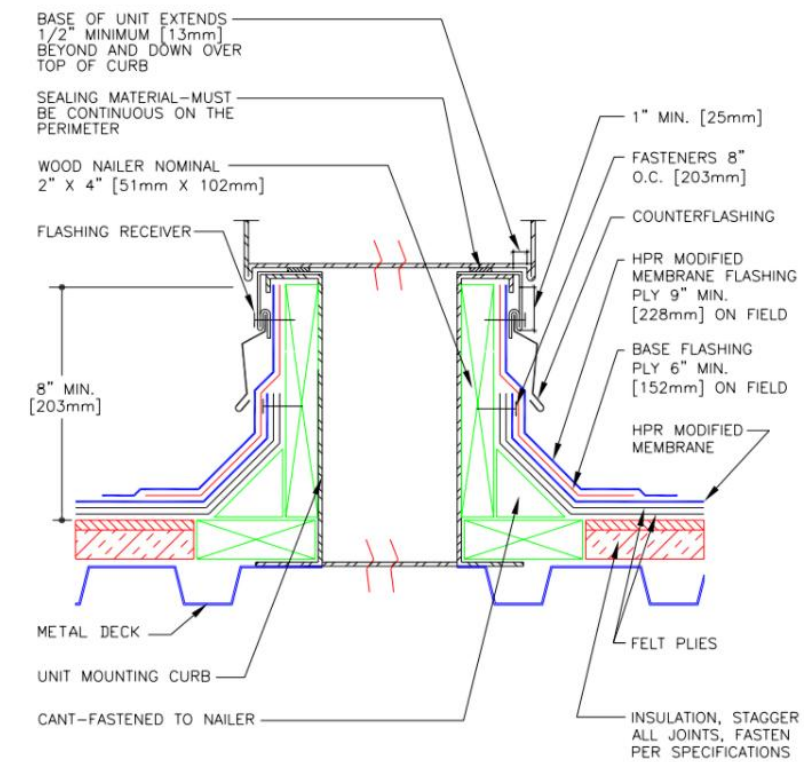
3
A COPING CAP
CITY OF NEW BERLIN



4
A SURFACE MOUNTED COUNTER FLASHING
CITY OF NEW BERLIN



5
A PITCH POCKET WITH UMBRELLA
CITY OF NEW BERLIN



6
A ROOF CURB
CITY OF NEW BERLIN



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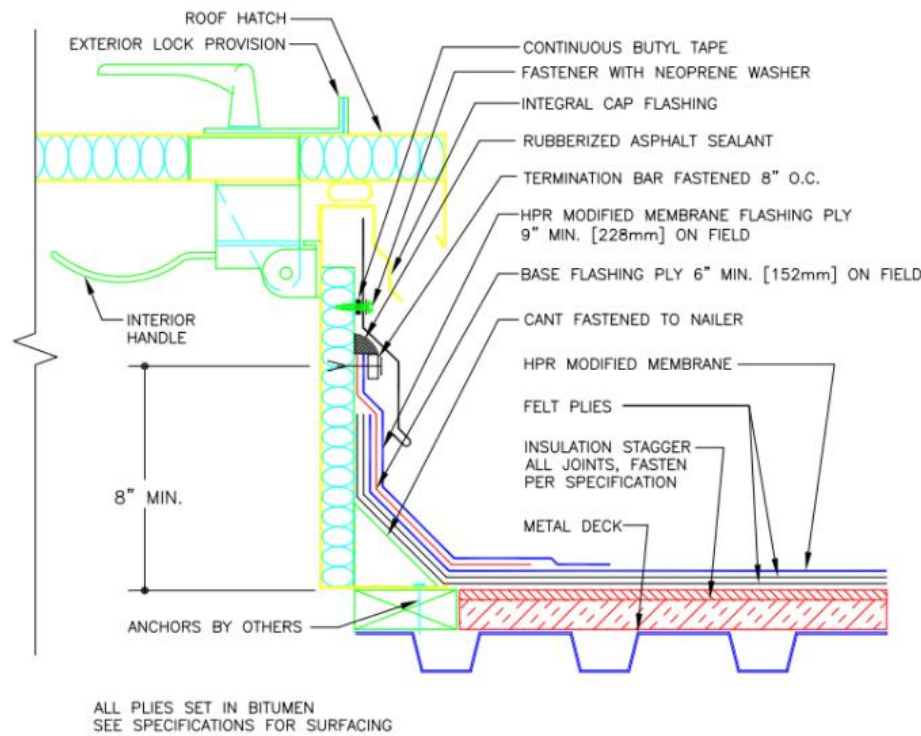
City of New Berlin
2023 Safety Building and Fire Station 1
Building Envelope Project

SHEET TITLE:

