

SPECIFICATIONS

MACOMB COUNTY JAIL
LAUNDRY HOT WATER STORAGE TANKS AND BOILER REPLACEMENT
WAKELY PROJECT NUMBER: 231997
MACOMB COUNTY BID ITEM #46-23
OCTOBER 25, 2023

PROJECT

MACOMB COUNTY JAIL LAUNDRY HOT WATER STORAGE TANKS AND BOILER REPLACEMENT

OWNER

Macomb County Board of Commissioners
Administration Building
1 South Main – 9th Floor
Mt. Clemens, MI 48043

ARCHITECT

Wakely Associates, Inc.
30500 Van Dyke Ave., Suite 209
Warren, Michigan 48093

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MACOMB COUNTY BOARD OF COMMISSIONERS
ADMINISTRATION BUILDING
1 SOUTH MAIN - 9TH FLOOR
MT. CLEMENS, MI 48043

ARCHITECT

WAKELY ASSOCIATES, INC.
30500 VAN DYKE, SUITE 209
WARREN, MICHIGAN 48093
586-573-4100

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**MACOMB COUNTY PURCHASING DEPARTMENT
REQUEST FOR BID**

BID ITEM NO.: 46-23

**BID TITLE: Macomb County Jail Laundry Hot Water Storage Tanks and
Boiler Replacement Project**

REQUEST FOR BID

The Macomb County Purchasing Department will be receiving sealed proposals for the Macomb County Jail Laundry Hot Water Storage Tanks and Boiler Replacement Project (Wakely Project Number 231997).

This project consists of work at: Macomb County Jail, 43565 Elizabeth Road, Mt. Clemens MI 48043.

- A. The project consists of removal and replacement of the Macomb County Jail Laundry Hot Water Storage Tanks and miscellaneous piping and controls. Also included is removal and replacement of designated exterior HM doors. Alternate #1 Exterior HM doors to be replaced with new FRP doors and aluminum frames. Project also includes removal and replacement of existing interior CMU and HM doors to facilitate hot water tank replacement with associated repainting of removed and replaced doors, frames, walls, etc. and elsewhere, where noted. Alternate #2 will include replacement of existing boilers associated with laundry as designated on the drawings.

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OBJECTIVE

The purpose of this Request for Bid (RFB) is to select a vendor to provide renovations to the Macomb County Administration Building. The goal is to select the most capable vendor offering the most competitive price. This proposal is in accordance with the Macomb County Procurement Policy.

SUBMISSION PROCEDURES

Date Due: **Thursday, November 16, 2023 at 2:30 PM (local time)**

Bids will be publicly opened and read.

DELIVER via FEDEX, UPS, or hand deliver DIRECTLY TO 44900 Vic Wertz Dr. Clinton Township, MI 48036 PURCHASING DEPARTMENT BY DUE DATE & TIME.

IF HAND DELIVERED – MAKE SURE TO GET A DATE AND TIME STAMPED RECEIPT FOR PROOF OF DELIVERY.

If USPS utilized for submissions, there is no guarantee of a timely delivery as the Post Office does not deliver to individual County Buildings.

NO LATE BIDS ACCEPTED.

Mail to: Macomb County Purchasing
Mark Chomontowski, Purchasing Manager
ATTN: Mary Schultz
44900 Vic Wertz Dr.
Clinton Township, MI 48036

Return: One (1) hard copy original
Two (2) copies of the Bid
Clearly mark on the envelope **SEALED BID ITEM 46-23 MACOMB COUNTY JAIL LAUNDRY HOT WATER STORAGE TANKS AND BOILER REPLACEMENT PROJECT**
Label all submission envelopes with the company name on the outside.
Complete and return all pages requiring vendor response.

All Bids must be submitted on the forms provided, properly executed and with all items filled out in ink or typed. Do not change or add words to the forms. Unauthorized conditions, limitations, or provisions on or attached to the forms may be cause for rejection of the Bid. Any Bidder information that is altered by erasure or by inter-lineation prior to submittal must be initialed and explained by notation above the signature of the Bidder.

Macomb County vendors should be registered on the Michigan Inter-governmental Trade Network (MITN) website www.bidnetdirect.com/mitn.

QUESTIONS

Due: **Thursday, November 9, 2023 at 12:00 PM (local time)**

Submit to: Email: Mary.Schultz@macombgov.org

Questions regarding bid specifications may be directed in writing only, by email. All questions or clarifications must be directed to the Purchasing Department. Any attempt to contact a county department, other than purchasing, regarding current bids may be grounds for disqualification as a vendor. Answers will be posted to MITN.

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MANDATORY PRE-BID MEETING

Date: Monday, November 6, 2023, at 1:00 PM (local time)

Location: Macomb County Jail, 43565 Elizabeth, Mt. Clemens, MI 48043

This is a **Mandatory** pre-bid meeting.

The purpose of this meeting is to review the job location and Bid Specifications. No other site visit will be scheduled. **No bids will be accepted if you do not attend this meeting.**

Facility related questions will be answered at this meeting. Other questions related to the Bid specifications must be submitted in writing to the Purchasing Department.

MODIFICATIONS

Macomb County vendors should be registered on the Michigan Inter-governmental Trade Network (MITN) website www.bidnetdirect.com/mitn. Clarifications, modifications, or amendments may be made to this document at the discretion of the Macomb County Purchasing Department prior to the opening of the solicitations. Should any such changes be made, an addendum will be issued and posted on the MITN website. It is the responsibility of each Bidder to check the website and verify that he/she has received all Addenda prior to submitting a Bid.

It is also the responsibility of each Bidder to verify that all sub-Bidders and material suppliers whose prices are incorporated in the Bidder's Bid are familiar with the Bidding Documents in their entirety, including all Addenda issued up to the time of the Bid opening. *(See also ERRORS, OMISSIONS, AND/OR DISCREPANCIES, below.)*

All addenda issued to Bidders prior to date of receipt of Bids shall become a part of these specifications, and all Bids are to include the Work therein described.

DEFINITIONS

- A. Bidding Documents include this Request for Bid, (including drawings, specifications and all Addenda issued prior to execution of the Contract) and the proposed Contract Documents.
- B. Addenda are written or graphic instruments issued by Macomb County prior to the execution of the Contract that modify or interpret the Bidding Documents.
- C. The Base Bid is the sum state in the Bid for which the Bidder offers to perform the Work described in the Bidding Documents as the base, to which Work may be added or from which Work may be deleted.
- D. A Unit Price is an amount stated in the Bid as a price per unit of measurement for materials, equipment, or services, or a portion of the Work as described in the Bidding Documents.
- E. A Bidder is a person or entity who submits a Bid to Macomb County, and who meets the requirements set forth in the Bidding Documents.

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- F. Default is the failure of the Bidder to fulfill the obligations of the contract, including but not limited to, failure to deliver on time or the unauthorized substitution of articles other than those quoted and specified on the contract; or failure to deliver specified quantities (repetitive shortages).
- G. Owner is the County of Macomb.
- H. Contractor is a person or business which provides goods or services to the County of Macomb under terms specified in a contract.

BIDDING DOCUMENTS

All Bidding Documents are available on the Michigan Inter-governmental Trade Network (MITN) website www.bidnetdirect.com/mitn. Bidders shall use complete sets of Bidding Documents in preparing Bids. Macomb County assumes no responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.

All Bidding Documents are the property of the Architect.

EXAMINATION OF BIDDING DOCUMENTS AND SITE

Before submitting a Bid, the Bidder shall carefully examine the drawings, read the specifications and all other Bidding Documents; and visit the site of the Work. Each Bidder shall inspect the site of the proposed Work to arrive at a clear understanding of the conditions under which the Work is to be performed. The Bidder shall fully inform himself/herself prior to bidding as to all existing conditions and limitations under which the Work is to be performed and he/she shall include in the Bid a sum to cover the cost of all items necessary to perform the Work as set forth in the Bidding Documents. No allowance will be made to the Bidder because of lack of such examination or knowledge. The submission of a Bid shall be construed as conclusive evidence that the Bidder has made such examination. Claims for extra payments based on lack of knowledge of existing circumstances will not be allowed.

BIDDER'S QUALIFICATIONS

Bidders must be properly licensed under the state laws governing their respective trades. Bidders shall meet qualifications indicated in the Bidding Documents. Macomb County may make such investigations as necessary to determine the ability of the Bidder to perform the Work, and the Bidder shall furnish to Macomb County all such information and data for this purpose as Macomb County may request. Macomb County reserves the right to reject any Bid if the evidence submitted by, or investigation of, such Bidder fails to satisfy Macomb County that such Bidder is not properly qualified to carry out the obligations of the Contract.

Submission of a Bid shall serve as evidence that the Bidder has confirmed that the Bidder is properly qualified to perform the work and is capable of obtaining the required bonds and insurance.

COMPONENT/PRODUCT RESPONSIBILITY

The successful Bidder will provide field instructions for Macomb County's operators, mechanics and/or supervisors. The successful Bidder shall be responsible to insure that all components delivered operate properly and with the intent and details of these specifications.

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STATUS OF BIDDERS

Proprietors submitting Bids shall indicate their status as proprietors.

Bidders submitting Bids for partnerships shall indicate their status as partners and shall submit, upon request of Macomb County within 24 hours following receipts of Bids, a certified copy of the power of attorney authorizing the executor of the Bid to bind the partnership.

Bidders submitting Bids for corporations shall indicate their status as corporations and shall submit, upon request of the Owner within 24 hours following receipt of Bids, a certified copy of the board of directors' authorization for the Bidder to bind the corporation and shall affix the corporate seal on the Bid.

Bidders shall provide, upon request of Macomb County, within 24 hours following receipt of Bids, the following:

1. Names and addresses of proprietors, of all members of a partnership, or of the corporation's officers.
2. Name of county or state where the partnership is registered or where the corporation is incorporated. Corporations must be licensed to do business in the project state at the time of executing the contract.

ERRORS, OMISSIONS, AND/OR DISCREPANCIES

Bidder shall not be allowed to take advantage of errors, omissions, and/or discrepancies found in the Bidding Documents. In the event a conflict or omission is discovered in the Bidding Documents after the issuing of the last addendum such that an interpretation cannot be issued by Macomb County prior to bidding, the Bidder is directed to estimate on and provide the quantity and quality of material and labor consistent with the overall represented work so as to provide all materials, equipment, labor, and services necessary for the completion of the Work.

SUBSTITUTION OF MATERIALS AND EQUIPMENT

Whenever a material, article or piece of equipment is identified on the Drawings or in the Specifications by reference to manufacturers' or vendors' names, trade names, catalog numbers, or the like, it is so identified for the purpose of establishing a standard, and any material, article, or piece of equipment of other manufacturers or vendors which will perform adequately the duties imposed by the general design will be considered equally acceptable provided that the material, article, or piece of equipment so proposed is, in the opinion of the Architect, of equal substance appearance and function.

To obtain approval to use unspecified products, Bidders shall submit written requests at least ten (10) days before the bid date. Requests received after this time will not be considered. Requests shall clearly describe the product for which approval is asked, including all data necessary to demonstrate acceptability.

If the product is acceptable, the Architect will approve it in an Addendum which will be posted on the MITN website. The product shall not be purchased or installed by the Contractor without the Architect's written approval.

Voluntary alternates or qualifications contrary to the Contract requirements made by the Bidder in or accompanying his/her Bid as a condition for the acceptance of the Contract will not be considered in the award of the Contract and will cause the rejection of the entire Bid.



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TERMINATION

Macomb County reserves the right to terminate any award to the Bidder without any liability, upon a 30-day notice from Macomb County.

DEFAULT (refer to Section: Definitions, Item F)

If continued abuse of any/or all of the default conditions persist, Macomb County will notify the Contractor in writing. The Contractor will be given thirty (30) days to correct this default condition. Failure to correct within the specified period will result in Macomb County canceling the Contract and procuring the articles or services from other sources. The Contractor will be responsible for any excess costs occasioned thereby.

RIGHT TO REJECT

Macomb County reserves the right to reject any or all Bids in whole or in part and to waive any informalities therein or accept any Bid it may deem in the best interest of the County.

Note: Past experience and performance may be a factor in making an award.

MODIFICATION AND WITHDRAWAL OF BIDS

A Bid may be withdrawn on personal requests received from Bidder prior to submission time. A Bid being withdrawn may be re-submitted up to submission time. Negligence or error on the part of the Bidder in preparing his/her Bid confers no right for withdrawal of the Bid after it has been opened.

OFFER PERIOD

Bids will remain firm for a period of 30 days after official opening of Bids.

BID BREAKDOWN CONSTRUCTION INFORMATION

Upon notice from the Architect, the low Bidders shall submit a detailed cost breakdown of all work covered by the Bidding Documents. The breakdown shall show quantity of material and labor, units of material and labor, material cost, labor cost and total cost.

EXECUTION OF CONTRACT

Macomb County reserves the right to accept any and all Bids, or to negotiate contract terms with the various Bidders when such is deemed by Macomb County to be Macomb County's best interest.

SCHEDULE - TIME OF COMPLETION

Work is to commence on a date specified in a written "Notice to Proceed", and the Work shall be fully complete within the required time allowed. Macomb County requires the Work to be substantially complete no later than April 26, 2024.

BASIS OF BID

A single lump sum Bid is being entertained for the Work of the Bid.

SALES AND EXCISE TAXES

All prices stated in the Bid response will include all Federal, State, County and Municipal taxes, including Michigan State Sales and Use Taxes, or contributions required by Bidder's business.

PERMITS

Any needed city permits, and bonds will be required prior to award of Contract and commencement of Work.

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INDEMNIFICATION

Macomb County will not be responsible for injury to Contractor's employees, Sub-Contractors, or to third parties caused by the Contractor's agents, servants or employees. Therefore, the Contractor agrees to incorporate the below hold harmless agreement into the required insurance and to be evidenced by being contained in the certificate of insurance. Further, the below listed indemnification is incorporated and is part of the subject contract.

The Contractor agrees to protect, defend, indemnify and hold the County of Macomb and its commissioners, officers, employees and agents free and harmless from and against any and all losses, penalties, damages, settlements, costs, charges, professional fees, or other expenses or liabilities of every kind and character arising out of or relating to any and all claims, legal fees, liens, demands, court costs, obligations, actions, proceedings or causes of action of every kind and character in connection with or arising directly or indirectly out of this agreement and/or the performance hereof. Without limiting the generality of the foregoing, any and all such claims, etc. relating to personal injury, death, damage to property, defects in materials or workmanship, or any actual or alleged violation of any applicable statute, ordinance, administrative order, rule or regulation, or decree of any court, shall be included in the indemnity hereunder.

The Contractor further agrees to investigate, handle, respond to, provide defense for and defend any such claims, etc. at his sole expense and agrees to bear all other costs and expenses related hereto, even if it (claims, etc.) is groundless, false or fraudulent. In any case in which this indemnification would violate legal prohibition, the foregoing provision concerning indemnification shall not be construed to identify the County for damage arising out of bodily injury to persons or damage to property caused by or resulting from the sole negligence of the County, its commissioners, officers, employees or agents.

BID BOND/GUARANTEE

All Bids must be accompanied by a certified check, cashier's check, or a satisfactory Surety Bid Bond in an amount not less than five percent (5%) of the total Bid price. Checks shall be made payable to County of Macomb. No Bid shall be considered unless it is accompanied by a certified check, cashier's check or a satisfactory Surety Bid Bond.

Checks will be returned to all except the three (3) lowest Bidders for each contract within five (5) days after the opening of the Bids, and the remaining checks will be returned promptly after Macomb County and the accepted Bidders have executed the Contract, or if no award has been made, within one hundred twenty (120) days after the date of the opening of the Bids, upon demand of the Bidder at any time thereafter, so long as he has not been notified of the acceptance of his/her Bid.

The Bid Bond/Guarantee may be forfeited to Macomb County, if the successful Bidder refuses to enter into a Contract within ten (10) days upon award of Contract from Macomb County.

Bid Bonds shall be accompanied by a Power-of-Attorney authorizing the signer of the bond to do so on behalf of the Surety Company.



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PERFORMANCE AND PAYMENT BOND

The successful Bidder will be required to furnish a satisfactory performance and payment bond each in an amount equal to 100 percent of the Contract Sum, within five (5) days after notification of intent to enter into Contract. Bonds, in the full amount of the contract, are required so that the County has a guarantee that the Contractor will faithfully perform the contract and the Contractor will make all payments for all labor and material costs or claims covered or furnished under the contract.

All bonds and policies or certificates of insurance must meet with the approval of Macomb County before the Contractor will be allowed to commence the Work. Failure or refusal to furnish bonds or insurance policies or certificates in a form satisfactory to Macomb County shall subject the Bidder(s) to forfeiture of Bid Bond.

The Performance and Payment Bond must be from a surety company licensed to do business in the State of Michigan, and will be in Compliance with all the requirements of MCL 129.201 et seq.

CONTRACTS WITH SUB-CONTRACTORS

All contracts made by the Bidder with Sub-Contractors shall be covered by the terms and conditions of the Contract. The Bidder shall inform all Sub-Contractors of these terms and conditions. Macomb County reserves the right to require of the Bidders tentatively selected for consideration in the awarding of the Contract, a list of the Sub-Contractors whom the Contractor intends to employ.

Macomb County reserves the right to disapprove the use of any proposed Sub-Contractor, and in such event, the Bidder submitting such Sub-Contractor shall submit another such Sub-Contractor in like manner within the time specified by Macomb County. Macomb County reserves the right to reject any proposal if such information required by Macomb County is not submitted as above indicated.

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INSURANCE

COMMERCIAL GENERAL LIABILITY INSURANCE

Shall be written on an occurrence basis with limits of Liability of not less than \$1,000,000 (one million dollars) as combined single limit for each occurrence of bodily injury and personal injury with an annual aggregate of not less than \$2,000,000 (two million dollars). The policy shall include:

- a. Contractual Liability
- b. Products and Completed Operations
- c. Independent Contractors Coverage
- d. Broad Form General Liability Extensions or equivalent

WORKERS' COMPENSATION

Workers' Compensation Insurance meeting Michigan statutory requirements. Employer's Liability Insurance with minimum limits of \$500,000 each accident, \$500,000 bodily injury by disease policy limit, \$500,000 bodily injury by disease each employee.

AUTOMOBILE LIABILITY INSURANCE

Motor Vehicle Liability Insurance including Michigan NO-FAULT Coverage for all vehicles, owned and non-owned, leased and hired used in the performance of this contract with limits of \$1,000,000 (one million dollars) as the combined single limit for each occurrence for bodily injury and property damage.

PROFESSIONAL LIABILITY/ERRORS & OMISSIONS

Professional Liability Insurance with minimum limits of \$1,000,000 (one million dollars) each occurrence and \$2,000,000 (two million dollars) aggregate.

INSURANCE INSTRUCTIONS

All certificates of insurance and duplicate policies shall contain the following:

The County of Macomb shall be named additional insured on all policies (excluding Worker's Compensation) and the underwriters will have no right of recovery or subrogation against the County of Macomb including its agents, employees, elected and appointed officials and agencies. It being the intention of the parties that the insurance policy so effected will protect both parties in primary coverage for any and all losses covered by the subject policy. The insurance carrier(s) must have an A.M. Best rating of no less than an A-, VII.

The insurance company(s) issuing the policy or policies will have no recourse against the County of Macomb for payment of any premiums or for assessments under any form of policy.

The Contractor will assume any and all deductibles in the above any and all deductibles in the above-described insurance policies.

The term "INSURED" is used severally, not collectively, but the inclusion in this policy of more than one insured will not operate to increase the limit of the Owner's liability.

All certificates are to provide a thirty (30) day notice of material change or cancellation. Certificates of insurance must be provided no less than ten (10) working days before commencement of work to the County of Macomb, 120 North Main Street, Mt. Clemens, Michigan 48043 Attention: Department of Risk Management.

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SPECIFICATIONS/SCOPE OF WORK

*Insert
Specs/Scope of Service
Here (or at the end)*

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FORMS

INSTRUCTIONS

All Proposals must be submitted on the forms provided, properly executed and with all items filled out in ink or typed. Do not change or add words to the forms. Unauthorized conditions, limitations, or provisions on or attached to the forms may be cause for rejection of the proposal. Any Bidder information that is altered by erasure or by inter-lineation prior to submittal must be initialed and explained by notation above the signature of the Bidder.

LIST

The following is a list of forms that are to be completed and returned:

County Vendor Disclosure Form	Page 13
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Macomb County Preference	Page 16
General Information	Page 17
Work References	Page 18
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Good Housekeeping & Best Mgmt Practices	Page 28

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County of Macomb, Michigan
VENDOR DISCLOSURE FORM

The Macomb County ethics ordinance requires vendors of the County to complete and file a disclosure statement, the purpose of which is to disclose any financial relationships or other conflicts of interest that may exist between vendors and employees or elected officials (or their appointees) of the County. Once filed, the disclosure form does not need to be updated unless there is a change in circumstance that would cause the answer to any of the questions to change, at which time an amended disclosure form must be filed. Filing of the disclosure form is considered a condition of payment.