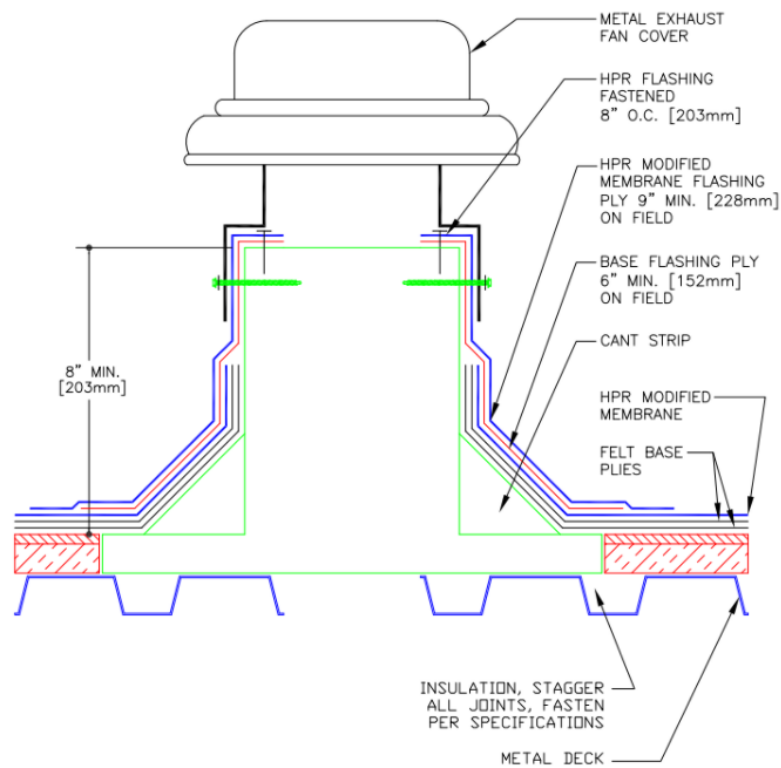
DETAILS

SHEET NO.

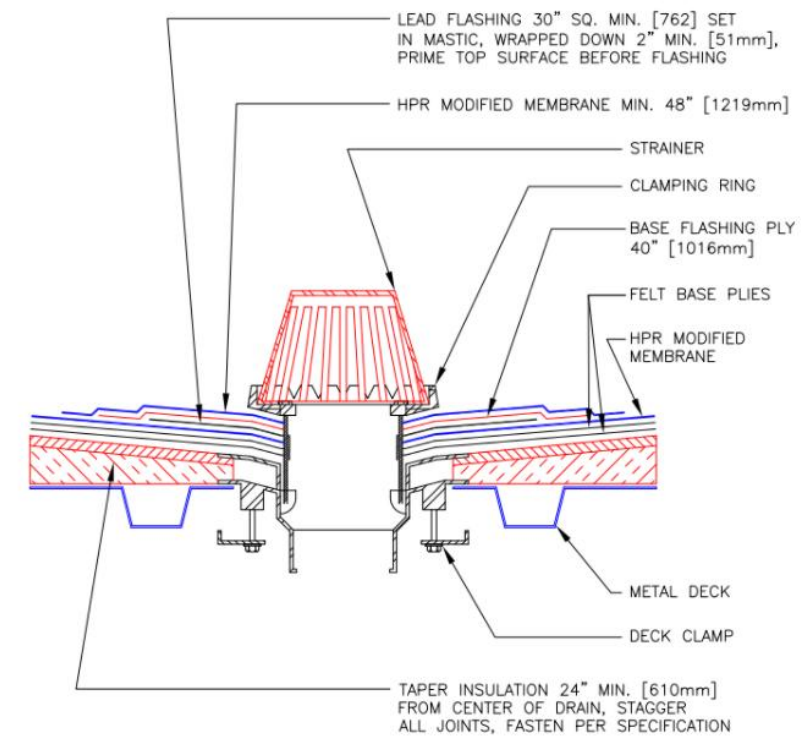
A-12



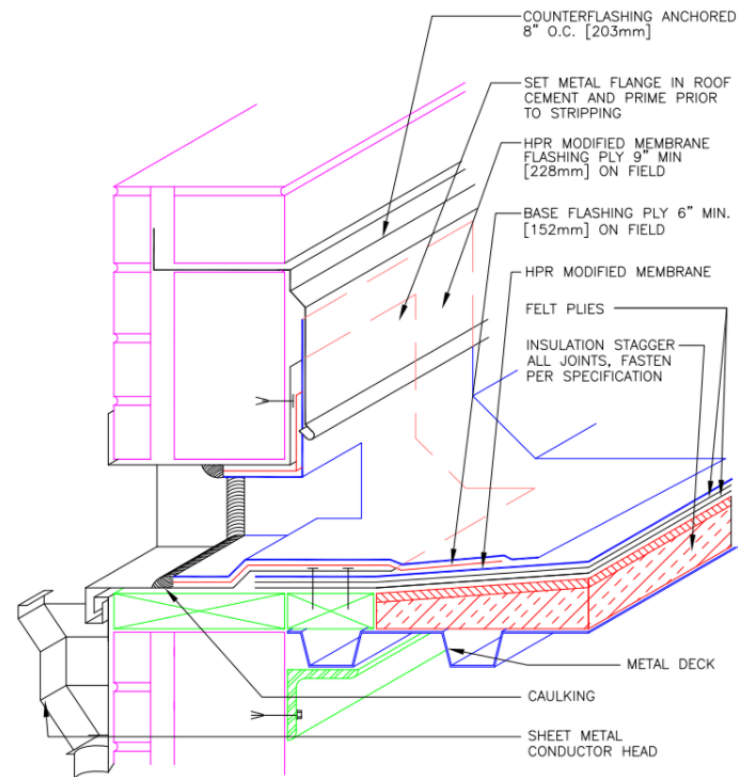
7
A **ROOF HATCH**
CITY OF NEW BERLIN



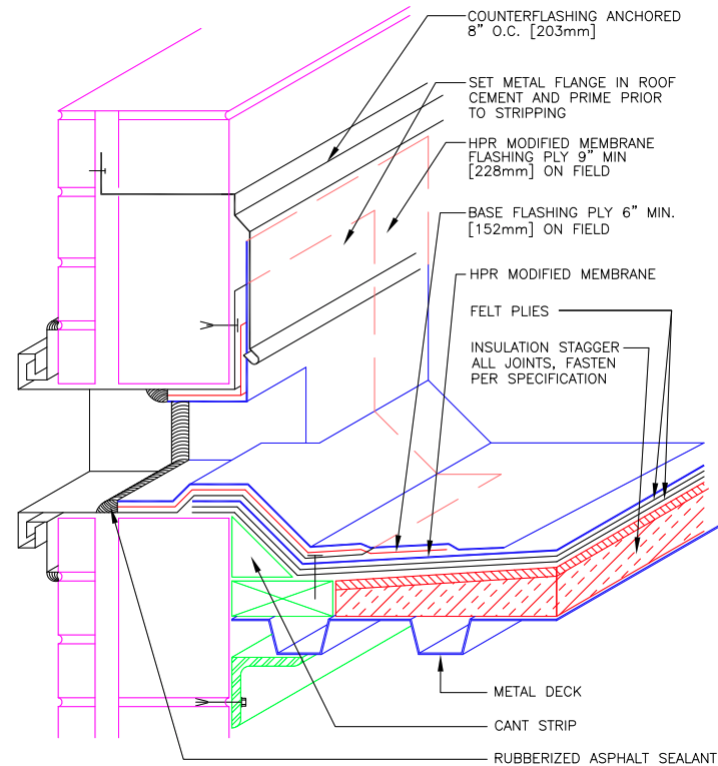
8
A **EXHAUST FAN DETAIL**
CITY OF NEW BERLIN