PLEASE RETURN THE COMPLETED FORM TO:

Macomb County Purchasing Department
ATTN: Vendor Disclosure/Mary Schultz
44900 Vic Wertz Dr.
Clinton Township, MI 48036

VENDOR NAME: _____

1. Does the vendor currently employ a relative of any employee, elected official or appointee of an elected official of Macomb County? Relative is defined as husband or wife, father or mother, son or daughter, brother or sister, uncle or aunt, first cousin, nephew or niece, great uncle or great aunt, grandfather or grandmother, grandson or granddaughter, father-in-law or mother-in-law, son-in-law or daughter-in-law, brother-in-law or sister-in-law, stepfather or stepmother, stepson or stepdaughter, stepbrother or stepsister, half-brother or half-sister, the parents or grandparents of the individual's fiancée.

YES NO

If yes, please answer the following:

- Name of County employee or elected official (or appointee): _____
- B. County Position/Title: _____
County Department or _____
- C. Agency: _____

2. Does any employee or elected official of Macomb County have an interest in the vendor organization in any of the following capacities, either compensated or non-compensated: director, officer, partner, beneficiary, trustee, member, employee or contractor.

YES NO

If yes, please answer the following:

- Name of County employee or elected official (or appointee): _____
- B. County Position/Title: _____
- C. County Department or Agency: _____
- D. Position/Title with Vendor: _____

**BID ITEM #46-23
MACOMB COUNTY JAIL LAUNDRY HOT WATER STORAGE TANKS
AND BOILER REPLACEMENT**



3. Does any current employee or elected official of Macomb County have legal or beneficial ownership of 10% or more of the outstanding stock of the vendor organization?

YES NO

If yes, please answer the following:

- A. Name of County employee or elected official (or appointee): _____
- B. County Position/Title: _____
- C. County Department or Agency: _____
% of Ownership of Vendor
- D. Organization: _____

4. In the last five calendar years, has the vendor failed to perform or otherwise deliver on the terms of a contract or agreement with Macomb County, or any other public entity, including suspensions or debarments?

YES NO

If yes, please provide further explanation:

I hereby certify that the information included on this form is complete, true and accurate to the best of my knowledge and belief. I understand that either myself or the organization to which this form applies may be subject to sanctions and/or penalties as set forth in the ethics ordinance if any information has been falsified or omitted.

Name (Please Print)

Title

Signature

Date

**BID ITEM #46-23
 MACOMB COUNTY JAIL LAUNDRY HOT WATER STORAGE TANKS
 AND BOILER REPLACEMENT**



MACOMB COUNTY BASED PREFERENCE

A local preference percentage credit from the following allowance table will be applied to the bid of any County-based Enterprise. This credit will be subtracted from the bid of the County-based Enterprise. In comparing bids, the bid of the County –based Enterprise after subtraction of the credit shall be considered the official bid. However, if the County-based Enterprise is awarded the Contract, the bid without the equalization percentage credit shall be the Contract price.

<u>Contract Amount</u>	<u>Local Preference Percentage</u>
Up to \$50,000.00	5
\$50,000.00 to \$200,000.00	3
\$200,000.00 and over	1

1. No business shall receive these credits unless it has been certified by the Purchasing Manager.
2. Any business who claims entitlement to any local preference credit shall disclose the records necessary to establish eligibility to the County.
3. After applying any local preference credits as provided above, the Contract shall be awarded to the lowest Responsible Bidder thus evaluated.

IN ORDER TO DETERMINE IF YOUR BUSINESS IS ENTITLED TO RECEIVE A LOCAL PREFERENCE PERCENTAGE CREDIT, PLEASE ANSWER THE FOLLOWING QUESTIONS:

1. Is your business headquarters physically located within Macomb County, or has it been conducting business at a location with a permanent street address in the County of Macomb on an ongoing basis for not less than one taxable year prior to your bid or response to this Request for Proposal? **YES _____ NO _____**
2. Has your business paid property taxes on real or personal property within the past year on property which is ordinarily needed to perform the proposed contract? **YES _____ NO _____**
3. Are at least 50 percent of your regular full-time employees based at the County location to perform the proposed contract? **YES _____ NO _____**
4. Has your business been dealing for at least one year on a regular commercial basis in the kind of goods or services which are the subject of this bid or proposal? **YES _____ NO _____**

Drug Screening

To the extent not prohibited by law, all contracts for construction, repair, alteration, or rebuilding of a County building or other property shall include a provision requiring the contractor and any subcontractor providing services under the contract to conduct pre-hire screening for illegal drug use by their employees who provide services under the contract.

If applicable, is your business compliant with this requirement? **YES _____ No _____**

**BID ITEM #46-23
MACOMB COUNTY JAIL LAUNDRY HOT WATER STORAGE TANKS
AND BOILER REPLACEMENT**



GENERAL INFORMATION

In further description of this Bid, we desire to submit sheets marked as follows:

Bidding under the name of: _____

DUNS Number: _____
Federal Employer Identification Number: _____
which is (check one of the following):

Corporation, incorporated under the laws of the State of:

Partnership, consisting of (list partners):

Assumed Name (Register No.) _____

Individual

AUTHORIZED SIGNATURE: _____

Printed or typed signature: _____

Title: _____

Address: _____

City, State: _____

Date: _____

Telephone Number: _____

Fax Number: _____

Email: _____

When payment on such order or contract is to be directed to the same company at an address different from above, please list the address to be used below:

**BID ITEM #46-23
MACOMB COUNTY JAIL LAUNDRY HOT WATER STORAGE TANKS
AND BOILER REPLACEMENT**



WORK REFERENCES

BIDDER'S COMPANY NAME _____
Please list at least three (3) companies or public agencies for which you have done similar work.

Macomb County reserves the right to reject low Bids for poor past performance or inadequate references.

NAME OF COMPANY _____

CONTACT PERSON _____

ADDRESS _____

TELEPHONE NO. _____

NAME OF COMPANY _____

CONTACT PERSON _____

ADDRESS _____

TELEPHONE NO. _____

NAME OF COMPANY _____

CONTACT PERSON _____

ADDRESS _____

TELEPHONE NO. _____

NAME OF COMPANY _____

CONTACT PERSON _____

ADDRESS _____

TELEPHONE NO. _____

**BID ITEM #46-23
MACOMB COUNTY JAIL LAUNDRY HOT WATER STORAGE TANKS
AND BOILER REPLACEMENT**



FEDERAL E-VERIFY PROGRAM

The Macomb County Board of Commissioners has established a policy regarding the Federal E-Verify Program. This policy states that future contracts (including both new and reviewing contracts) between Macomb County and contractors and vendors who provide services in excess of twenty-thousand dollars (\$20,000) shall require the contractors and vendors to register with, participate in, and utilize the E-Verify Program (or any successor program implemented by the federal Department of Homeland Security and Social Security Administration) when hiring their employees and require the County's Human Resources Department to utilize the E-Verify Program (or any successor program implemented by the federal Department of Homeland Security and Social Security Administration) when hiring new employees.

For more information about E-Verify, go to www.uscis.gov. Click on the E-Verify icon on the bottom left-hand corner of page.

**ACKNOWLEDGMENT OF MACOMB COUNTY'S POLICY
REQUIRING PARTICIPATION IN THE FEDERAL E-VERIFY PROGRAM
AND CERTIFICATION OF COMPLIANCE**

The undersigned hereby acknowledges receipt of a copy of the policy of the Macomb County Board of Commissioners requiring contractors, including those providing professional services, who provide services **in excess of \$20,000 a year** to the County to register and participate in the Federal E-Verify Program.

The undersigned hereby certifies that (he/she/it) will comply with this policy and will register with, participate in and utilize the E-Verify Program or any successor program implemented by the Federal Department of Homeland Security and Social Security Administration when hiring employees.

DATED: _____

Authorized Signature

Printed or Typed Signature

Name of Company

**BID ITEM #46-23
MACOMB COUNTY JAIL LAUNDRY HOT WATER STORAGE TANKS
AND BOILER REPLACEMENT**



CERTIFICATION OF COMPLIANCE – IRAN ECONOMIC SANCTIONS ACT

Michigan Public Act No. 517 of 2012

The undersigned, the owner or authorized officer of the below-named Bidder _____, hereby certifies, represents and warrants that the Bidder, including its officers, directors and employees, is not an “Iran linked business” within the meaning of the Iran Economic Sanctions Act, Michigan Public Act No. 517 of 2012 (the “Act”), and that in the event Bidder is awarded a contract, the Bidder will not become an “Iran linked business” at any time during the course of performing any services under the contract.

BIDDER: _____
Name of Bidder

By: _____

Its: _____

Date: _____

**BID ITEM #46-23
MACOMB COUNTY JAIL LAUNDRY HOT WATER STORAGE TANKS
AND BOILER REPLACEMENT**



BID FORM

Bid Item #46-23
Macomb County Jail
Laundry Hot Water Storage Tanks and
Boiler Replacement Project

Bidder: _____
(print or type company name)

County of Macomb
Mount Clemens, Michigan

OWNER

(Telephone Number)

MACOMB COUNTY
MT. CLEMENS, MICHIGAN 48043

ARCHITECT

WAKELY ASSOCIATES INC.
30500 VAN DYKE AVENUE, SUITE 209
WARREN, MI 48093

GENERAL AGREEMENTS

- A. The Bidder acknowledges that he/she has had the opportunity to examine the site and locality where the Work is to be performed and has become familiar with the legal requirements, laws, rules, regulations and conditions affecting the cost, progress and performance of the Work; and has made such independent investigations as Bidder deemed necessary to prepare the Bid. Further, Bidder hereby states that the Base Bid set forth in this Bid Response is true and correct.
- B. The Bidder agrees that this Bid shall not be withdrawn for a period of 30 calendar days after the scheduled closing time for receiving Bids.
- C. The Bidder declares that in preparing this Bid, Bidder is assured of the availability of all labor, materials and products to meet the substantial completion date.
- D. The Bidder acknowledges that the price stated below includes all taxes of whatever character or description.
- E. The Bidder agrees to execute a Contract for work covered by this Bid, provided that he/she be notified of its acceptance within thirty (30) days after the opening of Bids.

SCHEDULE - TIME OF COMPLETION

The undersigned agrees to commence the Work of the Contract Documents on a date specified in a written "Notice to Proceed", and shall fully complete the Work within the required time allowed. Owner requires work to be substantially complete no later than April 26, 2024. The proposed Bid is in full consideration of this.

ACKNOWLEDGEMENT OF ADDENDA

The Bidder acknowledges receipt of and use of the following Addenda in the preparation of this Bid:

Addendum No. 1, dated _____, Addendum No. 3, dated _____

Addendum No. 2, dated _____, Addendum No. 4, dated _____

**BID ITEM #46-23
MACOMB COUNTY JAIL LAUNDRY HOT WATER STORAGE TANKS
AND BOILER REPLACEMENT**



BID FORM SUPPLEMENTS

Attached to this Bid Form and incorporated herein are the following documents, completed in full by the undersigned:

Base Bid Form Supplement – Unit Prices/Supplemental Fees

BASE BID

The undersigned Bidder, having carefully examined the Bidding and Contract Requirements, Conditions of the Contract, Drawings, Specifications, and all subsequent Addenda, all as issued by the Owner, and being familiar with all conditions and requirements of the Work, hereby proposes and agrees to furnish all material, labor, equipment, tools and supervision; and to furnish all services necessary to complete the Work required in accordance with the Bidding Documents for the following projects, in the following amount:

_____ Dollars \$ _____
(Sum to be written out)

CONTINGENCY: (This amount, when unused, will be returned to the Owner. This contingency will only be used after written authorization of the Owner's representative).

- A. The undersigned acknowledges that they have included the sum of THIRTY FIVE THOUSAND DOLLARS (\$35,000.00) in the base bid for use as a Construction Contingency. Note: Unused Contingency will be returned to Owner at the end of the project.

ALTERNATES

Two Alternates are being priced. As follows:

Alternate No. 1: Replacement of existing HM doors at the Laundry Hot Water Mechanical Room with new FRP doors and aluminum framing system.

ALTERNATE NO. 1: _____
Dollars \$ _____ (sum to be written out)

Alternate No. 2: Replacement of boilers and associated painting of Boiler Room.

ALTERNATE NO. 2: _____
Dollars \$ _____ (sum to be written out)

**BID ITEM #46-23
 MACOMB COUNTY JAIL LAUNDRY HOT WATER STORAGE TANKS
 AND BOILER REPLACEMENT**



VOLUNTARY ALTERNATES

The following voluntary alternates are offered by the Bidder. The undersigned agrees that the amounts indicated below shall be added to or deducted from the Base Bid, as the case may be for each alternate which is accepted.

Description of Voluntary Alternates	Add	Deduct
1. _____	\$ _____	\$ _____
2. _____	\$ _____	\$ _____
3. _____	\$ _____	\$ _____
4. _____	\$ _____	\$ _____

Respectfully submitted this ____ day of _____, 20____.

By: _____
 (Name of bidding firm or corporation)

Witness:

By: _____
 (Signature)

Attest: _____
 (Signature)

 (Type or print name)

By: _____
 (Type or print name)

Title: _____
 (Owner/Partner/President/Vice Pres.)

Title: _____
 (Corporate Secretary or Assistant Secretary Only)

Address: _____
 Phone: _____

License: _____

Federal ID No.: _____

(Affix Corporate Seal Here)

 Company Name

 Company Representative

 Title

 Date



**BID ITEM #46-23
MACOMB COUNTY JAIL LAUNDRY HOT WATER STORAGE TANKS
AND BOILER REPLACEMENT**

BID FORM SUPPLEMENT - UNIT PRICES/SUPPLEMENTAL FEES

This form is required to be attached to the Base Bid Form.

Bid Item #46-23
Macomb County Jail
Laundry Hot Water Storage Tanks and
Boiler Replacement Project

Bidder: _____
(print or type company name)

County of Macomb
Mount Clemens, Michigan

SUPPLEMENTAL FEES

For additional work performed upon instruction of Macomb County, by Sub-Contractors of the Undersigned, add to the Sub-Contractor's prices for such work a fee of _____%, which includes all the charges of the undersigned for overhead and profit.

Any additional work performed upon instruction of Macomb County by persons other than the Sub-Contractors of the undersigned, the charges will be actual cost of the labor, and materials, (less all discounts) plus the fee of _____%, which includes all the charges of the undersigned for overhead and profit, and to which shall be added the actual cost of insurance & taxes.

Each Bid covering extra work, shall be accompanied with complete itemized material & labor breakdowns.

For all revisions involving the deletion of contract work, it is agreed that the full credit shall be given Macomb County for such work deleted, including overhead and profit as quoted hereinbefore.

NEGOTIATION

The undersigned agrees that, should the overall cost exceed the funds available, he/she will be willing to negotiate with Macomb County and Architect; for the purpose of making further reductions in the Contract work, and shall agree to give full credit for all such reductions in the work requested by Macomb County, including full value of labor, materials, and Sub-Contract work and reasonable proportionate reductions in overhead and profit, thereby arriving at an agreed upon Contract price.

**BID ITEM #46-23
MACOMB COUNTY JAIL LAUNDRY HOT WATER STORAGE TANKS
AND BOILER REPLACEMENT**



Submitted this ____ day of _____, 20____

By: _____
(Name of bidding firm or corporation)

By: _____
(Signature)

(Type or print name)

Title: _____
(Owner/Partner/President/Vice Pres.)



**BID ITEM #46-23
MACOMB COUNTY JAIL LAUNDRY HOT WATER STORAGE TANKS
AND BOILER REPLACEMENT**

BID FORM SUPPLEMENT - LIST OF SUB-CONTRACTORS

All sealed bids for construction contracts shall provide a list of preferred sub-contractors and identify, with documentation, whether each subcontractor is a County-based Enterprise.

NAME OF BIDDER: _____

NAME OF SUB-CONTRACTOR _____

CONTACT PERSON _____

ADDRESS _____

TELEPHONE NO. _____

MACOMB COUNTY BASED ENTERPRISE (Y/N) _____

NAME OF SUB-CONTRACTOR _____

CONTACT PERSON _____

ADDRESS _____

TELEPHONE NO. _____

MACOMB COUNTY BASED ENTERPRISE (Y/N) _____

NAME OF SUB-CONTRACTOR _____

CONTACT PERSON _____

ADDRESS _____

TELEPHONE NO. _____

MACOMB COUNTY BASED ENTERPRISE (Y/N) _____

NAME OF SUB-CONTRACTOR _____

CONTACT PERSON _____

ADDRESS _____

TELEPHONE NO. _____

MACOMB COUNTY BASED ENTERPRISE (Y/N) _____

**BID ITEM #46-23
MACOMB COUNTY JAIL LAUNDRY HOT WATER STORAGE TANKS
AND BOILER REPLACEMENT**



**COUNTY OF MACOMB
VENDOR CERTIFICATION DEBARMENT**

All information requested in this section must be completed and the document notarized. Any information omitted, or erroneously reported, may result in disqualification for current or future bidding and supply on behalf of the County of Macomb.

The undersigned warrants and presents that they have full complete authority to make representations for and on behalf of the undersigned company and that their representations are fully binding upon the undersigned company.

1. The undersigned are not presently debarred, suspended, proposed for debarment, declared ineligible, or excluded from transactions by any federal department or agency, or any state, county or local municipality, department or agency.
2. The undersigned has not within a three (3) year period preceding this bid been convicted of, or had a civil judgment rendered against them for the commission of fraud, a criminal offense in connection with obtaining, attempting to obtain, or performing a public (federal, state or local) transaction, or a contract a public transaction, violation of federal or state antitrust statutes, or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property.
3. The undersigned are not presently indicted for or otherwise criminally or civilly charged by any governmental entity (federal, state or local) with commission of any of the offenses set forth in paragraph 2.
4. The undersigned have not within a three (3) year period preceding this bid, had one or more public transactions (federal, state or local) terminated or attempted to be terminated for cause or default.

IF THE APPLICANT IS UNABLE TO CERTIFY TO ANY OF THE STATEMENTS IN THIS CERTIFICATION, CERTIFICATION AND EXPLANATION SHALL BE ATTACHED AND PRESENTED WITH THIS CERTIFICATION.

THE UNDERSIGNED CERTIFIES OR AFFIRMS THE TRUTHFULNESS AND ACCURACY OF THE CONTENTS OF THE STATEMENTS SUBMITTED MADE ON BEHALF OF THE UNDERSIGNED BIDDER.

Bidder: _____

Bidder Address: _____

Applicant/Bidder Representative: _____

Signature: _____
(Print full name)

Subscribed and sworn to before me this
_____ day of _____, 20__.

Notary Public
County of _____,
State of _____
My Commission expires: _____

**BID ITEM #46-23
MACOMB COUNTY JAIL LAUNDRY HOT WATER STORAGE TANKS
AND BOILER REPLACEMENT**



GOOD HOUSEKEEPING AND BEST MANAGEMENT PRACTICES

Bidder shall comply with the Good Housekeeping and Best Management Practices as outlined in SEMCOG's LID that can be found at:

<https://semcog.org/Reports/LID/files/assets/basic-html/page-1.html#>.

Where applicable, Bidder to annually certify their trucks and tanks to ensure that materials extracted stay within the truck until it reaches the permitted disposal site.

All equipment utilized in the cleaning process will abide by manufacturers recommendations.

Initial

Date

MACOMB COUNTY JAIL
LAUNDRY HOT WATER STORAGE TANKS
AND BOILER REPLACEMENT 231997

OCTOBER 25, 2023

SECTION 00851 - INDEX OF DRAWINGS

TITLE SHEET

The following drawings, dated October 25, 2023, are issued for Macomb County Jail Laundry Hot water Storage Tanks and Boiler Replacement, Bid Item #46-23, Michigan. Architect's Project Number 231997.

TITLE SHEET

SHEET NO. TITLE

DRAWINGS:

G0.0 COVER SHEET
A1.1 COMPOSITE AND ENLARGED FLOOR PLAN - FIRST FLOOR

MECHANICAL DRAWINGS:

M0.00 MECHANICAL GENERAL INFORMATION
M1.01 MECHANICAL DEMOLITION AND NEW WORK PLANS
ME4.01 ENLARGED MECHANICAL AND ELECTRICAL DEMOLITION AND NEW
WORK PLANS
M6.00 MECHANICAL SCHEDULES, DETAILS AND TEMPERATURE CONTROLS
M7.00 PIPING DIAGRAMS

END OF SECTION 00851

SECTION 01010 - SUMMARY OF WORK

PART I - GENERAL

1.01 RELATED DOCUMENTS:

- A. Attention is directed to Division 0, Bidding and Contract Requirements, and to Division 1, General Requirements, which are hereby made a part of this section.

1.02 PROJECT:

This project consists of work at: Macomb County Jail, 43565 Elizabeth Road, Mt. Clemens MI 48043.

- A. The project consists of removal and replacement of the Macomb County Jail Laundry Hot Water Storage Tanks and miscellaneous piping and controls. Also included is removal and replacement of designated exterior HM doors. Alternate #1 Exterior HM doors to be replaced with new FRP doors and aluminum frames. Project also includes removal and replacement of existing interior CMU and HM doors to facilitate hot water tank replacement with associated repainting of removed and replaced doors, frames, walls, etc. and elsewhere, where noted. Alternate #2 will include replacement of existing boilers associated with laundry as designated on the drawings.