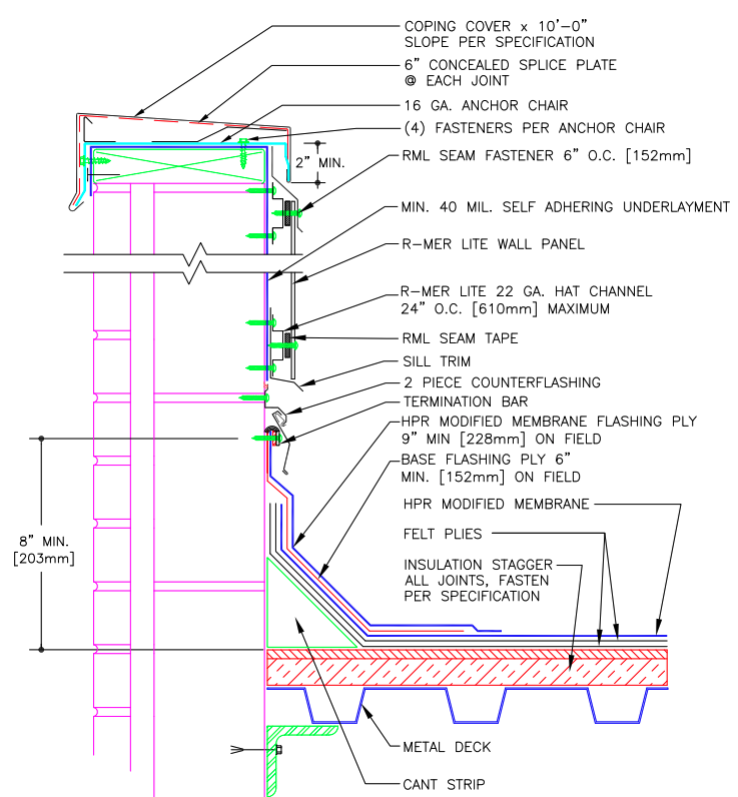
9
A **ROOF DRAIN**
CITY OF NEW BERLIN



10
A **THROUGHWALL SCUPPER WITH DOWNSPOUT**
CITY OF NEW BERLIN



11
A **THROUGHWALL SCUPPER (OVERFLOW)**
CITY OF NEW BERLIN



12
A **WALL CLADDING**
CITY OF NEW BERLIN



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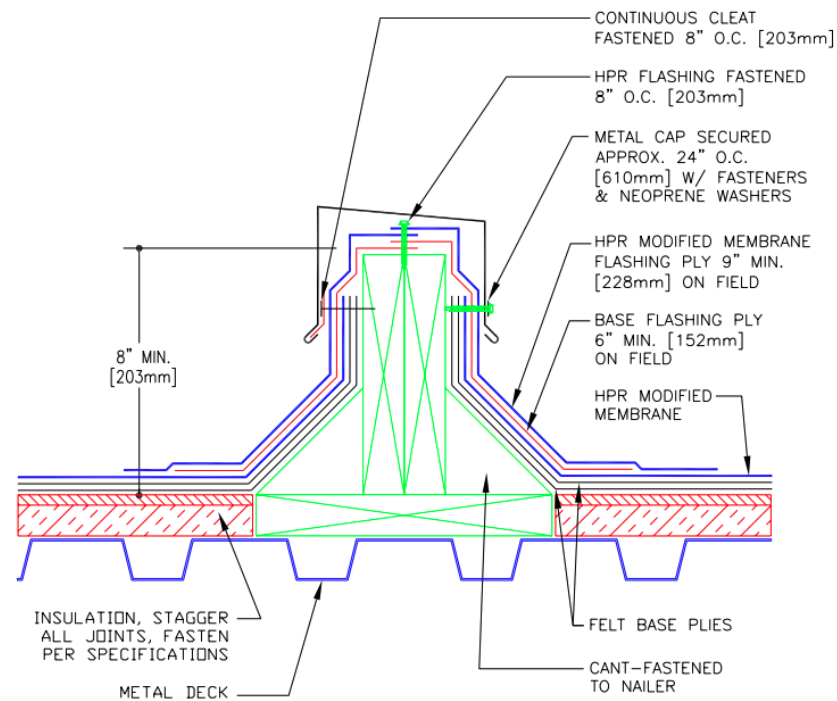
City of New Berlin
2023 Safety Building and Fire Station 1
Building Envelope Project

SHEET TITLE:

DETAILS

SHEET NO.

A-13



13 AREA DIVIDER
A CITY OF NEW BERLIN

DETAIL REQUIREMENTS

- 1) Details shown are representative of finished details. Contractors shall take into account existing insulation, new insulation, and the new roof system. Wood blocking shall be added to achieve the minimum flashing heights shown.
- 2) All one piece sheet metal fascia is limited to a maximum of 8". Any face metal extending beyond 8" must have two piece metal and two keeper strips.



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BIDDING**

City of New Berlin
2023 Safety Building and Fire Station 1
Building Envelope Project

SHEET TITLE:

DETAILS

SHEET NO.

A-14

BID TABULATION FORM

Project: City of New Berlin- 2023 Safety Building and Fire Station 1 Building Envelope Project - Project #8382867
Bid Date: 3/6/23

DISCIPLINE:

CONTRACTOR	Addendum Received	Bid Bond	BASE BID - Safety Building	BASE BID - Fire Station 1	BASE BID - Safety Building & Fire Sation 1	ALTERNATE BID 1 - Safety Building	ALTERNATE BID 1 - Fire Sation 1	ALTERNATE BID 1 - Safety Building & Fire Station 1
Carlson Racine Roofing	Yes	Yes	\$1,541,000	\$497,600	\$2,038,600	\$1,703,500	\$671,012	\$2,374,512
Langer Roofing	Yes	Yes	\$1,297,650	\$450,940	\$1,730,100	\$1,547,850	\$528,500	\$2,055,590
Pioneer Roofing	Yes	Yes	\$1,144,392.00	\$467,872.00	\$1,612,264.00	\$1,518,674.00	\$592,946.00	\$2,171,620.00

City of New Berlin
2023 Safety Building & Fire Station 1 Building Envelope Project
16300 W National Ave, New Berlin, WI 53151