1.03 SCHEDULE:

- A. Asbestos may be present and if found will be abated by the Owner. There will be no extra costs allowed due to the time required by the Owner for any abatement.
- B. All sites will remain in operation during the construction period. Schedule and work operations must be coordinated with Macomb County Facilities and Operations.

1.04 ALLOWANCES:

- A. The undersigned acknowledges that he has included the sum of THIRTY FIVE THOUSAND DOLLARS (\$35,000.00) in the combined base bid for use as a Construction Contingency. This amount, when unused, will be returned to the Owner. This allowance will only be used after written authorization of the Owners representative.

PARTS 2 & 3 - PRODUCT AND EXECUTION
Not applicable

END OF SECTION 01010

SECTION 01041 - PROJECT COORDINATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

- A. Attention is directed to Division 0, Bidding and Contract Requirements, and to other Sections of Division 1, General Requirements, which are hereby made a part of this Section.

1.02 DESCRIPTION:

- A. Contractor shall provide the services of a full time Project Coordinator for the duration of the construction work.
 - 1. Employ someone with not less than (10) ten years experience performing coordination work on projects of similar size and scope.
 - 2. Submit name and qualifications to Architect.
- B. Provide additional administrative and supervisory personnel as required for the performance of the work including coordination of the various subcontractors.
- C. Related Requirements Specified in Other Sections:
 - 1. Summary of Work: Section 01010.

1.03 PROJECT COORDINATOR'S DUTIES:

- A. Coordinate the work of the various subcontractors:
 - 1. For temporary utilities.
 - 2. With the work of trades specified in Division 2 through 26.
- B. Coordinate the schedules of subcontractors.
 - 1. Verify timely deliveries of products for installation by other trades.
 - 2. Verify that labor and materials are adequate to maintain schedules.

- C. Maintain conferences among subcontractors and other concerned parties, as necessary to:
1. Maintain coordination and schedules.
 2. Resolve matters in dispute.
- D. Participate in project meetings:
1. Report progress of work.
 2. Recommend needed changes in schedule.
- E. Temporary Utilities:
1. Coordinate installation, operation and maintenance, to verify compliance with project requirements and with Contract Documents.
 2. Verify adequacy of service at required locations.
- F. Shop Drawings, Product Data and Samples:
1. Prior to submittal, review for compliance with Contract Documents.
 - a. Check field dimensions and clearance dimensions.
 - b. Check relation to available space.
 - c. Check anchor bolt settings (if indicated on drawings).
 - d. Review the effect of any changes on the work of other contracts or trades.
 - e. Check compatibility with equipment and work of other trades.
- G. Coordination Drawings:
1. Prepare, as required to assure coordination of work or to resolve conflicts.
 2. Submit for review and transmittal.
 3. Reproduce and distribute approved copies to all concerned parties.

H. Observe required testing; maintain a record of tests:

1. Testing agency and name of inspector.
2. Subcontractor.
3. Manufacturer's representative present.
4. Date and time of testing.
5. Type of product or work.
6. Type of test and results.
7. Retesting required.

I. Verify that subcontractors maintain accurate record documents.

J. Substitutions and Changes:

1. Review proposals and requests.
 - a. Check for compliance with Contract Documents.
 - b. Verify compatibility with work and equipment of other trades.
2. Promptly report deficiencies or discrepancies to the contractor.

K. Assemble documentation for handling of claims or disputes.

L. Inspection and Acceptance of Work:

1. Prior to inspection, check that work is complete and ready for acceptance
2. Assist Inspector: Prepare list of items to be completed or corrected.
3. Should acceptance of work constitute the beginning of the specified guarantee period, prepare and transmit written notice to Contractor for the Owner.

M. Assemble record documents from subcontractors.

END OF SECTION 01041

SECTION 01045 - CUTTING AND PATCHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements for cutting and patching.
- B. Refer to other Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.
- C. Demolition of selected portions of the building for alterations is included in Section "Selective Demolition."

1.3 SUBMITTALS

- A. Cutting and Patching Proposal: Where approval of procedures for cutting and patching is required before proceeding, submit a proposal describing procedures well in advance of the time cutting and patching will be performed and request approval to proceed. Include the following information, as applicable, in the proposal:
 - 1. Describe the extent of cutting and patching required and how it is to be performed; indicate why it cannot be avoided.
 - 2. Describe anticipated results in terms of changes to existing construction; include changes to structural elements and operating components as well as changes in the building's appearance and other significant visual elements.
 - 3. List products to be used and firms or entities that will perform Work.
 - 4. Indicate dates when cutting and patching is to be performed.
 - 5. List utilities that will be disturbed or affected, including those that will be relocated and those that will be temporarily out-of-service. Indicate how long service will be disrupted.

6. Where cutting and patching involves addition of reinforcement to structural elements, submit details and engineering calculations to show how reinforcement is integrated with the original structure.
7. Approval by the Architect to proceed with cutting and patching does not waive the Architect's right to later require complete removal and replacement of a part of the Work found to be unsatisfactory.

1.4QUALITY ASSURANCE

- A. Requirements for Structural Work: Do not cut and patch structural elements in a manner that would reduce their load-carrying capacity or load-deflection ratio.
- B. Operational and Safety Limitations: Do not cut and patch operating elements or safety related components in a manner that would result in reducing their capacity to perform as intended, or result in increased maintenance, or decreased operational life or safety.
- C. Visual Requirements: Do not cut and patch construction exposed on the exterior or in occupied spaces, in a manner that would, in the Architect's opinion, reduce the building's aesthetic qualities, or result in visual evidence of cutting and patching. Remove and replace Work cut and patched in a visually unsatisfactory manner.

PART 2 - PRODUCTS

2.1MATERIALS

- A. Use materials that are identical to existing materials. If identical materials are not available or cannot be used where exposed surfaces are involved, use materials that match existing adjacent surfaces to the fullest extent possible with regard to visual effect. Use materials whose installed performance will equal or surpass that of existing materials.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Before cutting existing surfaces, examine surfaces to be cut and patched and conditions under which cutting and patching is to be performed. Take corrective action before proceeding, if unsafe or unsatisfactory conditions are encountered.
 - 1. Before proceeding, meet at the site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

3.2 PREPARATION

- A. Temporary Support: Provide temporary support of Work to be cut.
- B. Protection: Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of the Project that might be exposed during cutting and patching operations.
- C. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
- D. Take all precautions necessary to avoid cutting existing pipe, conduit or ductwork serving the building, but scheduled to be removed or relocated until provisions have been made to bypass them.

3.3 PERFORMANCE

- A. General: Employ skilled workmen to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time and complete without delay.
 - 1. Cut existing construction to provide for installation of other components or performance of other construction activities and the subsequent fitting and patching required to restore surfaces to their original condition.

- B. Cutting: Cut existing construction using methods least likely to damage elements to be retained or adjoining construction. Where possible review proposed procedures with the original installer; comply with the original installer's recommendations.
1. In general, where cutting is required use hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut holes and slots neatly to size required with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 2. To avoid marring existing finished surfaces, cut or drill from the exposed or finished side into concealed surfaces.
 3. Cut through concrete and masonry using a cutting machine such as a carborundum saw or diamond core drill.
 4. Comply with requirements of applicable Sections of Division-2 where cutting and patching requires excavating and backfilling.
 5. By-pass utility services such as pipe or conduit, before cutting, where services are shown or required to be removed, relocated or abandoned. Cut-off pipe or conduit in walls or partitions to be removed. Cap, valve or plug and seal the remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after by-passing and cutting.
- C. Patching: Patch with durable seams that are as invisible as possible. Comply with specified tolerances.
1. Where feasible, inspect and test patched areas to demonstrate integrity of the installation.
 2. Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
 3. Where removal of walls or partitions extends one finished area into another, patch and repair floor and wall surfaces in the new space to provide an even surface of uniform color and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary to achieve uniform color and appearance.
 - a. Where patching occurs in a smooth painted surface, extend final paint coat over entire unbroken containing the patch, after the patched area has received primer and second coat.

4. Patch, repair or rehang existing ceilings as necessary to provide an even plane surface of uniform appearance.

3.4 CLEANING

- A. Thoroughly clean areas and spaces where cutting and patching is performed or used as access. Remove completely paint, mortar, oils, putty and items of similar nature. Thoroughly clean piping, conduit and similar features before painting or other finishing is applied. Restore damaged pipe covering to its original condition.

END OF SECTION 01045

SECTION 01090 - REFERENCE STANDARDS

PART 1 - GENERAL

1.01 SECTION INCLUDES:

- A. Quality assurance.
- B. Schedule of references.

1.02 QUALITY ASSURANCE:

- A. For products or workmanship specified by association, trade, or Federal Standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- B. Conform to reference standard by date of issue current on date for receiving bids.
- C. Obtain copies of standards when required by Contract Documents.
- D. Maintain copy at job site during submittals, planning, and progress of the specific work, until Substantial Completion.
- E. Should specified reference standards conflict with Contract Documents, request clarification from Architect/Engineer before proceeding.
- F. The contractual relationship of the parties to the Contract shall not be altered from the Contract Documents by mention or inference otherwise in any reference document.

1.04 SCHEDULE OF REFERENCE:

- AA Aluminum Association
900 19th Street, N.W. - Suite 300
Washington, DC 20006
- AABC Associated Air Balance Council
1518 K Street N.W.
Washington, DC 20005
- AASHTO American Association of State Highway
and Transportation Officials
444 North Capitol Street, N.W. - Suite 249
Washington, DC 20001

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- ACI American Concrete Institute
P.O. Box 9094
Farmington Hills, MI 48333-9094
- ADC Air Diffusion Council
1901 N. Roselle Rd., Suite 800
Schaumburg, IL 60195
- AF&PA American Forest & Paper Association
1111 19th Street, NW, Suite 800
Washington, DC 20036
- AGC Associated General Contractors of America
2300 Wilson Blvd., Suite 400
Arlington, VA 22201
- AI Asphalt Institute
2696 Research Park Drive
Lexington, KY 40511-8480
- AIA American Institute of Architects
1735 New York Avenue, N.W.
Washington, DC 20006-5292
- AISC American Institute of Steel Construction
One East Wacker Drive
Suite 3100
Chicago, IL 60601-2001
- AISI American Iron and Steel Institute
1140 Connecticut Ave - Suite 705
Washington, DC 20036
- AITC American Institute of Timber Construction
7012 S. Revere Parkway - Suite 140
Englewood, CO 80112
- AMCA Air Movement and Control Association
30 West University Drive
Arlington Heights, IL 60004
- ANSI American National Standards Institute
25 West 43rd Street, Fourth Floor
New York, NY 10036
- APA American Plywood Association
Box 11700
Tacoma, WA 98411-0700

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ARI Air Conditioning and Refrigeration Institute
4100 North Fairfax Drive - Suite 200
Arlington, VA 22203

ASHRAE American Society of Heating, Refrigeration and
Air Conditioning Engineers
1791 Tullie Circle, N.E.
Atlanta, GA 30329

ASME American Society of Mechanical Engineers
Three Park Avenue
New York, NY 10016-5990

ASTM American Society for Testing and Materials
100 Barr Harbor Drive
West Conshohocken, PA 19428-2959

AWI Architectural Woodwork Institute
46179 Westlake Drive, Suite 120
Potomac Falls, VA 20165

AWPA American Wood-Preservers' Association
P.O. Box 5690
Grandbury, TX 76049

AWS American Welding Society
550 N.W. LeJeune Road
Miami, FL 33126

AWWA American Water Works Association
6666 West Quincy Avenue
Denver, CO 80235

BIA Brick Institute of America
1350 Centennial Park Drive, Suite 301
Reston, VA 20191

CDA Copper Development Association
260 Madison Avenue - 16th Floor
New York, NY 10016

CLFMI Chain Link Fence Manufacturers Institute
10015 Old Columbia Road, Suite B-215
Columbia, MD 21046

CRSI Concrete Reinforcing Steel Institute
933 Plum Grove Road
Schaumburg, IL 60173-4758

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CSSB Cedar Shake and Shingle Bureau
P.O. Box 1178
Sumas, WA 98295-1178

DHI Door and Hardware Institute
14150 Newbrook Drive, Suite 200
Chantilly, VA 20151

EJCDC Engineers' Joint Contract Documents Committee
American Council of Engineering Companies
1015 15th Street, N.W., 8th Floor
Washington, DC 20005

EJMA Expansion Joint Manufacturers Association
25 North Broadway
Tarrytown, NY 10591

FGMA Flat Glass Marketing Association
3310 Harrison
White Lakes Professional Building
Topeka, KS 66611

FM Factory Mutual System
Standards Laboratories Department
1151 Boston-Providence Turnpike
Norwood, MA 02062

FS Federal Specification
General Services Administration
Specifications and Consumer Information
Distribution Section (WFSIS)
1800 F Street, NW
Washington, DC 20405

GA Gypsum Association
810 First Street N.W. #510
Washington, DC 20002-4268

ICC International Code Council
5203 Leesburg Pike, Suite 600
Falls Church, VA 22041

IEEE Institute of Electrical and Electronics Engineers
345 East 47th Street
New York, NY 10017

IMIAC International Masonry Industry All-Weather Council
International Masonry Institute
815 15th Street, N.W.
Washington, DC 20005

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MBMA Metal Building Manufacturer's Association
1300 Sumner Avenue
Cleveland, OH 44115-2351

MFMA Maple Flooring Manufacturers Association
60 Revere Drive
Northbrook, IL 60062

MIL Military Specification
Naval Publications and Forms Center
700 Robbins Avenue, Building 4, Section D
Philadelphia, PA 19111-5093

ML/SFA Metal Lath/Steel Framing Association
Division of National Association of Architectural Metal
Manufacturers (NAAMM MLIFSA)
600 South Federal Street, Suite 400
Chicago, IL 60605

NAAMM National Association of Architectural Metal
Manufacturers
800 Roosevelt Road, Building C, Suite 312
Glen Ellyn, IL 60137

NCMA National Concrete Masonry Association
2302 Horse Pen Road
Herndon, VA 22071-3499

NEBB National Environmental Balancing Bureau
8575 Grovement Circle
Gaithersburg, MD 20877

NEMA National Electrical Manufacturers' Association
1300 North 17th Street, Suite 1752
Rosslyn, VA 22209

NFPA National Fire Protection Association
#1 Battery March Park
Quincy, MA 02269-9101

NSWMA National Solid Wastes Management Association
4301 Connecticut Avenue, N.W., Suite 300
Washington, DC 20008-2304

NTMA National Terrazzo and Mosaic Association
201 North Maple, Suite 208
Purcellville, VA 20132

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- PCA Portland Cement Association
5420 Old Orchard Road
Skokie, IL 60077
- PCI Precast Prestressed Concrete Institute
175 W. Jackson Blvd.-Suite 1859
Chicago, IL 60604-9773
- PS Product Standard
U.S. Department of Commerce
1401 Constitution Avenue, N.W.
Washington, DC 20230
- RIS Redwood Inspection Service
Division of California Redwood Association)
405 Enfrente Drive
Novato, CA 94949
- SDI Steel Deck Institute
P.O. Box 25
Fox River Grove, IL 60021
- SDI Steel Door Institute
c/o Wherry Associates
30200 Detroit Road
Cleveland, OH 44145-1967
- SIGMA Sealed Insulating Glass Manufacturers Association
401 N. Michigan Avenue
Chicago, IL 60611
- SJI Steel Joist Institute
3127 10th Avenue North
Myrtle Beach, SC 29577-6760
- SMACNA Sheet Metal and Air Conditioning Contractors'
National Association
4201 Lafayette Center Drive
Chantilly, VA 20151-1209
- SSPC Society for Protective Coatings
40 24th Street, 6th Floor
Pittsburgh, PA 15222-4656
- TCNA Tile Council of North America, Inc.
100 Clemson Research Blvd.
Anderson, SC 29625

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TPI Turfgrass Producers International
2 East Main Street
East Dundee, IL 60118

UL Underwriters' Laboratories, Inc.
333 Pfingston Road
Northbrook, IL 60062-2096

WCLIB West Coast Lumber Inspection Bureau
6980 S.W. Varns Road
Tigard, OR 97223

WDMA Window & Door Manufacturers Associations
1400 W. Touhy Avenue, Suite 470
Des Plaines, IL 60018

WWPA Western Wood Products Association
522 SW Fifth Avenue, Suite 500
Portland, OR 97204-2122

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION 01090

SECTION 01100 - ALTERNATES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

- A. Attention is directed to Division 0, Bidding and Contract Requirements, and to Division 1, General Requirements, which are hereby made a part of this Section.

1.02 DESCRIPTION OF WORK:

- A. This section identifies each Alternate by number, and describes the basic changes to be incorporated into the work, only when the Alternate is made a part of the work by specific provisions in the Owner-Contractor Agreement.
- B. Alternate schedule below is part of the Bidding Documents and will be considered in selection of Contractors and awarding contracts.
- C. Unless otherwise provided, Owner will accept or reject alternates within thirty (30) days of date of contract. Owner reserves the right to reject any or all alternates.

1.03 ALTERNATES:

A. General:

- 1. The descriptions for each alternate listed in the schedule are primarily scope definitions, and do not necessarily detail the full range of materials and processes needed to complete the work as required.
- 2. Refer to applicable specification sections (Division 2 through 26), and to applicable drawings, for specific requirements of the work, regardless of whether references are so noted in description of each alternative.
- 3. Coordinate pertinent related work and modify surrounding work as required to properly integrate the work under each Alternate, and to provide the complete construction required by Contract Documents.
- 4. Referenced sections of specifications stipulate pertinent requirements for products and methods to achieve the work stipulated under each Alternate.

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B. Schedule:

1. **Alternate No. 1:** Removal and replacement of designated exterior hollow metal doors with new FRP doors and aluminum frames.
2. **Alternate No. 2:** Removal and replacement of existing boilers associated with the laundry as indicated on the drawings.

END OF SECTION 01100

SECTION 01200 - PROJECT MEETINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and General Provisions of the Contract, including General and Supplementary Conditions and other Division-1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements for project meetings including but not limited to:
 - 1. Pre-Construction Conference.
 - 2. Pre-Installation Conferences.
 - 3. Coordination Meetings.
 - 4. Progress Meetings.
- B. Construction schedules are specified in Spec Section 01310.

1.3 PRE-CONSTRUCTION CONFERENCE

- A. Schedule a pre-construction conference and organizational meeting at the Project site or other convenient location no later than (14) fourteen calendar days after execution of the Agreement and prior to commencement of construction activities. Conduct the meeting to review responsibilities and personnel assignments.
- B. Attendees: The Owner, Directors of the Macomb County Facilities and Operations, and Macomb County Jail, Architect and their consultants, the Contractor and its superintendent, major subcontractors, manufacturers, suppliers and other concerned parties shall each be represented at the conference by persons familiar with and authorized to conclude matters relating to the work.
- C. Agenda: Discuss items of significance that could affect progress including such topics as:
 - 1. Tentative construction schedule.
 - 2. Critical work sequencing.
 - 3. Designation of responsible personnel.
 - 4. Procedures for processing field decisions and Change Orders.
 - 5. Procedures for processing Applications for Payment.
 - 6. Distribution of Contract Documents.

7. Submittal of Shop Drawings, Product Data and Samples.
8. Preparation of record documents.
9. Use of the premises.
10. Office, Work and storage areas.
11. Equipment deliveries and priorities.
12. Safety procedures.
13. First aid.
14. Security.
15. Housekeeping.
16. Working hours.

1.4 PRE-INSTALLATION CONFERENCES

- A. Conduct a pre-installation conference at the site before each construction activity that requires coordination with other construction. The Installer and representatives of manufacturers and fabricators involved in or affected by the installation, and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise the Architect of scheduled meeting dates.

1. Review the progress of other construction activities and preparations for the particular activity under consideration at each pre-installation conference, including requirements for:
 - a. Contract Documents.
 - b. Options.
 - c. Related Change Orders.
 - d. Purchases
 - e. Deliveries.
 - f. Shop Drawings, Product Data and quality control Samples.
 - g. Possible conflicts.
 - h. Compatibility problems.
 - i. Time schedules.
 - j. Weather limitations.
 - k. Manufacturer's recommendations.
 - l. Compatibility of materials.
 - m. Acceptability of substrates.
 - n. Temporary facilities.
 - o. Space and access limitations.
 - p. Governing regulations.
 - q. Safety.
 - r. Inspection and testing requirements.
 - s. Required performance results.
 - t. Recording requirements.
 - u. Protection.

2. Record significant discussions and agreements and disagreements of each conference, along with the approved schedule. Distribute the record of the meeting to everyone concerned, promptly, including the Owner and Architect.
3. Do not proceed if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of Work and reconvene the conference at the earliest feasible date.

1.5 COORDINATION MEETINGS

- A. Conduct Project coordination meetings at regularly scheduled times convenient for all parties involved. Project coordination meetings are in addition to specific meetings held for other purposes, such as regular progress meetings and special pre-installation meetings.
- B. Request representation at each meeting by every party currently involved in coordination or planning for the construction activities involved.
- C. Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

1.6 PROGRESS MEETINGS

- A. Conduct progress meetings at the Project site at regularly scheduled intervals. Notify the Macomb County Facilities and Operations Department, Macomb County Jail personnel and Architect of scheduled meeting dates. Coordinate dates of meetings with preparation of the payment request. Note: Separate meetings for each building may be required.
- B. Attendees: In addition to representatives of the Macomb County Facilities and Operations Department, Macomb County Jail personnel and Architect, each subcontractor, supplier or other entity concerned with current progress or involved in planning, coordination or performance of future activities shall be represented at these meetings by persons familiar with the Project and authorized to conclude matters relating to progress.
- C. Agenda: Review and correct or approve minutes of the previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to the current status of the Project.