BID FORM

1. GENERAL DIRECTIONS TO BIDDERS

- A. All Bids must be submitted on these standard form sheets inclusive without modification. Fill out all blanks on the Bid Form by typing or writing in ink. Sign in ink. Erasures or other changes in Bid must be explained or noted over signature of Bidder. Enter Bid amount in both written words and printed figures in spaces provided on Bid Form. In case of conflict, amount given in written words will govern.
- B. Base Bid(s) must be for Work bid in strict accordance with the Drawings and Specifications. **INCLUDE BOND(s) COSTS IN THE BASE BID(S)**. All requested Alternates must be bid. If no change to the Base Bid applies, enter "No Change."
- C. Bid Forms containing qualifications, conditions, omissions, unexplained erasures, alterations or items not called for in Bid Form or other irregularities of any kind may be rejected at the discretion of the Owner.
- D. Bidders shall examine the provisions of the Project Manual thoroughly to ensure compliance with all bidding requirements.
- E. Bidders shall only submit the Bid Forms included in the Project Manual – DO NOT return the Project Manual.
- F. Bidders shall ensure that all items in the Bid Form such as Work Schedule, Bidders Official Title and Signature, and Proof of Responsibility are properly executed.
- G. A bid must be accompanied by a bid security made payable to Owner in an amount of 5% of bidder's maximum bid price (determined by adding the base bid and all alternates), and in the form of a certified check, bank money order or a bid bond issued by a surety acceptable to the City. The bid security will be retained by the City until the City awards the contract to such bidder and such bidder has executed the contract documents and met the other conditions of the Notice of Award, where upon the bid security will be released. If the successful bidder fails to execute and deliver the contract documents and furnish the requirements contract security within 15 days after the Notice of Award, the Owner may consider the bidder to be in default and annul the Notice of Award and the bid security of that bidder will be forfeited. Such forfeiture shall be the Owner's exclusive remedy if the bidder defaults.

- H. The Bidder shall be required to identify any subcontractor, suppliers, individuals or entities to be submitted to the Owner 14 days in advance of the City's acceptance of the agreement. The apparent successful bidder shall, within 5 days after the bid opening, submit to the Owner a list of all such subcontractors, suppliers, individuals or other entities that will be utilized in the completion of the work. An experience statement with pertinent information regarding similar projects and other evidence of qualification for the work that the subcontractor will be performing is required. If the Owner, after review of such information, determines, in its sole discretion, that such subcontractor, supplier, individual or entity is not satisfactory, the Owner, prior to the Notice of Award, shall give notice to the successful bidder requiring that an acceptable substitute be provided. In the event there is any adjustment to the cost as a result of said substitution, Owner may take that into consideration in making the contract award. In the event that the contractor fails to make the substitution requested, the Owner may award the contract to the next lowest responsive responsible bidder.
- I. Bids not conforming to the above directions may be declared irregular and are subject to disqualification at the discretion of the Owner.

THE BIDDER HEREBY AGREES THAT THIS BID IS INVALID WITHOUT BIDDER'S SIGNATURE APPEARING IN THE SIGNATURE BLOCK ON THE LAST PAGE OF THIS BID FORM.

2. BID SUBMITTAL PROCEDURE

In submitting a Bid, the Bidder represents that:

- He/She thoroughly reviewed and understood the Bidding and Contract Documents and the Bid is made in full accordance with these documents and amendments issued thereto.
- He/She has thoroughly reviewed and understands the Bidding and Contract Documents related to the Work of other portions of the Project, if any, being bid concurrently or presently under construction.
- He/She has thoroughly reviewed informational reports and documents available to him/her, visited the project site, become familiar with actual local conditions under which the Work is to be performed and has correlated his/her evaluations and personal observations with the requirements of the Bidding and Contract Documents.
- The contract for the work, if awarded, will be on the basis of materials and equipment specified or described in the bidding documents, and those or equal or substitute or materials and equipment subsequently approved by the Owner prior to the submittal of bids and identified by addendum. No item of material or equipment will be considered by Owner as an or equal or substitute unless written requests for approval has been submitted by the bidder and has been received by the Owner at least 10 days prior to the date of receipt of bids in the case of a proposed substitute. The burden of proof on the merit of the proposed item is upon the bidder. The Owner's decision of approval or disapproval of a proposed item will be final. If the Owner approves any such proposed items, such approval will be set forth as an addendum issued to all

perspective bidders. Bidder shall not rely upon approvals made in any other manner. All prices that Bidder sets forth in this bid shall be based on the presumption that the contractor will furnish the materials and equipment specified or described in the bidding documents as supplemented by any addenda.

- A. After Bid Forms are completed, place one (1) set of signed originals and the Bid Bond in a sealed envelope. Oral, telephonic, e-mailed, or faxed Bids are invalid and will not be considered.
- B. Address the envelope to:
City of New Berlin
Attn: City Clerk's Office
3805 S Casper Dr
New Berlin, WI 53151
- C. Bidders shall affix their name and address to the front upper left-hand corner of the envelope with the words "Sealed Bid Enclosed" written on the outside. Identified in lower left corner should be: Bid number, project name and opening date.

3. BID CLOSING

- A. Bids must be received on or before 10:00 a.m. on March 6th, 2023. The Bidder assumes full responsibility for timely delivery at the location designated for receipt of Bids. **Bids received after the time and date for receipt of Bids will be rejected and returned unopened.**

4. BID OPENING

- A. Bids will be publicly read at 10:00 a.m. on March 6th, 2023 in the New Berlin City Hall – Common Council Chambers.
(a corporation)

We Langer Roofing & Sheet Metal, Inc. ~~(a partnership)~~
~~(an individual)~~

(Cross out inapplicable)

Of 345 S. Curtis Rd., Milwaukee WI 53214
Street City County State Zip

hereby agree to execute the proposed Contract and to furnish a satisfactory Public Improvement Performance/Labor and Material Payment Bond, in the amount of one hundred percent (100%), and to provide all labor and material required for the construction of the designated Work, for the prices hereinafter set forth, in strict accordance with the Construction Documents released by: **City of New Berlin**, address: 3805 S. Casper Dr, New Berlin, WI dated February 8th, 2023.