1. Contractor's Construction Schedule: Review progress since the last meeting. Determine where each activity is in relation to the Contractor's Construction Schedule, whether on time or ahead or behind schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 2. Review the present and future needs of each entity present, including such items as:
 - a. Interface requirements.
 - b. Time.
 - c. Sequences.
 - d. Deliveries.
 - e. Off-site fabrication problems.
 - f. Access.
 - g. Site utilization.
 - h. Temporary facilities and services.
 - i. Hours of Work.
 - j. Hazards and risks.
 - k. Housekeeping.
 - l. Quality and Work standards.
 - m. Change Orders.
 - n. Documentation of information for payment requests.
- D. Reporting: No later than (3) three days after each progress meeting date, distribute copies of minutes of the meeting to each party present and to other parties who should have been present. Include a brief summary, in narrative form, of progress since the previous meeting and report.
1. Schedule Updating: Revise the construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue the revised schedule concurrently with the report of each meeting.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01200



SUBSTITUTION REQUEST (During the Bidding Phase)

Project: Substitution Request Number: From: To: Date: Re: A/E Project Number: Contract For:

Specification Title: Description: Section: Page: Article/Paragraph:

Proposed Substitution: Manufacturer: Address: Phone: Trade Name: Model No.:

Attached data includes product description, specifications, drawings, photographs, and performance and test data adequate for evaluation of the request; applicable portions of the data are clearly identified.

Attached data also includes a description of changes to the Contract Documents that the proposed substitution will require for its proper installation.

The Undersigned certifies:

- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product. Same warranty will be furnished for proposed substitution as for specified product. Same maintenance service and source of replacement parts, as applicable, is available. Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule. Proposed substitution does not affect dimensions and functional clearances. Payment will be made for changes to building design, including A/E design, detailing, and construction costs caused by the substitution.

Submitted by: Signed by: Firm: Address: Telephone:

A/E's REVIEW AND ACTION

- Substitution approved - Make submittals in accordance with Specification Section 01340. Substitution approved as noted - Make submittals in accordance with Specification Section 01340. Substitution rejected - Use specified materials. Substitution Request received too late - Use specified materials.

Signed by: Date:

Supporting Data Attached: Drawings Product Data Samples Tests Reports

**SUBSTITUTION
REQUEST**
(After the Bidding/Negotiating Phase)

Project: _____ Substitution Request Number: _____

_____ From: _____

To: _____ Date: _____

_____ A/E Project Number: _____

Re: _____ Contract For: _____

Specification Title: _____ Description: _____

Section: _____ Page: _____ Article/Paragraph: _____

Proposed Substitution: _____

Manufacturer: _____ Phone: _____

Address: _____

Trade Name: _____ Model No.: _____

Installer: _____ Phone: _____

Address: _____

History: New Product 1-4 years old 5-10 years old More than 10 years old

Differences between proposed substitution and specified product: _____

Point-by-point comparative data attached.

Reason for not providing specified item: _____

Similar Installation:

Project: _____ Architect: _____

Address: _____ Owner: _____

_____ Date Installed: _____

Proposed Substitution affects other parts of work: No Yes; explain _____

Savings to Owner for accepting substitution: _____ (\$_____).

Proposed substitution changes Contract Time: No Yes [Add] [Deduct] _____ days.

Supporting Data Attached: Drawings Product Data Samples Tests

Reports _____

**SUBSTITUTION
REQUEST**
(After the Bidding/Negotiating Phase)

The Undersigned certifies:

- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.
 - Same warranty will be furnished for proposed substitution as for specified product.
 - Same maintenance service and source of replacement parts, as applicable, is available.
 - Proposed substitution will have no adverse effects on other trades and will not affect or delay progress schedule.
 - Cost data as stated above is complete. Claims for additional costs related to accepted substitution which may subsequently become apparent are to be waived.
 - Proposed substitution does not affect dimensions and functional clearances.
 - Payment will be made for changes to building design, including A/E design, detailing, and construction costs caused by the substitution.
 - Coordination, installation, and changes in the Work as necessary for accepted substitution will be complete in all respects.
-

Submitted by: _____

Signed by: _____

Firm: _____

Address: _____

Telephone: _____

Attachments: _____

A/E's Review Action

- Substitution approved – Make submittals in accordance with Specification Section 01340.
- Substitution approved as noted – Make submittals in accordance with Specification Section 01340.
- Substitution rejected – Use specified materials.
- Substitution Request received too late – Use specified materials.

Signed by: _____ Date: _____

Additional Comments: Contractor Subcontractor Supplier Manufacturer
 A/E Other

SECTION 01310 - CONSTRUCTION SCHEDULES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

- A. Attention is directed to Division 0, Bidding and Contract Requirements, and to other Sections of Division 1, General Requirements, which are hereby made a part of this Section.

1.02 DESCRIPTION OF REQUIREMENTS:

- A. General: This section specifies the particular administrative and procedural requirements for progress time scheduling and progress reporting for the performance of the work, as indicated in the General Conditions and elsewhere in the Contract Documents. Refer also to the General Conditions and to the "Contractor" for definition and specific dates of the Contract Time.
- B. Scheduling Responsibility: Submission of Contractor's progress schedule to the Owner or Architect shall not relieve the Contractor of his total responsibility for scheduling, sequencing and pursuing the work to comply with the requirements of the Contract Documents, including adverse effects such as delays resulting from ill-timed work; refer to General Conditions.

1.03 FORM OF SCHEDULES:

- A. Contractor shall prepare a "Plan of Operations and Progress Schedule" which shall show concisely the manner in which different phases of the work are to be started, methods and speed for the inter-relationship of the work under the various contracts, times upon which different phases of the work are to be started, methods and speed for progressing the different phases and dates upon which the certain subcontractors are dependent upon that under other subcontracts.
- B. The plan of operations and progress schedule shall be "weighed" to schedule each trade in proportion to the entire project, both physically and financially.
- C. In preparing the above plan of operations and progress schedule, the Contractor shall assure that the methods, dates and other pertinent matters are acceptable to the Architect and, when completed, he shall submit to and obtain approval from the Architect.

- D. After approval of the above plan of operations and progress schedule, the Contractor shall be responsible for seeing that it is adhered to and for ascertaining that proper coordination is maintained between work of all Contracts.

1.04 PROGRESS REVISIONS:

- A. Indicate progress of each activity to date of submission.
- B. Show changes occurring since previous submission of schedule:
 - 1. Major changes in scope.
 - 2. Activities modified since previous submission.
 - 3. Revised projections of progress and completion.
 - 4. Other identifiable changes.
- C. Provide a narrative report as needed to define:
 - 1. Problem areas, anticipated delays, and the impact on the schedule.
 - 2. Corrective action recommended and its effect.
 - 3. The effect of changes on schedules of other contractors.

1.05 SUBMISSIONS:

- A. Submit initial schedules within 14 days after award of Contract.
 - 1. Architect, Macomb County Facilities & Operations Department representatives and Macomb County Jail personnel will review schedules and return review copy within (10) ten days after receipt.
 - 2. Resubmit within (10) ten calendar days after return of review copy.
- B. Submit revised progress schedules and narratives with each application for payment.

1.06 DISTRIBUTION:

- A. Distribute copies of the reviewed schedules and narratives to:
 - 1. Job site file.
 - 2. Subcontractors.
 - 3. Other concerned parties.
- B. Instruct recipients to report promptly to the Contractor, in writing, any problems anticipated by the projections shown in the schedules.

1.07 DAILY REPORTS:

- A. Contractor shall prepare a daily report, recording the following information concerning events at the site and submit duplicate copies to the Architect and Owner at regular intervals not exceeding weekly intervals.
 - 1. List of subcontractors at the site.
 - 2. List of separate contractors at the site.
 - 3. Count of personnel at the site.
 - 4. High/low temperatures, general weather conditions.
 - 5. Accidents (refer to accident reports).
 - 6. Meetings and significant decisions.
 - 7. Unusual events.
 - 8. Stoppages, delays, shortages, losses.
 - 9. Emergency procedures, field orders.
 - 10. Orders/requests by governing authorities.
 - 11. Change orders received, implemented.

PART 2 and 3 - PRODUCTS AND EXECUTION - Not Applicable

END OF SECTION 01310

SECTION 01340 - SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

- A. Attention is directed to Division 0, Bidding and Contract Requirements, and to other Sections of Division 1, General Requirements, which are hereby made a part of this Section.

1.02 DESCRIPTION:

- A. Submit shop drawings, product data and samples as required by the Contract Documents. Individual submittal requirements are specified in applicable sections for each unit of work. Receive, check and coordinate all submittals of contractors as provided herein.

- B. Definitions:

- 1. Shop Drawings are drawings, diagrams, schedules and other data specifically prepared for the Work by the Contractor or any subcontractor, manufacturer, supplier or distributor to illustrate some portion of the Work.
- 2. Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams and other information furnished by the Contractor to illustrate a material, product or system for some portion of the Work.
- 3. Samples are physical examples which illustrate materials, equipment or workmanship and establish standards by which the work will be judged.

1.03 SUBMITTAL REQUIREMENTS:

- A. Coordinate preparation and processing of submittals with performance of the work so that work will not be delayed by submittals. Coordinate and sequence different categories of submittals for the same work, and for interfacing units of work, so that one will not be delayed for coordination with another. No extension of time will be allowed because of failure to properly coordinate and sequence submittals.
- B. Submit a PDF version of each shop drawing, including fabrication, erection, layout and setting drawings and such other drawings as required under various sections of the Specifications, until final acceptance is obtained. Prepare

drawings legible, drawing plans, elevations, sections and details in scales required and on drawing sheets not larger than 30" x 42" nor smaller than 8-1/2" x 11". Reproductions of contract documents are not an acceptable submittal. Submit copies of manufacturer's descriptive data including catalog sheets for materials, equipment and fixtures, showing dimensions, performance characteristics and capacities, wiring diagrams and controls, schedules, and other pertinent information as required. Where printed materials describe more than one product or model, clearly identify which is to be furnished.

- C. Shop drawings, product data and samples shall be dated including Contractor and Subcontractor dates of submittal and approval, and marked to show the names of the Project, Architect, Contractor, origination Subcontractor, manufacturer or supplier, and separate detailer if pertinent. Shop drawings shall completely identify Specification section and locations at which materials or equipment are to be installed. Reproductions of Contract Drawings are acceptable as Shop Drawings only when specifically authorized in writing by the Architect.
- D. Submission of shop drawings, product data and samples shall be accompanied by a copy of a transmittal letter containing Project name, Contractor's name, number of drawings, and samples, titles and other pertinent data. Transmittal shall bear signature of the Contractor as evidence he checked same and found them in conformance with the Contract Documents.
- E. The Contractor shall review, approve and submit, with reasonable promptness and in such sequence as to cause no delay in the Work or in the work of the Owner or any separate contractor, all Shop Drawings, Product Data and Samples required by the Contract Documents.
- F. By approving and submitting Shop Drawings, Product Data and Samples, the Contractor represents that he has determined and verified all materials, field measurements, and field construction criteria related thereto, or will do so, and that he has checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

- G. The Contractor shall not be relieved of responsibility for the deviation from the requirements of the Contract Documents by the Architect's acceptance of Shop Drawings, Product Data or Samples under Paragraph 13.12 of the AIA A201 General Conditions, 2017 edition unless the Contractor has specifically informed the Architect in writing of such deviation at the time of subdeviation. The Contractor shall not be relieved from responsibility for errors or omissions in the Shop Drawings, Product Data or Samples by the Architect's acceptance thereof.
- H. The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data or Samples, to revisions other than those requested by the Architect on previous submittals.
- I. No portion of the Work requiring submission of a Shop Drawing, Product Data or Sample shall be commenced until the submittal has been accepted by the Architect as provided in Paragraph 13.12 of the AIA A201 General Conditions 2017 edition. All such portions of the Work shall be in accordance with approved submittals.
- J. Architect/Engineer will review Shop Drawings, Product Data and Samples as provided in Paragraph 13.12 AIA A201 of the General Conditions 2017 edition. The Architect/Engineer will mark each such submittal as follows:
1. Accepted - Where no comment made.
 2. Accepted as Noted - Where comments indicated on submittal qualifying, modifying, or otherwise changing it; however, submittal can be used for ordering, fabrication and erection at contractor's own risk until revised submittals have been made, reviewed and stamped acceptable.
 3. Not Accepted - Submittal not in conformance; revise and resubmit. Acceptance does not authorize any changes in the Contract Documents unless specifically stated in a separate letter or change order.
- K. Contractor is responsible for obtaining and distributing required prints of shop drawings to his subcontractors and material suppliers; after as well as before final approval. Prints of reviewed shop drawings shall be made from transparencies which carry the Architect's appropriate stamp.

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L. Obtain copies of all shop drawings, product data and samples
submitted to date and accepted from other contractors.

PARTS 2 and 3 - PRODUCT AND EXECUTION

Not applicable.

END OF SECTION 01340

SECTION 01370 - SCHEDULE OF VALUES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

- A. Attention is directed to Division 0, Bidding and Contract Requirements, and to other Sections of Division 1, General Requirements, which are hereby made a part of this Section.

1.02 DESCRIPTION OF WORK:

- A. Submit to the Architect a Schedule of Values allocated to the various portions of the work, within (10) ten days after award of contract.
- B. Upon request of the Architect, support the values with data which will substantiate their correctness.
- C. The Schedule of Values, unless objected to by the Architect or Owner, shall be used only as the basis for the Contractor's Applications for Payment.

1.03 FORM AND CONTENT OF SCHEDULE OF VALUES:

- A. Use AIA Form G702.
- B. Schedule shall list the installed value of the component parts of the work in sufficient detail to serve as a basis for computing values for progress payments during construction.
- C. Follow the table of contents of Sections as the format for listing component items. Each building shall be listed separately.
 1. Identify each line item with the number and title of the respective major section of the specifications.
- D. For each major line item list sub-values of major products or operations under the item.
 1. Each item shall include a directly proportional amount of the Contractor's overhead and profit.
- E. The sum of all values listed in the schedules shall equal the total Contract Sum.

PARTS 2 AND 3 - PRODUCTS AND EXECUTION - Not Applicable

END OF SECTION 01370

SECTION 01400 - QUALITY CONTROL

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

- A. Attention is directed to Division 0, Bidding and Contract Requirements, and to Division 1, General Requirements, which are hereby made a part of this Section.

1.02 DESCRIPTION:

- A. Specific quality control requirements for the work are indicated throughout the contract documents. The term "Quality Control" includes, but is not necessarily limited to, inspection and testing and associated requirements. This section does not specify or modify Architect's duties relating to quality control and Contract enforcement.
- B. Coordinate quality control programs of separate contractors including submittals, conferences and on site programs.

1.03 RESPONSIBILITY:

- A. Residual Contractor Responsibility: Whatever required, inspection, testing and similar quality control provisions to be performed by independent agencies (not directly by the Contractor), and not indicated to be Owner's responsibility, shall be the Contractor's responsibility. The costs for those required services by independent testing laboratories are recognized to be included in Contract Sum.
- B. Contractor's General Responsibility: No failure of test agencies, whether engaged by Owner or Contractor, to perform adequate inspections or tests or to properly analyze or report results, shall relieve Contractor of responsibility for fulfillment of requirements of contract documents. It is recognized that required inspection and testing program is intended to assist the Contractor, Owner, Architect, and governing authorities in nominal determination of probable compliances with requirements for certain elements of work. The program is not intended to limit the Contractor's regular quality control program, as needed for general assurance of compliances.

1.04 QUALITY ASSURANCE:

- A. General Workmanship Standards: Comply with recognized workmanship quality standards within the industry as applicable to each unit of work, including ANSI standards where applicable. It is a requirement that each category of trades person or installer performing the work be prequalified, to the extent of being familiar with applicable and recognized quality standards for that category of work, and being capable of workmanship complying with those standards.
- B. Qualification of Quality Control Agencies: Except where another qualification standard is indicated, and except where it is specifically indicated that use of prime product manufacturer's test facilities is acceptable, engage independent testing laboratories complying with "Recommended Requirements for Independent Laboratory Qualifications" as published by American Council of Independent Laboratories, and specializing in type(s) of inspections and tests required.

1.05 SUBMITTALS:

- A. General: Refer to Section 01340, "Shop Drawings, Product Data and Samples" for requirements applicable to inspection and test reports, quality control samples, maintenance agreements, warranties, and similar documentation of quality compliances as required. Refer to individual work sections of Division 2 through 26 for specific certification and submittal requirements.
- B. Copies and Distribution: Where inspection and test reports and certifications are required by governing authorities, provide additional copies as required, and where required, send copies directly from inspection or testing agency to governing authority.

1.06 PRODUCT DELIVERY, STORAGE, AND HANDLING:

- A. General: Handle, store and protect materials and products, including fabricated components, by methods and means which will prevent damage, deterioration and losses including theft (and resulting delays), thereby ensuring highest quality results as performance of the work progresses. Control delivery schedules so as to minimize unnecessary long-term storage at project site prior to installation.

PART 2 - PRODUCTS

Not applicable.

PART 3 - EXECUTION:

3.01 PREPARATION FOR INSTALLATION:

A. Pre-Installation Conferences: Well in advance of installation of every major unit of work which requires coordination with other work, meet at the project site with installers and representatives of manufacturers and fabricators who are involved in or affected by the unit of work, and in its coordination or integration with other work which has proceeded or will follow. Advise Architect and Owner of scheduled meeting dates. At each meeting, review progress of other work and preparations for particular work under consideration, including requirements of contract documents, options, related change orders, purchases, deliveries, shop drawings, product data, quality control samples, possible conflicts, compatibility problems, time schedule, weather limitations, temporary facilities, space and access limitations, structural limitations, governing regulations, safety, inspection and testing requirements required performance results, recording requirements, and protection. Record significant discussions of each conference, and agreements and disagreements along with final plan of action. Distribute record of meeting promptly to everyone concerned, including Architect and Owner.

1. Do not proceed with the work if associated pre-installation conference cannot be concluded successfully. Instigate actions to resolve impediments to performance of the work, and reconvene conference at earliest date feasible.

B. Installer's Inspection of Conditions: Require Installer of each major unit of work to inspect substrate to receive the work, and conditions under which the work will be performed, and to report (in writing to Contractor) unsatisfactory conditions. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.

3.02 COORDINATION OF TEST AGENCY WORK:

A. Coordination with Owner's Agencies: Afford access and reasonable time in construction sequence for Owner's inspection and tests to be performed. Cooperate with agencies and provide incidental labor and services needed for the removal and delivery of test samples, and for

inspections and taking measurements. Provide patching and restoration services where test samples have been removed, complying with individual technical sections of Divisions 2 through 26.

1. Except for specialized laboratory sampling equipment, and except as otherwise indicated, supply and operate tools and construction equipment needed to obtain test samples from the work, including cutting devices for sawing, drilling, flame-cutting, coring and similar operations. Assist agencies in labeling and packing of test samples removed from the work.
- B. Coordination with Contractor's Independent Agencies: Except for required independent agency activities of inspection, measuring, testing, analyzing, reporting and similar activities, the assignment of labor, equipment, cutting, Patching and similar necessary activities associated therewith are Contractor's option recognizing that entire activity is Contractor's responsibility.

C. Test Agency Responsibilities:

1. Test agencies, regardless of whether engaged by Owner or Contractor, are not authorized to change or negate requirements of Contract Documents. Each agency shall coordinate its assigned work with construction schedule as maintained by Contractor, and shall perform its work promptly so as not to delay the work. Observances (by agencies) having a bearing on the work shall be reported to Architect in most expeditious way possible, and shall be recorded in writing by agency. Agency personnel shall not interfere with or assume duties of Contractor.
2. Reports: The testing agency shall prepare reports of inspections and laboratory tests, including analysis and interpretation of test results where applicable. Properly identify each report and, where required, provide agency's certification of test results. Describe test methods used, and compliance with recognized test standards (if any). Complete and submit report at earliest possible date in each case.

3.03 INSTALLATION QUALITY CONTROL:

- A. Manufacturer's Instructions: Where installations include manufactured products, comply with manufacturer's applicable instructions and recommendations for installation, to whatever extent these are more explicit or more stringent than applicable requirements indicate in contract documents.

- B. Inspect each item of materials or equipment, immediately prior to installation, and reject damaged and defective items.
- C. Provide attachment and connection devices and methods for securing work properly as it is installed; true to line and level, and within recognized industry tolerances, if not otherwise indicated. Allow for expansions and building movements. Provide uniform joint widths in exposed work, organized for best possible visual effect. Refer questionable visual effect choices to Architect for final decision.
- D. Recheck measurements and dimensions of the work, as an integral step of starting each installation.
- E. Install work during conditions of temperature, humidity, exposed, forecasted weather, and status of project completion which will ensure best possible results for each unit of work, in coordination with entire work. Isolate each unit of work from non-compatible work, as required to prevent deterioration.
- F. Coordinate enclosure (closing-in) of work with required inspections and tests, so as to avoid necessity of uncovering work for that purpose.
- G. Mounting Heights: Except as otherwise indicated, mount individual units of work at industry-recognized standard mounting heights, for applications indicated. Refer questionable mounting height choices to Architect for final decision.
- H. Adjust, clean, lubricate, restore, marred finished, and protect newly installed work, to ensure that it will remain without damage or deterioration during the remainder of construction period.