Including Amendment Nbr(s). 1 dated 2/24/2023.

5. BASE BID 1 – Safety Building (Roof Sections 1, 2, 3, 4 & 5)

Base Bid 1 includes all work required to complete the Project, including Building Permits, General Conditions, overhead, profit, insurance, bonds, taxes, and all other expenses. Bid Guarantee ten percent (10%) Bid Bond Cost, Public Improvement Performance Bond and Labor and Materials Payment Bond Cost one hundred percent (100 %) for the sum of:

One Million Two Hundred Ninety-Seven Thousand Six Hundred Fifty Dollars (\$ 1,297,650.00)

BASE BID 2 – Fire Station 1 (Roof Sections 1, 2, 3, & 4)

Base Bid 2 includes all work required to complete the Project, including Building Permits, General Conditions, overhead, profit, insurance, bonds, taxes, and all other expenses. Bid Guarantee ten percent (10%) Bid Bond Cost, Public Improvement Performance Bond and Labor and Materials Payment Bond Cost one hundred percent (100 %) for the sum of:

Four Hundred Fifty Thousand Nine Hundred Forty Dollars (\$ 450,940.00)

BASE BID 1 & 2 - Safety Building (Roof Sections 1, 2, 3, 4, & 5) & Fire Station 1 (Roof Sections 1, 2, 3, & 4)

Base Bid 1 & 2 includes all work required to complete the Project, including Building Permits, General Conditions, overhead, profit, insurance, bonds, taxes, and all other expenses. Bid Guarantee ten percent (10%) Bid Bond Cost, Public Improvement Performance Bond and Labor and Materials Payment Bond Cost one hundred percent (100 %) for the sum of:

One Million Seven Hundred Thirty Thousand One Hundred Dollars (\$ 1,731,100.00)

ALTERNATE BID 1 – Safety Building (Roof Sections 1, 2, 3, 4, & 5)

Alternate Bid 1 includes all work required to complete the Project, including Building Permits, General Conditions, overhead, profit, insurance, bonds, taxes, and all other expenses. Bid Guarantee ten percent (10%) Bid Bond Cost, Public Improvement Performance Bond and Labor and Materials Payment Bond Cost one hundred percent (100 %) for the sum of:

One Million Five Hundred Forty-Seven Thousand Eight Hundred Fifty Dollars (\$ 1,547,850.00)

ALTERNATE BID 2 -- Fire Station 1 (Roof Sections 1, 2, 3, & 4)

Alternate Bid 2 includes all work required to complete the Project, including Building Permits, General Conditions, overhead, profit, insurance, bonds, taxes, and all other expenses. Bid Guarantee ten percent (10%) Bid Bond Cost, Public Improvement Performance Bond and Labor and Materials Payment Bond Cost one hundred percent (100 %) for the sum of:

Five Hundred Twenty-Eight Thousand Five Hundred Dollars (\$ 528,500.00)

ALTERNATE BID 1 & 2 -- Safety Building (Roof Section 1, 2, 3, 4, & 5) & Fire Station 1 (Roof Sections 1, 2, 3, & 4)

Alternate Bid 1 & 2 includes all work required to complete the Project, including Building Permits, General Conditions, overhead, profit, insurance, bonds, taxes, and all other expenses. Bid Guarantee ten percent (10%) Bid Bond Cost, Public Improvement Performance Bond and Labor and Materials Payment Bond Cost one hundred percent (100 %) for the sum of:

Two Million Fifty-Five Thousand Five Hundred Ninety Dollars (\$ 2,055,590.00)

6. SCHEDULE OF VALUES

- A. Submit schedule of standard rates for all personnel, including personnel of subcontractors, involved with project. See attached.
- B. Include schedule of standard markups. See attached.
- C. Submit Unit Pricing for:
 - i. Wet Insulation \$ 15.00 / sq foot
 - ii. Deck Replacement \$ 12.00 / sq foot

7. COMMENCEMENT, PROGRESS AND COMPLETION OF WORK

- A. If written Notice of Intent to Award Contract is issued not later than March 31st, 2023 with a Project commencement of April 1st, 2023, can you complete the Work in compliance with the requirements of the Contract Documents by October 31st, 2023, in full cooperation and coordination with other Contractors, if any.

Yes ☒ No ☐.

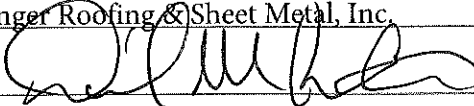
If "No", state additional calendar days required _____.

- B. The undersigned understands that time is of the essence and agrees that the specified time period for completion stated above is a reasonable time for the completion of the Work. All time limits shall be binding.

8. BID ACCEPTANCE:

- A. All Bids as stated above are effective and open for acceptance by the Owner for a period of ninety (90) days after date set for opening of Bids.
B. One contractor will be selected for the project

FIRM NAME Langer Roofing & Sheet Metal, Inc.

BY SIGNATURE 

TITLE Vice President

DATED 3/6/2023

TELEPHONE 414-476-5800

FAX NBR 414-476-3044

EMAIL ADDRESS: dannyk@langer-roofing.com

If a corporation, answer the following:

Incorporated under laws of what state?

SEAL Wisconsin (If Bid is by Corporation)



REQUESTED ACTION STATEMENT

DATE: March 7, 2023

TO: Mayor
Common Council
Parks, Buildings and Grounds Commission

FROM: Josh Radomski – Director of Public Works

ISSUE: Fire Station #1 Roof

REQUESTED:

Recommend Council to award the Fire Station #1 Roof Replacement project to the lowest, responsive and responsible bidder, Langer Roofing and Sheet Metal, Inc.

FISCAL IMPACT:

Monies to come from the Roof Replacement – Fire Station #1 account #04251300-61312-C2023 for the contract amount of \$450,940 with a 4% Contingency of \$19,060 for a total construction cost of \$470,000.

RATIONALE:

Langer Roofing and Sheet Metal, Inc. was the lowest, responsive and responsible bidder.

City of New Berlin
2023 Safety Building & Fire Station 1 Building Envelope Project
16300 W National Ave, New Berlin, WI 53151

BID FORM

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- The contract for the work, if awarded, will be on the basis of materials and equipment specified or described in the bidding documents, and those or equal or substitute or materials and equipment subsequently approved by the Owner prior to the submittal of bids and identified by addendum. No item of material or equipment will be considered by Owner as an or equal or substitute unless written requests for approval has been submitted by the bidder and has been received by the Owner at least 10 days prior to the date of receipt of bids in the case of a proposed substitute. The burden of proof on the merit of the proposed item is upon the bidder. The Owner's decision of approval or disapproval of a proposed item will be final. If the Owner approves any such proposed items, such approval will be set forth as an addendum issued to all

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- B. Address the envelope to:
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Attn: City Clerk's Office
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New Berlin, WI 53151
- C. Bidders shall affix their name and address to the front upper left-hand corner of the envelope with the words "Sealed Bid Enclosed" written on the outside. Identified in lower left corner should be: Bid number, project name and opening date.

3. BID CLOSING

- A. Bids must be received on or before 10:00 a.m. on March 6th, 2023. The Bidder assumes full responsibility for timely delivery at the location designated for receipt of Bids. **Bids received after the time and date for receipt of Bids will be rejected and returned unopened.**

4. BID OPENING

- A. Bids will be publicly read at 10:00 a.m. on March 6th, 2023 in the New Berlin City Hall – Common Council Chambers.

(a corporation)

(an LLC)

(a partnership)

We Pioneer Roofing, A Tecta America Company, LLC

(an individual)

(Cross out inapplicable)

Of 151 Maple St, PO Box 277, Johnson Creek, WI 53038

Street City County State Zip

hereby agree to execute the proposed Contract and to furnish a satisfactory Public Improvement Performance/Labor and Material Payment Bond, in the amount of one hundred percent (100%), and to provide all labor and material required for the construction of the designated Work, for the prices hereinafter set forth, in strict accordance with the Construction Documents released by: **City of New Berlin**, address: 3805 S. Casper Dr, New Berlin, WI dated February 8th, 2023.

Including Amendment Nbr(s). 1 dated 2/24/2023.

5. BASE BID 1 – Safety Building (Roof Sections 1, 2, 3, 4 & 5)

Base Bid 1 includes all work required to complete the Project, including Building Permits, General Conditions, overhead, profit, insurance, bonds, taxes, and all other expenses. Bid Guarantee ten percent (10%) Bid Bond Cost, Public Improvement Performance Bond and Labor and Materials Payment Bond Cost one hundred percent (100 %) for the sum of:

One Million One Hundred Forty Four Thousand Three Dollars (\$ 1,144,392.00)
Hundred Ninety Two & 00/100 Dollars

BASE BID 2 – Fire Station 1 (Roof Sections 1, 2, 3, & 4)

Base Bid 2 includes all work required to complete the Project, including Building Permits, General Conditions, overhead, profit, insurance, bonds, taxes, and all other expenses. Bid Guarantee ten percent (10%) Bid Bond Cost, Public Improvement Performance Bond and Labor and Materials Payment Bond Cost one hundred percent (100 %) for the sum of:

Four Hundred Sixty Seven Thousand Eight Hundred Dollars (\$ 467,872.00)
Seventy Two & 00/100 Dollars

BASE BID 1 & 2 - Safety Building (Roof Sections 1, 2, 3, 4, & 5) & Fire Station 1 (Roof Sections 1, 2, 3, & 4)