END OF SECTION 01400

SECTION 01500 - TEMPORARY FACILITIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division-1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section specifies requirements for temporary services and facilities, including utilities, construction and support facilities, security and protection.
- B. Temporary utilities required include but are not limited to:
 - 1. Not applicable.
- C. Temporary construction and support facilities required include but are not limited to:
 - 1. Waste disposal services.
 - 2. Construction aids and miscellaneous services and facilities.
- D. Security and protection facilities required include but are not limited to:
 - 1. Temporary fire protection.
 - 2. Barricades, warning signs, lights.
 - 3. Environmental protection.

1.3 SUBMITTALS

- A. Not Applicable.

1.4 QUALITY ASSURANCE

- A. Regulations: Comply with industry standards and applicable laws and regulations if authorities having jurisdiction, including but not limited to:
 - 1. Building Code requirements.
 - 2. Health and safety regulations.
 - 3. Police, Fire Department and Rescue Squad rules.
 - 4. Environmental protection regulations.

- B. Standards: Comply with NFPA Code 241, "Building Construction and Demolition Operations", ANSI-A10 Series standards for "Safety Requirements for Construction and Demolition", and NECA Electrical Design Library "Temporary Electrical Facilities."
1. Refer to "Guidelines for Bid Conditions for Temporary Job Utilities and Services", prepared jointly by AGC and ASC, for industry recommendations.
 2. Electrical Service: Comply with NEMA, NECA and UL standards and regulations for temporary electric service. Install service in compliance with National Electric Code (NFPA 70).
- C. Inspections: Arrange for authorities having jurisdiction to inspect and test each temporary utility before use. Obtain required certifications and permits.

1.5 PROJECT CONDITIONS

- A. Conditions of Use: Keep facilities clean and neat in appearance. Operate in a safe and efficient manner. Take necessary fire prevention measures. Do not overload facilities, or permit them to interfere with progress. Do not allow hazardous dangerous or unsanitary conditions, or public nuisances to develop or persist on the site.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Provide new materials; if acceptable to the Architect, undamaged previously used materials in serviceable condition may be used. Provide materials suitable for the use intended.
- B. Lumber and Plywood:
1. For safety barriers, and similar uses, provide minimum 5/8" thick fire retardant plywood.
- C. Water: Contractor may use Owners water service.

2.2 EQUIPMENT

- A. General: Provide new equipment; if acceptable to the Architect, undamaged, previously used equipment in serviceable condition may be used. Provide equipment suitable for use intended.

- B. Water Hoses: Provide 3/4" heavy-duty, abrasion-resistant, flexible rubber hoses 100 ft. long, with pressure rating greater than the maximum pressure of the water distribution system; provide adjustable shut-off nozzles at hose discharge.
- C. Electrical Outlets: Provide properly configured NEMA polarized outlets to prevent insertion of 110-120 volt plugs into higher voltage outlets. Provide receptacle outlets equipped with ground-fault circuit interrupters, reset button and pilot light, for connection of power tools and equipment.
- D. Electrical Power Cords: Provide grounded extension cords; use "hard-service" cords where exposed to abrasion and traffic. Provide waterproof connectors to connect separate lengths of electric cords, if single lengths will not reach areas where construction activities are in progress.
- E. Lamps and Light Fixtures: Provide general service incandescent lamps of wattage required for adequate illumination. Provide guard cages or tempered glass enclosures, where exposed to breakage. Provide exterior fixtures where exposed to moisture.
- F. Toilets: Contractor may use Owner's designated toilet facilities.
- G. First Aid Supplies: Comply with governing regulations.
- H. Fire Extinguishers: Provide hand-carried, portable UL-rated, class "A" fire extinguishers for temporary offices and similar spaces. In other locations provide hand-carried, portable, UL-rated, class "ABC" dry chemical extinguishers, or a combination of extinguishers of NFPA recommended classes for the exposures.
 - 1. Comply with NFPA 10 and 241 for classification, extinguishing agent and size required by location and class of fire exposure.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Use qualified personnel for installation of temporary facilities. Locate facilities where they will serve the Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required.

- B. Provide each facility ready for use when needed to avoid delay. Maintain and modify as required. Do not remove until facilities are no longer needed, or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY CONSTRUCTION AND SUPPORT FACILITIES INSTALLATION

- A. Collection and Disposal of Waste: Collect waste from construction areas and elsewhere daily. Comply with requirements of NFPA 241 for removal of combustible waste material and debris. Enforce requirements strictly. Do not hold materials more than 7 days during normal weather or 3 days when the temperature is expected to rise above 80 deg F (27 deg C). Handle hazardous, dangerous, or unsanitary waste materials separately from other waste by containerizing properly. Dispose of material in a lawful manner.

3.3 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Except for use of permanent fire protection as soon as available, do not change over from use of temporary security and protection facilities to permanent facilities until Substantial Completion, or longer as requested by the Architect.
- B. Temporary Fire Protection: Until fire protection needs are supplied by permanent facilities, install and maintain temporary fire protection facilities of the types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 10 "Standard for Portable Fire Extinguishers," and NFPA 241 "Standard for Safeguarding Construction, Alterations and Demolition Operations."
 - 1. Locate fire extinguishers where convenient and effective for their intended purpose, but not less than one extinguisher at each area of work.
 - 2. Store combustible materials in containers in fire-safe locations.
 - 3. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire protection facilities, stairways and other access routes for fighting fires. Prohibit smoking in hazardous fire exposure areas.
 - 4. Provide supervision of welding operations, combustion type temporary heating units, and similar sources of fire ignition.

- C. Permanent Fire Protection: At the earliest feasible date in each area of the Project, complete installation of the permanent fire protection facility, including connected services, and place into operation and use. Instruct key personnel on use of facilities.
- D. Barricades, Warning Signs and Lights: Comply with standards and code requirements for erection of structurally adequate barricades. Paint with appropriate colors, graphics and warning signs to inform personnel and the public of the hazard being protected against. Where appropriate and needed provide lighting, including flashing red or amber lights.
- E. Security Enclosure and Lockup: Install substantial temporary enclosure of partially completed areas of construction. Provide locking entrances to prevent unauthorized entrance, vandalism, theft and similar violations of security.
 - 1. Storage: Where materials and equipment must be stored, and are of value or attractive for theft, provide a secure lockup. Enforce discipline in connection with the installation and release of material to minimize the opportunity for theft and vandalism.
- F. Environmental Protection: Provide protection, operate temporary facilities and conduct construction in ways and by methods that comply with environmental regulations, and minimize the possibility that air, waterways and subsoil might be contaminated or polluted, or that other undesirable effects might result. Avoid use of tools and equipment which produce harmful noise. Restrict use of noise making tools and equipment to hours that will minimize complaints from persons or firms near the site.

3.4 OPERATION, TERMINATION AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. Limit availability of temporary facilities to essential and intended uses to minimize waste and abuse.
- B. Maintenance: Maintain facilities in good operating condition until removal. Protect from damage by freezing temperatures and similar elements.
 - 1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation and similar facilities on a 24-hour day basis where required to achieve indicated results and to avoid possibility of damage.

2. Protection: Prevent water filled piping from freezing. Maintain markers for underground lines. Protect from damage during excavation operations.
- C. Termination and Removal: Unless the Architect requests that it be maintained longer, remove each temporary facility when the need has ended, or when replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with the temporary facility. Repair damaged Work, clean exposed surfaces and replace construction that cannot be satisfactorily repaired.
1. Materials and facilities that constitute temporary facilities are property of the Contractor. The Owner reserves the right to take possession of Project identification signs.
 2. At Substantial Completion, clean and renovate permanent facilities that have been used during the construction period, including but not limited to:
 - a. Replace air filters and clean inside of ductwork and housings.

END OF SECTION 01500

SECTION 01600 - MATERIAL AND EQUIPMENT

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

- A. Attention is directed to Division 0, Bidding and Contract Requirements, and to Division 1, General Requirements, which are hereby made a part of this Section.

1.02 DESCRIPTION:

- A. Material and equipment incorporated into the work:
 - 1. Conform to applicable specifications and standards.
 - 2. Comply with size, make, type and quality specified, or as specifically approved in writing by the Architect.
 - 3. Manufactured and Fabricated Products:
 - a. Design, fabricate and assemble in accord with the best engineering and shop practices.
 - b. Manufacture like parts of duplicate units to standard sizes and gages, to be interchangeable.
 - c. (2) Two or more items of the same kind shall be identical, by the same manufacturer.
 - d. Products shall be suitable for service conditions.
 - e. Equipment capacities, sizes and dimensions shown or specified shall be adhered to unless variations are specifically approved in writing.
 - 4. Do not use material or equipment for any purpose other than that for which it is designed or is specified.

1.03 MANUFACTURER'S INSTRUCTIONS:

- A. When Contract Documents require that installation of work shall comply with manufacturer's printed instructions, obtain and distribute copies of such, including three copies to Architect.
 - 1. Maintain (1) one set of complete instructions at the job site during installation and until completion.

- B. Handle, install, connect, clean, condition and adjust products in strict accord with such instructions and in conformity with specified requirements.
 - 1. Should job conditions or specified requirements conflict with manufacturer's instructions, consult with Architect for further instructions.
 - 2. Do not proceed with work without clear instructions.
- C. Perform work in accord with manufacturer's instructions. Do not omit preparatory step or installation procedure unless specifically modified or exempted by contract documents.

1.04 TRANSPORTATION AND HANDLING:

- A. Arrange deliveries of products in accord with construction schedules, coordinate to avoid conflict with work and conditions at the site.
 - 1. Immediately on delivery, inspect shipments to assure compliance with requirements of contract documents and approved submittals, and that products are properly protected and undamaged.
- B. Provide equipment and personnel to handle products by methods to prevent soiling or damage to products or packaging.

1.05 STORAGE AND PROTECTION:

- A. Store products in accord with manufacturer's instructions, with seals and labels intact and legible.
 - 1. Store products subject to damage by the elements in weathertight enclosures.
 - 2. Maintain temperature and humidity within the ranges required by manufacturer's instructions.

B. EXTERIOR STORAGE:

- 1. Store fabricated products above the ground, on blocking or skids, prevent soiling or staining. Cover products which are subject to deterioration with impervious sheet coverings, provide adequate ventilation to avoid condensation.

2. Store loose granular materials in a well-drained area on solid surfaces to prevent mixing with foreign matter.

C. Arrange storage in a manner to provide easy access for inspection. Make periodic inspections of stored products to assure that products are maintained under specified conditions, and free from damage or deterioration.

D. Preparation After Installation:

1. Provide substantial coverings as necessary to protect installed products from damage from traffic and subsequent construction operations. Remove when no longer needed.

1.06 SUBSTITUTIONS AND PRODUCT OPTIONS:

A. Products List:

1. Within (14) fourteen calendar days after contract date, submit to Architect a complete list of major products proposed to be used, with the name of the manufacturer and the installing subcontractor. Comply with provisions for Contractor's Options and Substitutions.

B. Contractor's Options:

1. For products specified only by reference standard, select any product meeting that standard.

2. For products specified by naming several products or manufacturers, select any one of the products or manufacturers named, which complies with the specifications.

3. For products specified by naming one or more products or manufacturers and "or equal," Contractor must submit a request as for substitutions for any product or manufacturer not specifically named.

a. Submit Form contained in Spec Section 01251 for Substitutes During Bidding or Form Contained in Spec Section 01252 For Substitute After Bidding/Negotiation.

4. For products specified by naming only one product and manufacturer, there is no option.

C. Substitutions:

1. For a period of (14) fourteen calendar days after contract date, Architect will consider written requests from Contractor for substitution of products.
2. Submit a separate request for each product, supported with complete data, with drawings and samples as appropriate, including:
 - a. Comparison of the qualities of the proposed substitution with that specified.
 - b. Changes required in other elements of the work because of the substitution.
 - c. Effect on the construction schedule.
 - d. Cost data comparing the proposed substitution with the product specified.
 - e. Any required license fees or royalties.
 - f. Availability of maintenance service, and source of replacement materials.
3. Architect shall be the judge of the acceptability of the proposed substitution except where a change in cost is involved.

D. Contractor's Representation:

1. A request for a substitution constitutes a representation that Contractor:
 - a. Has investigated the proposed product and determined that it is equal to or superior in all respects to that specified.
 - b. Will provide the same warranties or bonds for the substitution as for the product specified.
 - c. Will coordinate the installation of an accepted substitution into the work, and meet such other changes as may be required to make the work complete in all respects.
 - d. Waives all claims for additional costs, under his responsibility which may subsequently become apparent.

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E. Architect will review requests for substitutions with reasonable promptness, and notify the Contractor, in writing, of the decision to accept or reject the requested substitution.

PARTS 2 AND 3 PRODUCTS AND EXECUTION

Not applicable.

END OF SECTION 01600

SECTION 01700 - PROJECT CLOSEOUT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements for project closeout, including but not limited to:
 - 1. Inspection procedures.
 - 2. Project record document submittal.
 - 3. Operating and maintenance manual submittal.
 - 4. Submittal of warranties.
 - 5. Final cleaning.
- B. Closeout requirements for specific construction activities are included in the appropriate Sections in Divisions-2 through 26.

1.3 SUBSTANTIAL COMPLETION

- A. Preliminary Procedures: Before requesting inspection for certification of Substantial Completion, complete the following. List exceptions in the request.
 - 1. In the Application for Payment that coincides with, or first follows, the date Substantial Completion is claimed, show 100 percent completion for the portion of the Work claimed as substantially complete. Include supporting documentation for completion as indicated in these Contract Documents and a statement showing an accounting of changes to the Contract Sum.
 - a. If 100 percent completion cannot be shown, include a list of incomplete items, the value of incomplete construction, and reasons the Work is not complete.
 - 2. Advise Owner of pending insurance change-over requirements.
 - 3. Submit specific warranties, workmanship bonds, maintenance agreements, final certifications and similar documents.

4. Obtain and submit releases enabling the Owner unrestricted use of the Work and access to services and utilities; include occupancy permits, operating certificates and similar releases.
5. Complete final clean up requirements, including touch-up painting. Touch-up and otherwise repair and restore marred exposed finishes.

B. Inspection Procedures: On receipt of a request for inspection, the Architect will either proceed with inspection or advise the Contractor of unfilled requirements. The Architect will prepare the Certificate of Substantial Completion following inspection, or advise the Contractor of construction that must be completed or corrected before the certificate will be issued.

1. The Architect will repeat inspection when requested and assured that the Work has been substantially completed.
2. Results of the completed inspection will form the basis of requirements for final acceptance.

1.4 FINAL ACCEPTANCE

A. Preliminary Procedures: Before requesting final inspection for certification of final acceptance and final payment, complete the following. List exceptions in the request.

1. Submit the final payment request with releases and supporting documentation not previously submitted and accepted. Include certificates of insurance for products and completed operations where required.
2. Submit an updated final statement, accounting for final additional changes to the Contract Sum.
3. Submit a certified copy of the Architect's final inspection list of items to be completed or corrected, stating that each item has been completed or otherwise resolved for acceptance, and the list has been endorsed and dated by the Architect.
4. Submit consent of surety to final payment.
5. Submit evidence of final, continuing insurance coverage complying with insurance requirements.

B. Reinspection Procedure: The Architect will reinspect the Work upon receipt of notice that the Work, including inspection list items from earlier inspections, has been completed, except items whose completion has been delayed because of circumstances acceptable to the Architect.

1. Upon completion of reinspection, the Architect will prepare a certificate of final acceptance, or advise the Contractor of Work that is incomplete or of obligations that have not been fulfilled but are required for final acceptance.
2. If necessary, upon authorization of the Owner, reinspection will be repeated.
NOTE: Contractor will be responsible to the Owner for additional fees to pay for Architects services if multiple inspections are required to review incomplete punch list items and/or close punch list items out.

1.5 RECORD DOCUMENT SUBMITTALS

- A. General: Do not use record documents for construction purposes; protect from deterioration and loss in a secure, fire-resistive location; provide access to record documents for the Architect's reference during normal working hours.
- B. Record Drawings: Maintain a clean, undamaged set of blue or black line white-prints of Contract Drawings and Shop Drawings. Mark the set to show the actual installation where the installation varies substantially from the Work as originally shown. Mark whichever drawing is most capable of showing conditions fully and accurately; where Shop Drawings are used, record a cross-reference at the corresponding location on the Contract Drawings. Give particular attention to concealed elements that would be difficult to measure and record at a later date.
 1. Mark record sets in red or other colors (other than black) to distinguish between variations in separate categories of the Work.
 2. Mark new information that is important to the Owner, but was not shown on Contract Drawings or Shop Drawings.
 3. Note related Change Order numbers where applicable.
 4. Organize record drawing sheets into manageable sets, bind with durable paper cover sheets, and print suitable titles, dates and other identification on the cover of each set.
- C. Record Specifications: Maintain (1) one complete copy of the Project Manual, including addenda, and (1) one copy of other written construction documents such as Change Orders and modifications issued in printed form during construction. Mark these documents to show substantial variations in actual Work performed in comparison with the text of the Specifications and modifications. Give particular attention to substitutions, selection of options

and similar information on elements that are concealed or cannot otherwise be readily discerned later by direct observation. Note related record drawing information and Product Data.

1. Upon completion of the Work, submit record Specifications to the Architect for the Owner's records.
- D. Record Product Data: Maintain one copy of each Product Data submittal. Mark these documents to show significant variations in actual Work performed in comparison with information submitted. Include variations in products delivered to the site, and from the manufacturer's installation instructions and recommendations. Give particular attention to concealed products and portions of the Work which cannot otherwise be readily discerned later by direct observation. Note related Change Orders and mark-up of record drawings and Specifications.
1. Upon completion of mark-up, submit complete set of record Product Data to the Architect for the Owner's records.
- E. Record Sample Submitted: Immediately prior to the date or dates of Substantial Completion, the Contractor will meet at the site with the Architect and the Owner's personnel to determine which of the submitted Samples that have been maintained during progress of the Work are to be transmitted to the Owner for record purposes. Comply with delivery to the Owner's Sample storage area.
- F. Miscellaneous Record Submittals: Refer to other Specification Sections for requirements of miscellaneous record-keeping and submittals in connection with actual performance of the Work. Immediately prior to the date or dates of Substantial Completion, complete miscellaneous records and place in good order, properly identified and bound or filed, ready for continued use and reference. Submit to the Architect for the Owner's records.
- G. Maintenance Manuals: Organize operating and maintenance data into suitable sets of manageable size. Bind properly indexed data in individual heavy-duty 2-inch, 3-ring vinyl-covered binders, with pocket folders for folded sheet information. Mark appropriate identification on front and spine of each binder. Include the following types of information:

1. Emergency instructions.
2. Spare parts list.
3. Copies of warranties.
4. Wiring diagrams.
5. Recommended "turn around" cycles.
6. Inspection procedures.
7. Shop Drawings and Product Data.
8. Fixture lamping schedule.

- H. Submit (2) hard copies and one thumb drive with PDF electronic files of marked-up and final documents to Architect/Engineer with claim for final Application for Payment.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 CLOSEOUT PROCEDURES

- A. Operating and Maintenance Instructions: Arrange for each installer of equipment that requires regular maintenance to meet with the Owner's personnel to provide instruction in proper operation and maintenance. If installers are not experienced in procedures, provide instruction by manufacturer's representatives. Include a detailed review of the following items:
1. Maintenance manuals.
 2. Record documents.
 3. Spare parts and materials.
 4. Tools.
 5. Identification systems.
 6. Control sequences.
 7. Hazards.
 8. Cleaning.
 9. Warranties and bonds.
 10. Maintenance agreements and similar continuing commitments.
- B. As part of instruction for operating equipment, demonstrate the following procedures:
1. Safety procedures.
 2. Economy and efficiency adjustments.
 3. Effective energy utilization.

3.2 FINAL CLEANING

- A. General: General cleaning during construction is required by the General Conditions and included in Section 01300 "Temporary Facilities" and as required under applicable Specification Sections (Division 2 thru 26).
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to the condition expected in a normal, commercial building cleaning and maintenance program. Comply with manufacturer's instructions.
 - a. Remove labels that are not permanent labels.
 - b. Clean transparent materials, including glass in doors and windows. Remove glazing compound and other substances that are noticeable vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials.
 - c. Clean exposed exterior and interior hard-surfaced finishes to a dust-free condition, free of stains, films and similar foreign substances. Restore reflective surfaces to their original reflective condition. Leave concrete floors broom clean. Vacuum carpeted surfaces.
 - d. Wipe surfaces of mechanical and electrical equipment. Remove excess lubrication and other substances. Clean plumbing fixtures to a sanitary condition. Clean light fixtures and lamps.
 - e. Clean the site, including landscape development areas, of rubbish, litter and other foreign substances. Sweep paved areas broom clean; remove stains, spills and other foreign deposits. Rake grounds that are neither paved nor planted, to a smooth even-textured surface.
- C. Pest Control: Engage an experienced exterminator to make a final inspection, and rid the Project of rodents, insects and other pests.
- D. Removal of Protection: Remove temporary protection and facilities installed for protection of the Work during construction.

- E. Compliance: Comply with regulations of authorities having jurisdiction and safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on the Owner's property. Do not discharge volatile, harmful or dangerous materials into drainage systems. Remove waste materials from the site and dispose of in a lawful manner.
 - 1. Where extra materials of value remaining after completion of associated Work have become the Owner's property, arrange for disposition of these materials as directed.

END OF SECTION 01700

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SECTION 01800 - GUARANTEE - WARRANTY

PART ONE - GENERAL

1.01 GUARANTEE PERIOD

- A. The General Contractor shall and hereby does guarantee and warrant that all work for the buildings, under this Contract, shall be free from defects or faulty labor and/or materials for a period of **two (2) years** from the date of Final Acceptance of same, except when longer periods are herein specified, which develop within any guarantee periods.

1.02 FINAL PAYMENT

- A. Final payment is contingent upon the owner's receipt of such guarantees and/or warranties from the Construction Manager.

END OF SECTION 01800

SECTION 02070 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section requires the selective removal and subsequent offsite disposal of the following:
 - 1. Portions of existing building indicated on drawings and as required to accommodate new construction.
 - 2. Removal of interior partitions as indicated on drawings.
 - 3. Removal of doors and frames indicated "remove."
 - 4. Removal and protection of existing fixtures, materials, and equipment items indicated "salvage."
 - 5. Removal of existing electrical items as indicated on the drawings.
- B. Removal work specified elsewhere:
 - 1. Cutting nonstructural concrete floors and masonry walls for piping, ducts, and conduits is included with the work of the respective mechanical and electrical specification sections in Divisions 15 and 16.
- C. Related work specified elsewhere:
 - 1. Remodeling construction work and patching are included within the respective sections of specifications, including removal of materials for reuse and incorporation into remodeling or new construction.
 - 2. Installation of pipes, conduits, ducts, and other mechanical and electrical work is specified in other Divisions and/or Drawings.

1.3 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Schedule indicating proposed sequence of operations for selective demolition work to the Owner's Representative for review prior to start of work. Include coordination for shutoff, capping, and continuation of utility services as required, together with details for dust and noise control protection.
- C. Photographs of existing conditions of structure surfaces, equipment, and adjacent improvements that might be misconstrued as damage related to removal operations. File with Owner's Representative prior to start of work.

1.4 JOB CONDITIONS

- A. Occupancy: Owner will occupy portions of the building immediately adjacent to areas of selective demolition. Conduct selective demolition work in manner that will minimize need for disruption of Owner's normal operations. Provide minimum of (72) hours advance notice to Owner of demolition activities that will affect Owner's normal operations.
- B. Condition of Structures: Owner assumes no responsibility for actual condition of items or structures to be demolished.
 - 1. Conditions existing at time of inspection for bidding purposes will be maintained by Owner insofar as practicable. However, minor variations within structure may occur by Owner's removal and salvage operations prior to start of selective demolition work.
- C. Partial Demolition and Removal: Items indicated to be removed but of salvageable value to the Contractor may be removed from structure as work progresses. Transport salvaged items from site as they are removed.
 - 1. Storage or sale of removed items on site will not be permitted.
- D. Protections: Provide temporary barricades and other forms of protection to protect Owner's personnel, inmates and general public from injury due to selective demolition work.

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1. Provide protective measures as required to provide free and safe passage of Owner's personnel, inmates and general public to occupied portions of building.
 2. Provide interior and exterior shoring, bracing, or support to prevent movement, settlement, or collapse of structure or element to be demolished and adjacent facilities or work to remain.
 3. Protect from damage existing finish work that is to remain in place and becomes exposed during demolition operations.
 4. Protect floors with suitable coverings when necessary.
 5. Construct temporary insulated one hour fire rated dustproof partitions where required to separate areas where noisy or extensive dirt or dust operations are performed. Equip partitions with dustproof doors and security locks.
 6. Provide temporary weather protection during interval between demolition and removal of existing construction on exterior surfaces and installation of new construction to ensure that no water leakage or damage occurs to structure or interior areas of existing building.
 7. Remove protections at completion of work.
- E. Damages: Promptly repair damages caused to adjacent facilities by demolition work.
- F. Traffic: Conduct selective demolition operations and debris removal to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities.
1. Do not close, block, or otherwise obstruct streets, walks, or other occupied or used facilities without written permission from authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.
- G. Flame Cutting: Do not use cutting torches for removal until work area is cleared of flammable materials. At concealed spaces, such as interior of ducts and pipe spaces, verify condition of hidden space before starting flame-cutting operations. Maintain portable fire suppression devices during flame-cutting operations.

- H. Utility Services: Maintain existing utilities indicated to remain in service and protect them against damage during demolition operations.
1. Do not interrupt utilities serving occupied or used facilities, except when authorized in writing by authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, as acceptable to governing authorities.
 2. Maintain fire protection services during selective demolition operations.
- I. Environmental Controls: Use water sprinkling, temporary enclosures, and other methods to limit dust and dirt migration. Comply with governing regulations pertaining to environmental protection.
1. Do not use water when it may create hazardous or objectionable conditions such as ice, flooding, and pollution.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 PREPARATION

- A. General: Provide interior and exterior shoring, bracing, or support to prevent movement, settlement, or collapse of areas to be demolished and adjacent facilities to remain.
1. Cease operations and notify Owner's Representative immediately if safety of structure appears to be endangered. Take precautions to support structure until determination is made for continuing operations.
 2. Cover and protect furniture, equipment, and fixtures from soilage or damage when demolition work is performed in areas where such items have not been removed.
 3. Erect and maintain dust-proof partitions and closures as required to prevent spread of dust or fumes to occupied portions of the building.
 - a. Where selective demolition occurs immediately adjacent to occupied portions of the building, construct minimum one-hour dust-proof partitions of minimum 4-inch studs, 5/8-inch type 'x' drywall

(joints taped) on occupied side, 1/2-inch fire-retardant plywood on demolition side. Fill partition cavity with sound-deadening insulation.

- b. Provide weatherproof closures for exterior openings resulting from demolition work.
4. Locate, identify, stub off, and disconnect utility services that are not indicated to remain.
 - a. Provide bypass connections as necessary to maintain continuity of service to occupied areas of building. Provide minimum of (72) hours advance notice to Owner if shutdown of service is necessary during changeover.

3.2 DEMOLITION

- A. General: Perform selective demolition work in a systematic manner. Use such methods as required to complete work indicated on Drawings in accordance with demolition schedule and governing regulations.
 1. Demolish concrete and masonry in small sections. Cut concrete and masonry at junctures with construction to remain using power-driven masonry saw or hand tools; do not use power-driven impact tools.
 2. Locate demolition equipment throughout structure and promptly remove debris to avoid imposing excessive loads on supporting walls, floors, or framing.
 3. Provide services for effective air and water pollution controls as required by local authorities having jurisdiction.
 4. For interior slabs on grade, use removal methods that will not crack or structurally disturb adjacent slabs or partitions. Use power saw where possible.
- B. If unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure both nature and extent of the conflict. Submit report to Owner's Representative in written, accurate detail. Pending receipt of directive from Owner's Representative, rearrange selective demolition schedule as necessary to continue overall job progress without undue delay.

3.3 SALVAGED MATERIALS

- A. Salvaged Items: Where indicated on Drawings as "Salvage - Deliver to Owner," carefully remove indicated items, clean, store, and turn over to Owner and obtain receipt.
 - 1. Historic artifacts, including cornerstones and their contents, commemorative plaques and tablets, antiques, and other articles of historic significance, remain property of Owner. Notify Owner's Representative if such items are encountered and obtain acceptance regarding method of removal and salvage for Owner.

3.4 DISPOSAL OF DEMOLISHED MATERIALS

- A. Remove from building site debris, rubbish, and other materials resulting from demolition operations. Transport and legally dispose off site.
 - 1. If hazardous materials are encountered during demolition operations, comply with applicable regulations, laws, and ordinances concerning removal, handling, and protection against exposure or environmental pollution.
 - 2. Burning of removed materials is not permitted on project site.

3.5 CLEANUP AND REPAIR

- A. General: Upon completion of demolition work, remove tools, equipment, and demolished materials from site. Remove protections and leave interior areas broom clean.
 - 1. Repair demolition performed in excess of that required. Return elements of construction and surfaces to remain to condition existing prior to start operations. Repair adjacent construction or surfaces soiled or damaged by selective demolition work.

END OF SECTION 02070

SECTION 02925 - CLEANUP AND RESTORATION

PART 1 - GENERAL

- A. The Contractor shall restore areas disturbed by construction activities to a condition reasonably close to their condition before the project, unless shown otherwise on the plans. Restoration work should be performed as soon as possible after construction work is completed in a particular area.
- B. Upon the completion of work in an area, all excess materials, debris, equipment, and similar items shall be removed from the project area by the Contractor, and disposed of properly.

PART 2 - MATERIALS

Not Applicable.

PART 3 - EXECUTION

3.01 Restoration

- A. Unless otherwise provided; aggregate surfaces, bituminous pavements, and concrete pavements shall be restored by construction of similar replacement surfaces. Bituminous pavement shall be replaced with min. 3" (1.5 wearing course 1100T-20AA 1.5 binder course 1100L-20AA with MDOT SS-IN tack coat) with 8" min. 21AA aggregate base cross section(s) or cross section(s) and base to match existing conditions - the greater of the two. Concrete pavement shall be replaced with min. 6" concrete pavement in accordance with the specification for Concrete.
- B. Turf areas shall be restored by re-establishing the turf as described in the specification for turf establishment. All areas disturbed by construction that are not to be surfaced with aggregate or pavement shall be restored with turf, unless otherwise directed.

- C. Mailboxes, fences, signs, ornaments, and similar items shall be replaced at the completion of construction. Posts shall be installed plumb. Items that are lost or stolen shall be repaired or replaced at the Contractor's expense. Repairs or replacements shall meet the Owner's approval.

3.02 Temporary Restoration of Driving Surfaces

- A. Where a pavement or gravel surface is removed as a result of construction activities, a temporary surface shall be provided and maintained by the Contractor until the permanent surface is provided. Unless otherwise directed, the temporary surface shall be twelve inches of aggregate compacted to at least 95 percent of its maximum density (ASTM D1557) and graded to meet the adjacent, remaining surfaces. Aggregate shall meet the requirements of Series 23A as described in the 2022 Michigan Department of Transportation Specifications.
- B. The Contractor shall regrade the temporary surface and add additional aggregate at intervals necessary to maintain them in a relatively smooth condition.

END OF SECTION 02925

SECTION 03300 - BONDING AGENTS FOR CONCRETE

PART 1. GENERAL

1.01 SUMMARY

- A. This specification describes the use of a bonding bridge between new portland-cement mortar or concrete and hardened portland-cement mortar or concrete.

1.02 QUALITY ASSURANCE

- A. Manufacturing qualifications: The manufacturer of the specified product shall have in existence a recognized quality assurance program and be ISO 9001 Certified, a program of training, certifying and technically supporting a nationally-organized Approved Contractor Program with a re-certification program of its participants for a minimum of 5 years.
- B. Contractor qualifications: Contractor shall be an Approved Contractor of the manufacturer of the specified product, who has completed a program of instruction in the use of the specified coating material, and provides a certification from the manufacturer attesting to its Approved Contractor status.
- C. Install materials in accordance with all safety and weather conditions required by manufacturer, or as modified by applicable rules and regulations of local, state and federal authorities having jurisdiction. Consult Material Safety Data Sheets for complete handling recommendations.

1.03 DELIVERY, STORAGE AND HANDLING

- A. All materials must be delivered in original, unopened containers with the manufacturer's name, labels, product identification, and batch numbers. Damaged material must be removed from the site immediately.
- B. Store all materials off the ground and protect from rain, freezing or excessive heat until ready for use.
- C. Condition the specified product as recommended by the manufacturer.

1.04 JOB CONDITIONS

- A. Environmental Conditions: Do not apply material if it is raining or snowing or if such conditions appear to be imminent. Minimum application temperature 40°F (5°C) and rising.

- B. Protection: Precautions should be taken to avoid damage to any surface near the work zone due to mixing and handling of the specified coating.

1.05 SUBMITTALS

- A. Submit PDF copy of manufacturer's literature, to include: Product Data Sheet, System Data Sheet, Application Guide, and appropriate Material Safety Data Sheets (MSDS).
- B. Submit copy of Certificate of Approved Contractor status by manufacturer.

1.06 WARRANTY

- A. Provide a written warranty from the manufacturer against defects of materials for a period of (5) five years, beginning with date of substantial completion of the project.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Sika Armatec 110 EpoCem, as manufactured by Sika Corporation, 201 Polito Avenue, Lyndhurst, NJ 07071 is considered to conform to the requirements of this specification.

2.02 MATERIALS

- A. Epoxy resin/portland cement adhesive shall be Sika Armatec 110 EpoCem.
 - 1. Component "A" shall be an epoxy resin/water emulsion containing suitable viscosity control agents. It shall not contain butyl glycidyl ether.
 - 2. Component "B" shall be primarily a water solution of a polyamine.
 - 3. Component "C" shall be a blend of selected portland cements and sands.
 - 4. The material shall not contain asbestos.

2.03 PERFORMANCE CRITERIA

- A. Properties of the mixed epoxy resin/portland cement adhesive.
 - 1. Pot Life: 90 minutes @ 73°F.
 - 2. Contact Time:
 - 95°F (35°C) 6 hours
 - 68°F (20°C) 12 hours
 - 50°F (10°C) 16 hours
 - 40°F (5°C) 24 hours
 - 3. Color: Dark gray

- B. Properties of the cured epoxy resin/portland cement adhesive.
1. Compressive Strength (ASTM C-109)
 - a. 3 day: 4500 psi (31.0 MPa)
 - b. 7 day: 6500 psi (44.8 MPa)
 - c. 28 day: 8500 psi (58.6 MPa)
 2. Splitting Tensile Strength (ASTM C-496)
 - a. 28 days: 600 psi (4.1 MPa)
 3. Flexural Strength (ASTM C-348)
 - a. 1250 psi (8.6 MPa)
 4. Bond Strength ASTM C-882 at 14 days
 - a. Wet on Wet, 0-hr. open time: 2800 psi (19.3 MPa)
 - b. 24-hr. open time: 2600 psi (17.9 MPa)
 5. Bond of Steel Reinforcement to Concrete (Pullout Test)
 - a. Sika Armathec 110 coated: 625 psi (4.3 MPa)
 - b. Epoxy coated: 508 psi (3.5 MPa)
 - c. Plain Reinforcement: 573 psi (3.95 MPa)
 6. The epoxy resin/portland cement adhesive shall not produce a vapor barrier.
 7. Material must be proven to prevent corrosion of reinforcing steel when tested under the procedures as set forth by the Federal Highway Administration Program Report No. FHWA/RD86/193. Proof shall be in the form of an independent testing laboratory corrosion report showing prevention of corrosion of the reinforcing steel.

Note: Tests above were performed with material and curing conditions at 73°F and 45-55% relative humidity.

PART 3 - EXECUTION

3.01 MIXING AND APPLICATION

- A. Mixing the epoxy resin: Shake contents of Components "A" and Component "B". Completely empty both components into a clean, dry mixing pail. Mix thoroughly for 30 seconds using a jiffy paddle with a low-speed (400-600 rpm) drill. Slowly add the entire contents of Component "C" while continuing to mix for 3 minutes until uniform with no lumps. Mix only that quantity that can be applied within its pot life.

- B. Placement procedure for Bonding bridge:
 - 1. Apply to prepared surface with a stiff-bristle brush, broom or "hopper-type" spray equipment.
 - a. For hand-applied mortars-Place fresh, plastic concrete/mortar while the bonding bridge adhesive is "wet" or within open times indicated in section 2.03.A.2.
 - b. For machine-applied mortars-Apply while the bonding bridge adhesive is "wet" or within the open times indicated in section 2.03.A.2.
- C. Placement procedures for anti-corrosion coating:
 - 1. Apply to prepared steel surface with a stiff-bristle brush, or "hopper type" spray equipment at 20 mils minimum thickness. Properly coat the underside of the totally exposed steel. Allow to dry (approx 2-3 hours) then apply a second coat at 20 mils minimum thickness. Allow drying again before placing repair mortar.

*During the anti-corrosion coating method, after applying the second coat Sika Armatec 110 EpoCem, a mortar can be applied to "wet" Sika Armatec 110 EpoCem or within open times indicated in section 2.03.A.2 to achieve the benefit of bonding bridge.

- D. Adhere to all limitations and cautions for the epoxy resin/portland cement adhesive in the manufacturer's current printed literature.

3.02 CLEANING

- A. The uncured epoxy resin/portland cement adhesive can be cleaned from tools with water. The cured epoxy resin/portland cement adhesive can only be removed mechanically.
- B. Leave finished work and work area in a neat, clean condition without evidence of spillovers onto adjacent areas.

END OF SECTION 03300

SECTION 03730 - CONCRETE REHABILITATION

PART 1. GENERAL

1.01 SUMMARY

- A. This specification describes the patching or overlay of overhead, vertical and horizontal surfaces with a polymer-modified, portland cement mortar/cement.

1.02 QUALITY ASSURANCE

- A. Manufacturing qualifications: The manufacturer of the specified product shall be ISO 9001 certified and have in existence a recognized ongoing quality assurance program independently audited on a regular basis.
- B. Contractor qualifications: Contractor shall be qualified in the field of concrete repair and protection with a successful track record of 5 years or more. Contractor shall maintain qualified personnel who have received product training by a manufacturer's representative.
- C. Install materials in accordance with all safety and weather conditions required by manufacturer or as modified by applicable rules and regulations of local, state and federal authorities having jurisdiction. Consult Material Safety Data Sheets for complete handling recommendations.

1.03 DELIVERY, STORAGE AND HANDLING

- A. All materials must be delivered in original, unopened containers with the manufacturer's name, labels, product identification, and batch numbers. Damaged material must be removed from the site immediately.
- B. Store all materials off the ground and protect from rain, freezing or excessive heat until ready for use.
- C. Condition the specified product as recommended by the manufacturer.

1.04 JOB CONDITIONS

- A. Environmental Conditions: Do not apply material if it is raining or snowing or if such conditions appear to be imminent. Minimum application temperature 45°F (7°C) and rising.
- B. Protection: Precautions should be taken to avoid damage to any surface near the work zone due to mixing and handling of the specified coating.

1.05 SUBMITTALS

- A. Submit PDF copy of manufacturer's literature, to include: Product Data Sheets, and appropriate Material Safety Data Sheets (MSDS).

1.06 WARRANTY

- A. Provide a written warranty from the manufacturer against defects of materials for a period of (5) five years, beginning with date of substantial completion of the project.

PART 2. PRODUCTS

2.01 MANUFACTURER

- A. SikaTop 111 Plus, as manufactured by Sika Corporation, is considered to conform to the requirements of this specification.

2.02 MATERIALS

- A. Polymer-modified portland cement mortar:
 - 1. Component A shall be a liquid polymer emulsion of an acrylic copolymer base and additives.
 - a. pH: 4.5-6.5
 - b. Film Forming Temperature: 73°F max.
 - c. Tear Strength: 950-psi min.
 - d. Elongation at Break: 500% min.
 - e. Particle Size: less than 0.1 micron
 - 2. Component A shall contain an organic, penetrating corrosion inhibitor which has been independently proven to reduce corrosion via ASTM G3 (half-cell potential tests). The corrosion inhibitor shall not be calcium nitrite, and shall have a minimum of 5 years of independent field testing to document performance on actual construction projects.

3. Component B shall be a blend of selected portland cements, specially graded aggregates, admixtures for controlling setting time, water reducers for workability, and an organic accelerator.
 4. The materials shall be non-combustible, both before and after cure.
 5. The materials shall be supplied in a factory-proportioned unit.
 6. The polymer-modified, portland cement mortar must be placeable from $\frac{1}{2}$ -in. to 1-in. in depth per lift for horizontal applications.
- B. To prepare a polymer-modified portland cement concrete: aggregate shall conform to ASTM C-33, The factory-proportioned unit shall be extended with 42-lb. max. of a $\frac{3}{8}$ in. (No. 8 distribution per ASTM C-33, Table II) clean, well-graded, saturated surface dry aggregate, having low absorption and high density. Aggregate must be approved for use by the engineer.