Base Bid 1 & 2 includes all work required to complete the Project, including Building Permits, General Conditions, overhead, profit, insurance, bonds, taxes, and all other expenses. Bid Guarantee ten percent (10%) Bid Bond Cost, Public Improvement Performance Bond and Labor and Materials Payment Bond Cost one hundred percent (100 %) for the sum of:

One Million Six Hundred Twelve Thousand Two Dollars (\$1,612,264.00)
Hundred Sixty Four & 00/100 Dollars

ALTERNATE BID 1 – Safety Building (Roof Sections 1, 2, 3, 4, & 5)

Alternate Bid 1 includes all work required to complete the Project, including Building Permits, General Conditions, overhead, profit, insurance, bonds, taxes, and all other expenses. Bid Guarantee ten percent (10%) Bid Bond Cost, Public Improvement Performance Bond and Labor and Materials Payment Bond Cost one hundred percent (100 %) for the sum of:

One Million Five Hundred Eighteen Thousand Six Dollars (\$1,518,674.00)
Hundred Seventy Four & 00/100 Dollars

ALTERNATE BID 2 – Fire Station 1 (Roof Sections 1, 2, 3, & 4)

Alternate Bid 2 includes all work required to complete the Project, including Building Permits, General Conditions, overhead, profit, insurance, bonds, taxes, and all other expenses. Bid Guarantee ten percent (10%) Bid Bond Cost, Public Improvement Performance Bond and Labor and Materials Payment Bond Cost one hundred percent (100 %) for the sum of:

Five Hundred Ninety Two Thousand Nine Hundred Dollars (\$ 592,946.00)
Forty Six & 00/00 Dollars

ALTERNATE BID 1 & 2 – Safety Building (Roof Section 1, 2, 3, 4, & 5) & Fire Station 1 (Roof Sections 1, 2, 3, & 4)

Alternate Bid 1 & 2 includes all work required to complete the Project, including Building Permits, General Conditions, overhead, profit, insurance, bonds, taxes, and all other expenses. Bid Guarantee ten percent (10%) Bid Bond Cost, Public Improvement Performance Bond and Labor and Materials Payment Bond Cost one hundred percent (100 %) for the sum of:

Two Million One Hundred Seventy One Thousand Dollars (\$2,171,620.00)
Six Hundred Twenty & 00/100 Dollars

6. SCHEDULE OF VALUES

- A. Submit schedule of standard rates for all personnel, including personnel of subcontractors, involved with project.
- B. Include schedule of standard markups.
- C. Submit Unit Pricing for:

i. Wet Insulation \$ 10.00 / sq foot

ii. Deck Replacement \$ 25.00 / sq foot

7. COMMENCEMENT, PROGRESS AND COMPLETION OF WORK

- A. If written Notice of Intent to Award Contract is issued not later than March 31st, 2023 with a Project commencement of April 1st, 2023, can you complete the Work in compliance with the requirements of the Contract Documents by October 31st, 2023, in full cooperation and coordination with other Contractors, if any.

Yes X No .

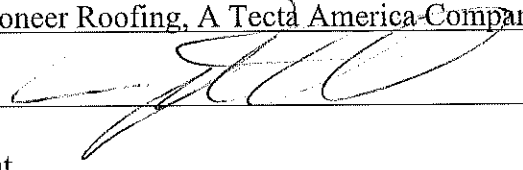
If “No”, state additional calendar days required .

- B. The undersigned understands that time is of the essence and agrees that the specified time period for completion stated above is a reasonable time for the completion of the Work. All time limits shall be binding.

8. BID ACCEPTANCE:

- A. All Bids as stated above are effective and open for acceptance by the Owner for a period of ninety (90) days after date set for opening of Bids.
B. One contractor will be selected for the project

FIRM NAME Pioneer Roofing, A Tecta America Company, LLC

BY SIGNATURE 

TITLE President

DATED 3/7/2023

TELEPHONE (920) 699-2731

FAX NBR (920) 699-2733

EMAIL ADDRESS: info@pioneerroofing.net

If a corporation, answer the following:

Incorporated under laws of what state?

SEAL _____ (If Bid is by Corporation)



REQUESTED ACTION STATEMENT

DATE: March 7, 2023

TO: Mayor
Common Council
Parks, Buildings and Grounds Commission

FROM: Josh Radomski – Director of Public Works

ISSUE: Safety Building Roof Project

REQUESTED:

Recommend Council to award the Safety Building Roof project to the lowest, responsive and responsible bidder, Pioneer Roofing, A Tecta America Company, LLC.

FISCAL IMPACT:

Monies to come from the Malone Park Lighting account #04252900-61127-C2022 for the contract amount of \$1,144,392 with a 3% Contingency of \$35,608 for a total construction cost of \$1,180,000.

RATIONALE:

Pioneer Roofing, A Tecta America Company, LLC. was the lowest, responsive and responsible bidder.