2.03 PERFORMANCE CRITERIA

- A. Typical Properties of the mixed polymer-modified, portland cement mortar:
1. Working Time: Approximately 30 minutes.
 2. Finishing Time: 50-120 minutes
 3. Color: Concrete gray
- B. Typical Properties of the cured polymer-modified, portland cement mortar:
1. Compressive Strength (ASTM C-109 Modified)
 - a. 1 day: 2500 psi min. (17.2 MPa)
 - b. 7 day: 5500 psi (37.9 MPa)
 - c. 28 day: 7000 psi (48.3 MPa)
 2. Flexural Strength (ASTM C-293) @ 28 days: 1500 psi (10.3 MPa)
 3. Splitting Tensile Strength (ASTM C-496) @28 days 700 psi (4.8 MPa)
 4. Bond Strength (ASTM C-882 Modified) @ 28 days: 2500 psi (17.2 MPa)
 5. The portland cement mortar shall not produce a vapor barrier.
 6. Density (wet mix): 136 lbs./cu. ft. (2.18 kg/l)

7. Permeability (AASHTO T-277 @ 28 days approximately 500 Coulombs)

Note: Tests above were performed with material and curing conditions at 71°F - 75°F and 45-55% relative humidity.

PART 3 - EXECUTION

3.01 SURFACE PREPARATION

- A. Areas to be repaired must be clean, sound, and free of contaminants. All loose and deteriorated concrete shall be removed by mechanical means. Mechanically prepare the concrete substrate to obtain a surface profile of +/- 1/16" (CSP 5 or greater as per ICRI Guidelines) with a new exposed aggregate surface. Area to be patched shall not be less than 1/2" in depth.
- B. Where reinforcing steel with active corrosion is encountered, sandblast the steel to a white metal finish to remove all contaminants and rust. Where corrosion has occurred due to the presence of chlorides, the steel shall be high pressure washed after mechanical cleaning. Prime steel with 2 coats of Sika Armatec 110 EpoCem as directed by manufacturer. (See Spec Component SC-201-0699).

3.02 MIXING AND APPLICATION

- A. Mechanically mix in appropriate sized mortar mixer or with a Sika jiffy paddle and low-speed (400-600 rpm) drill. Pour approximately 4/5 gal Component A into the mixing container. Add Component B while continuing to mix. Mix to a uniform consistency for a maximum of 3 minutes. Add remaining Component A to mix if a more loose consistency is desired. Should smaller quantities be needed, be sure the components are measured in the correct ratio and that the Component B is uniformly blended before mixing the components together. Mix only that amount of material that can be placed in 30 minutes. Do not retemper material.
- B. Mixing of the polymer-modified portland cement concrete: Pour all (1-gal) of Component A into the mixing container. Add Component B while continuing to mix. Add correct amount of the pre-approved coarse aggregate, and continue mixing to a uniform consistency. Mixing time should be 3 minutes maximum.
- C. Placement Procedure: At the time of application, the substrate should be saturated surface dry with no standing water. Mortar and/or concrete must be scrubbed into substrate filling all pores and voids. While the scrub coat is still wet, force material against edge of

repair, working toward center. If repair area is too large to fill while scrub coat is still wet use Sika Armatec 110 EpoCem in lieu of scrub coat (See Spec Component SC-200). After filling, consolidate, then screed. Allow mortar or concrete to set to desired stiffness, then finish with trowel, manual or power, for smooth surface. Broom or burlap for rough surface. Areas where the depth of the repair is less than 1-inch shall be repaired with polymer-modified portland cement mortar. In areas where the depth of the repair is greater than 1 inch, the repair shall be made with polymer-modified portland cement concrete.

- D. As per ACI recommendations for portland cement concrete, curing is required. Moist cure with wet burlap and polyethylene, a fine mist of water or a water-based* compatible curing compound. Moist curing should commence immediately after finishing and continue for 48 hours. Protect newly applied material from rain, sun and wind until compressive strength is 70% of the 28-day compressive strength. To prevent from freezing cover with insulating material. Setting time is dependent on temperature and humidity.

* Pretesting of curing compound is recommended.

- E. Adhere to all procedures, limitations and cautions for the polymer-modified portland cement mortar in the manufacturer's current printed technical data sheet and literature.

3.03 CLEANING

- A. The uncured polymer-modified portland cement mortar can be cleaned from tools with water. The cured polymer-modified portland cement mortar can only be removed mechanically.
- B. Leave finished work and work area in a neat, clean condition without evidence of spillovers onto adjacent areas.

END OF SECTION 03730

SECTION 04100 - MORTAR & GROUT

PART 1. GENERAL

1.01 RELATED DOCUMENTS

- A. Attention is directed to Division 0, Bidding and Contract Requirements, and to Division 1, General Requirements, which are hereby made a part of this specification. Refer to Structural Drawings for additional information.

1.02 SECTION INCLUDES

- A. Work included in this section consists of furnishing all labor, materials, equipment, and incidentals required for complete installation of mortar and grout for masonry.

1.03 ENVIRONMENTAL REQUIREMENTS

- A. Recommended Practices for Hot and Cold Weather Masonry Construction as published by the Masonry Industry Council.

PART 2. PRODUCTS

2.01 MATERIALS

- A. Portland Cement: ASTM C150, Type 1 provide natural color or white cement as required to provide mortar color indicated.
- B. Mortar Aggregate: ASTM C144, standard masonry type.
- C. Hydrated Lime: ASTM C207, Type 'S', or 'N'.
- D. Masonry Cement: ASTM C91.
- E. Premix Mortar: ASTM C387.
- F. Grout Aggregate: ASTM C404.
- G. Grout Fine Aggregate: ASTM C144, 100% passing #8 sieve, maximum 5-30% passing #50 sieve.
- H. Water: Clean and potable.
- I. Integral water repellent additive meeting ASTM E-514.

J. Plasticizer:

1. SIKA Chemical Corporation "Intraplast Z".
2. Euclid Chemical Co. "Eucon BK-S".

K. Storage of all material shall prevent the intrusion of foreign matter. Store all masonry units on the ground, protected against damage and intrusion of excess moisture. No damaged or deteriorated materials shall be used.

2.02 MORTAR MIXES

- A. Mortar for exterior load bearing walls and all exterior masonry work below grade; ASTM C270, Type 'M' or 'S', using the property method unless noted otherwise on structural drawings. Use ASTM C270 Type 'N' above grade at exterior veneers.
- B. Mortar for interior non-load bearing walls and partitions: ASTM C270, Type 'M' or 'S', using the property method.
- C. Mortar for reinforced masonry ASTM C270, Type 'S', using the property method.
- D. Pointing mortar for masonry veneers ASTM C270, Type 'N', using the property method.
- E. Ready-Mixed Mortar: Cementitious materials, water, and aggregate complying with requirements specified in this Article; combined with set-controlling admixtures to produce a ready-mixed mortar complying with ASTM C 1142.
- F. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494, Type C, and recommended by the manufacturer for use in masonry mortar of composition indicated.

2.03 MORTAR MIXING

- A. Thoroughly mix mortar ingredients in approved type mixing machine in quantities needed for immediate use in accordance with ASTM C270 or C780. Discharge mixer completely before recharging.

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- B. All exterior above grade mortar exposed to moisture shall be fabricated with integral water repellent additive.
- C. Blend admixtures in accordance with manufacturer's instructions.
- D. Do not use anti-freeze compounds to lower the freezing point of mortar.

2.04 GROUT MIXES

- A. Bond beams, lintels, engineered masonry, reinforced masonry walls: min. 3000 psi strength at 28 days unless noted otherwise; 8-10 inches slump; pre-mixed grout in accordance with ASTM C94, or batch mixed in accordance with ASTM C476 for fine or course grout.

PART 3. EXECUTION

3.01 EXAMINATION AND PREPARATION

- A. Apply bonding agent to existing concrete surfaces.

3.02 INSTALLATION

- A. Install pre-mix mortar and grout in accordance with manufacturer's instructions.
- B. Work grout into masonry cores and cavities to eliminate voids. Do not displace reinforcement. Reinforcing shall be mechanically anchored in masonry cores to prevent displacement during grouting.

END OF SECTION 04100

SECTION 04300 - UNIT MASONRY

PART 1. GENERAL

1.01 RELATED DOCUMENTS

- A. Attention is directed to Division 0, Bidding and Contract Requirements, and to Division 1, General Requirements, which are hereby made a part of this specification.

1.02 SECTION INCLUDES

- A. Work included in this section consists of furnishing all labor, materials, equipment and incidentals required for complete installation of concrete masonry including tuckpointing of CMU and block veneer including installation of reinforcement, anchorage and accessories.

- B. Related work specified elsewhere:

- 1. Section 04100 - Mortar & grout.

1.03 PERFORMANCE REQUIREMENTS

- A. Provide unit masonry that develops the following installed compressive strengths (f'm) at 28 days.

- 1. For concrete Unit Masonry: As follows, based on net area:
 - a. f'm = 1900 psi (13.05 MPa).
- 2. For brick unit masonry: As follows, based on gross area
 - a. f'm = 1500 psi (10.3 MPa).

1.04 SUBMITTALS

- A. Provide data on concrete masonry units including proposed reinforcing.
- B. Shop drawing for stone trim including cutting and setting diagrams.
- C. If specifically requested by the Architect/Engineer, provide samples for verification as follows.

1. Full-size units for each different exposed masonry unit required showing the full range of exposed colors, textures, and dimensions to be expected in the completed construction.
2. Weep vents in color to match mortar color.
3. Accessories embedded in the masonry.

1.05 QUALITY ASSURANCE

- A. Fire-Resistance Ratings: Where indicated, provide materials and construction identical to those of assemblies with fire resistance ratings determined per ASTM E 119 by a testing and inspecting agency, by equivalent concrete masonry thickness, or by another means, as acceptable to authorities having jurisdiction.
- B. Single-Source Responsibility for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from one source and by a single manufacturer for each different product required.
- C. Single-Source Responsibility for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from one manufacturer for each cementitious component and from one source or producer for each aggregate.

1.06 ENVIRONMENTAL REQUIREMENTS

- A. Hot and Cold weather requirements: Recommended Practices for Hot or Cold Weather Masonry Construction as published by the Masonry Industry Council.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Store masonry units on elevated platforms, under cover, and in a dry location to prevent their deterioration or damage due to moisture, temperature changes, contaminants, corrosion, and other causes. If units become wet, do not install until they are in an air-dried condition.
- B. Store cementitious materials on elevated platforms, under cover, and in a dry location.

- C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
- D. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

PART 2. PRODUCTS

2.01 CONCRETE MASONRY UNITS

- A. Concrete block (CMU): ASTM C90, normal weight (≥ 125 pcf). Use for above and below grade, exterior or interior wall applications.
- B. Texture of exposed faces of block shall be uniform for all block used in this project. Solid units may be used for bearing under structural members. No units with exposed chipped surfaces will be permitted in areas where exposed.
- C. Provide shapes such as special units at pilaster blocks, bullnose all external corners, sash recesses, square ends, lintel blocks and other, as required by drawings or specifications.

2.02 BRICK UNITS

- A. Face Brick: ASTM C216, Type FBX unless noted otherwise, Grade SW.
- B. Brick Masonry Units: Utility size of 3-5/8" x 3-5/8" x 11-5/8" unless noted otherwise. Provide special units of shape and size including solids as noted on drawings.
- C. Provide brick as follows (submit sample for verification prior to ordering):
 - 1. MACOMB COUNTY JAIL:
 - A. TOWER: Manufacturer: Belden - Commodore Smooth A 06-19
 - 1. Made at Sugarcreek Plant 2.
 - 2. Available at Belden Brick, Fraser 586-294-5400.

2.03 REINFORCEMENT AND ANCHORAGE

- A. All single wythe joint reinforcement shall be ladder type wire reinforcing consisting of No. 9 gauge deformed side rods, with No. 9 gauge standard ladder type cross rods. All rods shall be hot-dip galvanized using ASTM A153, Class B-2 standards. Out to out spacing of side rods shall be approximately 2" less than the nominal wall thickness. Provide pre-fabricated corners and tee units as required.
- B. For anchorage to steel framing, provide manufacturer's standard anchors with crimped 1/4 inch (6.4 mm) diameter wire anchor section for welding to steel and triangular-shaped wire tie section sized to extend within 1 inch (25 mm) of masonry face and wire diameter of 0.25". Provide one tie on each side of framing where masonry abuts. Ties to be spaced at 16" o.c. vertical.
- C. Manufacturers:
 - 1. AA Wire Products Co.
 - 2. Dur-O-Wal.
 - 3. National Wire.
 - 4. Hohmann and Barnard, Inc.
 - 5. Wire Bond
 - 6. Other Architect Approved.
- D. Reinforcing Steel: ASTM A615, 60-ksi-yield grade deformed steel bars unprotected finish.

2.05 ACCESSORIES

- A. Building Paper: 15# asphalt saturated felt.
- B. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials, recommended by masonry unit manufacturer.
- C. Column Wrap: Waxed corrugated cardboard or 15# asphalt saturated felt.

2.06 LINTELS

- A. Lintels shall be steel, precast or cast-in-place in accordance with details as shown or scheduled on the drawings.

PART 3. EXECUTION

3.01 EXAMINATION AND PREPARATION

- A. Verify that field conditions are acceptable and ready to receive work. Examine rough-in and built-in construction to verify locations prior to installation.
- B. Coordinate placement of anchors supplied to other sections.
- C. Employ skilled mechanics, experienced supervision. Lay masonry plumb, true to line, with level, accurately spaced courses. Break vertical joints unless otherwise indicated. Keep bond plumb. Rack courses, where necessary, without tothing. Lay out facing before setting, minimize cutting closures, jumping bond.
- D. Do not wet concrete masonry. Lay masonry with complete bearing in full beds of mortar. Butter sides for full vertical joints. Shove units into place. Anchor walls not otherwise bonded with ties every 8", every four (4) courses.
- E. Mix units for exposed unit masonry from several pallets as they are placed to provide a uniform blend of colors and textures.

3.02 COURSING

- A. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness. Lay out walls in advance for accurate spacing of openings, movement type joints, returns, etc. Avoid units of less than half size at corners and jambs.
- B. Block unit shall be laid in stack or running bond, as indicated on drawings with vertical joints aligned plumb, horizontal joints level. Joints in back-up work shall be worked out to provide bonding with facing masonry. Joints shall be uniform in width, thickness not to exceed 1/3". Exposed joints in finish work shall be tooled slightly concave, others shall be cut flush.

- C. Initial block course (first course above foundation) in walls (interior or exterior) shall be laid in full mortar beds on shells and cross webs; in other locations, units shall be laid in full mortar beds on shells only. Solid block units shall be laid same as brick. Vertical joints between units shall be filled with mortar between shell ends.
- D. All non-bearing walls and partitions shall terminate against beam soffits, roof, or structural deck, unless otherwise shown on drawings, or as stated below. Build wall to within 3/8" of overhead structure on roof, fill top joint and all voids with non-combustible insulation board which has width of 1" less than wall, then caulk joints.
- E. Both bearing and non-bearing masonry walls which enclose corridors, storage or mechanical rooms, shops, and other rooms requiring a rated separation from adjacent areas, must have the top joint as well as all voids at roof deck and elsewhere in or over these walls, filled with cement grout, mortar, or plaster bed of at least 2" in width. Where no ceilings occur in the room, said fill shall be troweled flush with the wall surface or surfaces on the exposed side of the wall.
- F. All interior and exterior block walls shall have control joints 20'-0" o.c. maximum for exterior and 25'-0" to 30'-0" at interior walls. Line up control joints with joints in foundation wall and joints in the veneer. Leave exposed faces on joints ready for caulking. Provide vertical reinforcing in grouted core on each side of exterior masonry control joints. Reinforcing to match vertical wall steel.
- G. Bond each course at corners and break vertical joints at least 2". Tee shaped or cross shaped intersecting walls shall have vertical continuous joint. These joints shall be caulked. Provide for continuity of joint reinforcing by providing pre-fabricated "T" shaped or "L" shaped units.

- H. Provide welded steel masonry reinforcing placed in every second horizontal course in all block walls with at least one layer below a window sill level and one layer above a lintel level. Lay reinforcing on wall and cover with mortar, bed unit as usual. Longitudinal wire shall be lapped not less than 32 diameters at splices. At corners, cut inside rod and bend to proper angle.
- I. Construct bond beams as indicated with concrete grout. Maintain accurate location of reinforcing steel during grout placement.
- J. Grout course solid (or use solid units immediately below window and door openings or other locations where masonry serves as a support for a sill.
- K. Stopping and Resuming Work: In each course, rack back 1/2-unit length for one-half running bond or 1/3-unit length for one-third running bond; do not tooth. Clean exposed surfaces of set masonry and remove loose masonry units and mortar prior to laying fresh masonry.

3.03 PLACING AND BONDING

- A. Isolate masonry partitions from vertical structural framing members with a control joint as indicated.
- B. Isolate top joint of masonry partitions from horizontal structural framing members and slabs or decks with fire rated compressible joint filler.

3.04 REPAIR OF AREAS AND OPENINGS DURING DEMOLITION BY MASON OR OTHERS

- A. All masonry openings sawcut by mason or by demolition work of other trades shall have new masonry units toothed in the existing adjacent masonry units to remain unless noted otherwise on the drawings. This includes all areas under construction or in the area of construction whether shown on the drawings or not.

3.05 REINFORCEMENT & ANCHORAGES - SINGLE WYTHE MASONRY

- A. Walls laid up with concrete block, including where used as back-up shall be reinforced with horizontal steel wall reinforcing as specified. Reinforcing shall be of proper width for block wythe, to have side wires over block shells. Place joint reinforcement at 16" o.c. vertical and continuous in first and second joint below top of walls.
- B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum of 3'-0" beyond each side of opening.
- C. Terminate reinforcing each side of control joints; lap end joints 12", form corners by cutting and lapping inside wire, bending outside wire; form intersections by cutting and lapping reinforcing from one wall with other wall. Bed side wires completely in mortar.

3.06 LINTELS

- A. Install loose steel lintels over door openings and other miscellaneous openings as indicated on the architectural plans.
- B. Construct concrete block lintels over window openings, door openings and other openings as indicated on the architectural plans or otherwise required.
- C. Maintain minimum bearing each side of opening of 8" or as specified on structural drawings. Align end of lintel with vertical block joints.

3.07 GROUTED COMPONENTS

- A. Reinforce bond beam and pilasters as detailed.
- B. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch of dimensioned position.
- C. Place and consolidate grout fill without displacing reinforcing.

- D. At beam bearing locations, fill masonry cores with grout for a minimum 12 inches either side of member and three courses vertical, unless otherwise noted.

3.08 ENGINEERED MASONRY

- A. Lay masonry units with core cells vertically aligned and cavities between wythes clear of mortar and unobstructed.
- B. Reinforce masonry unit cores and cavities with reinforcement bars and grout as indicated. Provide vertical bars in corners. Provide vertical bars at each side of all masonry openings. Vertical bars to continue at noted spacing above openings.
- C. Secure vertical reinforcement in position at top and bottom of cells and at intervals not exceeding 192 bar diameters. Splice reinforcement 48 bar diameters, minimum 12".
- D. Place mortar in masonry unit bed joints back 1/4 inch from edge of unit grout spaces; bevel back and upward. Permit mortar to cure (3) three days before placing grout.
- E. Grout spaces less than 2 inches in width with fine grout using low lift grouting techniques. Grout spaces 2 inches or greater in width with coarse grout using high or low lift grouting techniques.
- F. When grouting is stopped for more than one hour, terminate grout 1-1/2 inch below top of upper masonry unit to form a positive key for subsequent grout placement.
- G. Low Lift Grouting: Place first lift of grout to a height of 60 inches maximum and consolidate by mechanical vibration. Place subsequent lifts in maximum 60 inch increments and vibrate grout for consolidation. Ensure mortar has gained sufficient strength to withstand pressure prior to grouting. "Puddling" may be used in lieu of mechanical vibration if grout lifts are limited to 12 inches maximum.

H. High Lift Grouting:

1. Provide cleanout opening no less than 4 inches high at the bottom of each cell to be grouted by cutting one face shell of masonry unit.
2. Clean out masonry cells and cavities with high-pressure water spray. Permit complete water drainage. Cells and cavities may be "cleaned" by using steel rod to remove excess mortar protrusions.
3. Request that Architect/Engineer inspect the cells. Allow three days advance notice.
4. After cleaning and cell inspection, seal openings with masonry units.
5. Pump grout into spaces. Maintain water content in grout to intended slump without aggregate segregation.
6. Limit grout lift to 60 inches and mechanically vibrate for grout consolidation. Wait 30 to 60 minutes before placing next lift.

3.09 CONTROL AND EXPANSION JOINTS

- A. Do not extend horizontal joint reinforcement through control joints.
- B. Form control joint with a sheet building paper bond breaker fitted to one side of the hollow contour end of the masonry unit. Fill the resultant elliptical core with grout fill. Rake joint at exposed unit faces for placement of backer rod and sealant.
- C. Form control joints where indicated on drawings as detailed.

3.10 BUILT-IN WORK

- A. As Work progresses, build in metal door and glazed frames, fabricated metal frames, window frames, wood nailing strips, anchor bolts, plates, and other items to be built in the Work furnished by other Sections.
- B. Bed anchors of hollow metal door and aluminum frames in adjacent mortar joints. Fill hollow metal frame voids solid with grout. Fill adjacent masonry cores with grout minimum 12 inches from framed openings.

3.11 POINTING AND CLEANING

- A. Point up all exposed existing SGFT, CMU, brick where required, fill all holes and joints; remove loose mortar, cut out defective joints, and repoint where necessary.

3.12 TOLERANCES

- A. Maximum Variation from Plumb: 1/4 inch per story, non-cumulative.
- B. Maximum Variation from Level Coursing: 1/8 inch in 3 ft. and 1/4 inch in 10 ft.; 1/2 inch in 30 ft.

3.13 CUTTING AND FITTING

- A. Cut and fit for chases, pipes, conduit, sleeves, grounds, and other items. Coordinate with other Sections of Work to provide correct size, shape, and location.
- B. Form slots, grooves, chases, recesses, other items required for other trades. Build in all required structural steel, miscellaneous metal, frame anchors, precast concrete anchors, other items. Bed in mortar to line and level. Check all requirements in advance to eliminate cutting.
- C. Do necessary cutting of masonry for installation of items not otherwise provided for. Patch walls, maintain structural stability, appearance, weather resistance.
- D. Cut masonry units with motor-driven saws to provide clean, sharp, unchipped edges. Cut units as required to provide continuous pattern and to fit adjoining construction. Use full-size units without cutting, where possible. Allow units cut with water-cooled saws to dry before placing, unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

3.14 REPAIRING, POINTING AND CLEANING

- A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or if units do not match adjoining units. Install new units to match adjoining units; install in fresh mortar or grout, pointed to eliminate evidence of replacement.
- B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point-up joints, including corners, opening, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for application of sealants.
- C. Remove excess mortar and mortar smears.
- D. Clean soiled surfaces with cleaning solution.
- E. On completion of pointing and re-pointing of all face brick and block work, interior and exterior, clean thoroughly with "Sure Klean 600", "Craft Klean" or similar prepared detergent, applied strictly according to the manufacturer's instructions with stiff fiber brushes. Drench with clean water immediately after cleaning. Do not use job mixed acid on this project. All cleaning shall be done prior to installation of any finished floor, wall mounted light fixtures, aluminum frames or items subject to damage. Protect hollow metal frames, other built-in items.

3.15 MASONRY WASTE DISPOSAL

- A. Recycling: Undamaged, excess masonry materials are Contractor's property and shall be removed from the Project site for his use.

END OF SECTION

SECTION 05500 - METAL FABRICATIONS

PART 1. GENERAL

1.01 RELATED DOCUMENTS

- A. Attention is directed to Division 0, Bidding and Contract Requirements, and to Division 1, General Requirements, which are hereby made a part of this specification.

1.02 SECTION INCLUDES

- A. Work included in this section consists of furnishing all labor, materials, equipment and incidentals required for complete installation of miscellaneous metal work shown on the drawings, as specified herein, and/or as needed for a complete and proper installation whether shown or not.

1.03 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this section.
- B. Perform shop and/or field welding required in connection with the work of this Section in strict accordance with pertinent recommendations of the American Welding Society.
- C. Fabricator Qualifications: Firm experienced in producing metal fabrications similar to those indicated for this project with a record of successful in-service performance, and with sufficient production capacity to produce required units without delaying the work.
- D. Welding Standards: Comply with applicable provisions of AWS D1.1 "Structural Welding Code-Steel," AWS D1.2 "Structural Welding Code-Aluminum," and AWS D1.3 "Structural Welding Code-Sheet Steel."
 - 1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

1.04 SUBMITTALS

- A. Comply with pertinent provisions of Division 1.
- B. Product Data: Within (21) calendar days after the contractor has received the Owner's Notice to Proceed, submit:
 - 1. Shop drawings in sufficient detail to show fabrication, installation, anchorage, and interface of the work of this section with the work of adjacent trades. Provide templates for anchors and bolts specified for installation under other sections.

1.05 PROJECT CONDITIONS

- A. Field Measurements: Check Actual locations of walls and other construction to which metal fabrications must fit by accurate field measurements before fabrication. Show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the work.
 - 1. Where field measurements cannot be made without delaying the work, guarantee dimensions and proceed with fabricating products without field measurements. Coordinate construction to ensure that actual dimensions correspond to guaranteed dimensions. Allow for trimming and fitting.

PART 2. PRODUCTS

2.01 MATERIALS

- A. In fabricating items which will be exposed to view, limit materials to those which are free from surface blemishes, pitting, rolled trade names, and roughness.
- B. Comply with following standards as pertinent:
 - 1. Steel plates, shapes and bars: ASTM A36.
 - 2. Steel plates to be bent or cold-formed: ASTM A283, Grade C.
 - 3. Steel tubing (hot-formed, welded, or seamless): ASTM A501 or ASTM A500.
 - 4. Cold-finished steel bars: ASTM A108.

5. Cold-rolled carbon steel sheets: ASTM A336.
6. Galvanized carbon steel sheets: ASTM A526, with G90 zinc coating in accordance with ASTM A525.
7. Steel pipe: ASTM A53, Grade B, standard weight, black finish unless otherwise noted.
8. For exterior installations and where indicated, provide members with hot-dip galvanizing coat per ASTM A53.
9. Concrete inserts:
 - a. Threaded or wedge type galvanized ferrous castings of malleable iron complying with ASTM A27.
 - b. Provide required bolts, shims, and washers, hot-dip galvanized in accordance with ASTM A153.

2.02 FASTENERS

A. General:

1. For exterior use and where built into exterior walls, provide zinc-coated fasteners.
2. Provide fasteners of type, grade, and class required for the particular use.

B. Comply with following standards as pertinent:

1. Bolts and nuts: Provide hexagon-head regular type complying with ASTM A307, Grade A.
2. Lag bolts: Provide square-head type complying with Fed. Spec. FF-B-561.
3. Machine screws: Provide cadmium plated steel type complying with Fed. Spec. FF-S-111.
4. Washers:
 - a. Plain washers: Comply with Fed. Spec. FF-W-92, round, carbon steel.
 - b. Lock washers: Comply with Fed. Spec. FF-W-84, helical spring type carbon steel.
5. Toggle bolts: Provide type, class and style needed but complying with Fed. Spec. FF-B-588.
6. Anchorage devices: Provide expansion shield complying with Fed. Spec. FF-S-325.

2.03 OTHER MATERIALS

- A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by contractor subject to the approval of the Architect.

2.04 SHOP PAINT

- A. Primer: Use "10-99 Tnemec Primer" or Architect/Engineered equal product by Rustoleum.
- B. For repair of galvanizing, use a high zinc-dust content paint complying with SSPC-paint 20. Dry film containing not less than 94 percent zinc dust by weight.
- C. Bituminous Paint: Cold-applied asphalt mastic complying with SSPC-Paint 12, except containing no asbestos fibers.

2.05 FABRICATION

- A. Except as otherwise shown on the drawings or the approved shop drawings, use materials of size, thickness, and type required to produce reasonable strength and durability in the work of this Section.
- B. Fabricate with accurate angles and surfaces which are true to the required lines and levels, grinding exposed welds smooth and flush, forming exposed connections with hairline joints, and using concealed fasteners wherever possible.
- C. Prior to shop painting or priming, properly clean metal surfaces as required for the applied finish and for the proposed use of the items.
- D. On surfaces inaccessible after assembly or erection, apply two coats of the specified primer. Change color of second coat to distinguish it from the first.
- E. Shear and punch metals cleanly and accurately. Remove burrs.
- F. Ease exposed edges to a radius of approximately 1/32 inch, unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

- G. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

2.06 MISCELLANEOUS METAL FABRICATIONS

A. Rough Hardware:

- 1. Furnish bent or otherwise custom fabricated bolts, plates, anchors, hangers, dowels and other miscellaneous steel and iron shapes as required for framing and supporting woodwork and for anchoring or securing woodwork to concrete or other structures. Straight bolts and other stock rough hardware items are specified in Section 06100.
- 2. Manufacture or fabricate items of sizes, shapes, and dimensions required. Furnish malleable iron washers for heads and nuts which bear on wood structural connections; elsewhere, furnish steel washers.

B. Loose Bearing and Leveling Plates:

- 1. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction made flat, free from warps or twists, and of required thickness and bearing area. Drill plates to receive anchor bolts and for grouting as required. Galvanize after fabrication.

C. Loose Steel Lintels:

- 1. Provide loose structural steel lintels for opening and recesses in masonry walls and partitions as shown. Weld adjoining members together to form a single unit where indicated. Provide not less than 8" bearing at each side of openings, unless otherwise shown.

2. Size lintels as follows, unless otherwise indicated.
 - a. Up to 4'-0" span: One 3 1/2" x 4" x 5/16" steel angle supporting each 4" thick module of masonry.
 - b. Spans 4'-0" to 7'-0": One 5" x 3-1/2" x 5/16" steel angle supporting each 4" thick module of masonry.
 - c. Over 7'-0": Consult Architect if not indicated.
3. Hot dip galvanized loose steel lintels to be installed in exterior walls.

D. Miscellaneous Framing and Supports:

1. Provide miscellaneous steel framing and supports as required to complete work.
2. Fabricate miscellaneous units to sizes, shapes, and profiles shown or, if not shown, or required dimensions to receive adjacent other work to be retained by framing. Except as otherwise shown, fabricate from structural steel shapes, plates, and steel bars of welded construction using metered joints for field connection. Cut, drill and tap units to receive hardware and similar items.
3. Hot dip galvanize exterior miscellaneous frames and supports.

PART 3. EXECUTION

3.01 SURFACE CONDITIONS

- A. Examine the areas and conditions under which work of this section will be performed and notify the General Contractor, in writing, of conditions detrimental to the proper and timely completion of the work. Do not proceed until unsatisfactory conditions are corrected.

3.02 COORDINATION

- A. Coordinate as required with other trades to assure proper and adequate provision in the work of those trades for interface with the work of this Section.

3.03 INSTALLATION

A. General:

1. Set work accurately into position, plumb, level, true and free from rack.
2. Anchor firmly into position.
3. Where field welding is required, comply with AWS recommended procedures of manual-shielded metal-arc welding for appearance and quality of weld and for methods to be used in correcting welding work.
4. Grind exposed welds smooth and touch up shop prime coats.
5. Do not cut, weld, or abrade surfaces which have been hot-dip galvanized after fabrication and which are intended for bolted or screwed field connections.

- B. Immediately after erection, clean the field welds, bolted connections and abraded areas of shop priming. Paint the exposed areas with same material used for shop priming.

END OF SECTION 05500

SECTION 06100 - CARPENTRY

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

- A. Attention is directed to Division 0, Bidding and Contract Requirements, and to Division 1, General Requirements, which are hereby made a part of this Section.

1.02 DESCRIPTION OF WORK:

- A. The extent of the carpentry work is shown on the Drawings.

1.03 QUALITY ASSURANCE:

- A. Lumber Standard: Comply with U.S. Department of Commerce Product Voluntary Standards PS 1-07, "Structural Plywood", PS 2-04 Performance Standard for "Wood based structural use panels" and PS 20-05 American Softwood Lumber Standard, except as otherwise indicated.
- B. Factory mark each piece of lumber and plywood with type, grade, mill, and grading agency: West Coast Lumber Assoc. (WBLC) or Western Wood Products Association (WWPA).

1.04 SUBMITTALS:

- A. Wood Treatment Data:
 - 1. Submit treatment manufacturer's instructions for proper use of each type of treated material.
 - a. Pressure Treatment: For each type specified, include certification by treating plant stating chemicals and process used, net amount of preservative retained, and conformance with applicable standards.
 - b. For water-borne preservatives, include statement that moisture content of treated materials was reduced to a maximum of 15% prior to shipment to project site.
- B. Product Data:
 - 1. Submit manufacturer's specifications and other data for each carpentry anchorage, fastening, and miscellaneous material. Provide material certificates for all lumber and plywood. Transmit a copy of each instruction to the Installer.

1.05 PRODUCT HANDLING:

- A. Delivery and Storage: Keep materials dry during delivery and storage. Protect against exposure to weather and contact with damp or wet surfaces. Stack lumber and plywood and provide air circulation within stacks.

1.06 JOB CONDITIONS:

- A. Coordination: Fit carpentry work to other work, scribe and cope as required for accurate fit. Correlate location of furring, nailers, blocking, grounds, and similar supports to allow proper attachment of other work.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Lumber - General:

- 1. Nominal sizes are indicated, except as shown by detail dimensions. Provide actual sizes as required by PS 20-05, for the moisture content specified for each use. Use dressed lumber, surfaced four sides (SFS) seasoned with 19% maximum moisture content at time of dressing.

B. Framing Lumber (2" through 4" thick):

- 1. For light framing (less than 6" wide), provide Construction Grade Douglas Fir as graded by the West Coast Lumber Bureau (WCLB) or equivalent species and grade with minimum fiber stress rating (bending) of 1000 psi (Fb), and modulus of elasticity of 1,500,000 psi.
- 2. For structural framing (6" and wider and from 2" to 4" thick) provide dense No. 1 Grade Douglas Fir as graded by the West Coast Lumber Bureau (WCLB) or equivalent species and grade with minimum fiber stress rating (bending) of 1500 psi (Fb), and modulus of elasticity of 1,700,000 psi.

C. Boards (less than 2" thick):

- 1. Produce lumber of 19% maximum moisture content (S-DRY) and of the following species and grade.
 - a. Redwood Construction Common (RIS).
 - b. Southern Pine No. 2 Boards (SPIB).
 - c. Or any species graded construction Boards (WCLB or WWPA).

D. Plywood:

1. Provide only Douglas Fir Plywood in accordance with grading requirements of the APA - The Engineered Wood Association as follows:
 - a. Treated non-combustible AC standard with exterior glue.

E. Anchorage and fastening Materials:

1. Select proper type, size, material, and finish for each application. Comply with the following:
 - a. Nails and Staples: FS FF-N-105.
 - b. Wood Screws: FS FF-S-111.
 - c. Bolts and Studs: FS FF-B-575.
 - d. Nuts: FS FF-N-836.
 - e. Washers: FS FF-W-92.
 - f. Lag Screws or Lag Bolts: FS FF-B-561.
 - g. Masonry Anchoring Devices: For expansion shields, nails, and drive screws, comply with FS FF-S-325.
 - h. Toggle Bolts: FS FF-B-588.
 - i. Bar or Strap Anchors: ASTM A 575 carbon steel bars.

2.02 WOOD TREATMENT:

- A. Preservation Treatment: Where lumber or plywood is indicated as "Treated" or is specified herein to be treated, comply with the applicable requirements of the American Wood Preservers Association (AWPA) AWPA P23-08, ASTM D-1625 and Federal Specification TT-W-50.
- B. Pressure-treat above-ground items with water-borne preservatives complying with AWPA P5-09, ASTM D-1760, and Federal Specification TT-W-571. After treatment, kiln-dry to a maximum moisture content of 19%. Treat indicated items and the following, except where fire retardant treated.

1. Wood cants, nailers, blocking, stripping, and similar

members in connection with roofing, flashing, vapor barriers and waterproofing.

2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
3. Wood framing members less than 12 inches above grade excepting timber.

C. Fire Retardant Treated:

1. Wood blocking and similar items installed within the building shall be pressure impregnation with retardant chemicals to achieve a flame spread rating of not more than 25 when tested in accordance with UL Test 723, ASTM E 84, or NFPA Test 355.

PART 3 - EXECUTION

3.01 INSPECTION:

- A. Installer must examine the substrates and supporting structure and the conditions under which the carpentry work is to be installed and notify the General Contractor, in writing, of conditions detrimental to the work. Do not proceed with the installation until unsatisfactory conditions have been corrected in a manner acceptable to the installer.

3.02 INSTALLATION:

A. General:

1. Discard units of material with defects which might impair the quality of the work, and units which are too small to fabricate the work with minimum joints or the optimum joint arrangement.
2. Set carpentry work accurately to required levels and lines, with members plumb and true and accurately cut and fitted.
3. Securely attach carpentry work to substrate by anchoring and fastening as shown and as required. Provide washers under bolt heads and nuts in contact with wood. Nail plywood in accordance with the recommendations of APA-The Engineered Wood Association.
4. Use common wire nails, except as otherwise shown or

specified herein. Use finishing nails for exposed work. Do not wax or lubricate fasteners that depend on friction for holding power. Select fasteners of size that will not penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting of wood; pre-drill as required. Do not drive threaded friction type fasteners; turn into place. Tighten bolts and lag screws at installation and retighten as required for tight connections prior to closing in or at completion of work.

B. Wood Grounds, Nailers, Blocking and Sleepers:

1. Provide wherever shown and where required for screening or attachment of other work. Form to shapes as shown and cut as required for true line and level of work to be attached. Coordinate location with other work involved.
2. Attach to substrates as required to support applied loading. Countersink bolts and nuts flush with surfaces, unless otherwise shown. Build into masonry during installation of masonry work. Where possible, anchor to form work before concrete placement.
3. Provide permanent grounds of dressed, pressure preservative treated key-bevelled lumber not less than 1-1/2" wide and of the thickness required to bring face of ground to exact thickness of finished material involved. Remove temporary grounds when no longer required.

C. Wood Furring:

1. Install plumb and level with closure strips at all edges and openings. Shim with wood as required for tolerance of finished work.

D. Wood Framing:

1. Provide framing members of sizes and on spacings shown and frame openings as shown, or if not shown, comply with recommendations of "The Wood Frame Construction Manual" 2001 Ed. of the American Wood Council. Do not splice structural members between supports.
2. Anchor and nail as shown, and comply with the

MACOMB COUNTY JAIL
LAUNDRY HOT WATER STORAGE TANKS
AND BOILER REPLACEMENT

231997

OCTOBER 25, 2023

"Recommended Nailing Schedule - Table I of the Manual
for Housing Framing: and other recommendations of the
N.F.P.A.

E. Installation of Plywood:

1. Comply with recommendations of the Engineered Wood Association (APA) for the installation of plywood.

END OF SECTION 06100

SECTION 07840 - FIRESTOPPING

PART I - GENERAL

1.01 RELATED DOCUMENTS:

- A. Attention is directed to Division 0, Bidding and Contract Requirements, and to Division 1, General Requirements, which are hereby made a part of this section.

1.02 DESCRIPTION OF WORK:

- A. Provide labor and materials necessary for complete installation of firestopping materials and systems. Section includes firestopping for the following:
 - 1. Penetrations through fire resistance rated floor construction including both empty openings and openings containing cables, pipes, ducts, conduits, and other penetrating items.
 - 2. Penetrations through fire resistance rated walls and partitions including both empty openings and openings containing cables, pipes, ducts, conduits and other penetrating items.
 - 3. Penetrations through smoke barriers and construction enclosing compartmentalized area involving both empty openings and openings containing penetrating items.
 - 4. Sealant joints in fire resistance rated construction.

1.03 SUBMITTALS:

- A. Product Data: Manufacturer's specifications and technical data for each material including the composition and limitations, documentation of UL or other nationally recognized independent testing laboratories firestop systems to be used and manufacturer's installation instructions.
 - 1. Submit material safety data sheets (MSDS) provided with product delivered to jobsite.

- B. Product certificates signed by manufacturers of firestopping products certifying that their products and installation comply with specified requirements. Certification shall be signed by the Installer.

1.04 QUALITY ASSURANCE:

- A. Conform to applicable governing codes, including local governing authorities, but not limited to the following:
 - 1. NFPA 101 2012 Life Safety Code
 - 2. 2015 MBC
- B. Meet requirements of ASTM E814 or UL 1479 tested assemblies that provide a fire rating equal to that of construction being penetrated and other ASTM Standards as applicable for the installation.
 - 1. ASTM E84 "Test Method for Surface Burning Characteristics of Building Materials".
 - 2. ASTM E119 "Test Methods for Fire Tests of Building Construction and Materials".

PARTS 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with through-penetration firestop systems (XHEZ) listed in Volume II of the UL Fire Resistance Directory, provide products by one of the following:
 - 1. Hilti Construction Chemicals, Tulsa, OK
 - 2. Specified Technologies Inc. (STI) Sommerville, NJ
 - 3. 3M Fire Protection Products, St. Paul, MN
 - 4. The Rectorseal Corp., Houston, TX
 - 5. Tremco, Inc. Beachwood, OH

2.02 FIRESTOPPING, GENERAL

- A. Compatibility: Provide firestopping composed of components that are compatible with each other, the substrates forming openings, and the items, if any, penetrating the firestopping under conditions of service and application, as demonstrated by firestopping manufacturer based on testing and field experience.

- 1. All materials shall comply with ASTM E814 or E119

(UL 1429) and shall be manufactured of non-toxic, non-hazardous, asbestos free materials, and unaffected by water or moisture when cured.

2. Primers: Conform to manufacturer's recommendations for primers required for various substrate and conditions.
 3. Backup materials: Backup materials, supports, and anchoring devices shall be provided as required by UL testing.
- B. Accessories: Provide components for each firestopping system that are needed to install fill materials and to comply with "System Performance Requirements" in Part 1. Use only components specified by the firestopping manufacturer and approved by the qualified testing and inspecting agency for the designated fire resistance rated system. Accessories include but are not limited to the following items:
1. Permanent forming/damming/backing materials must be noncombustible and may include the following:
 - a. Semirefractory fiber (mineral wool) insulation.
 - b. Sealants used in combination with other forming/damming materials to prevent leakage of fill materials in liquid state.
 - c. Joint fillers for joint sealants.
 2. Temporary forming materials.
 3. Substrate primers.
 4. Collars.
 5. Steel sleeves.

2.03 FIRE STOPPING, MATERIALS

- A. Use only firestopping products that have been UL 1479 or ASTM E814 tested for specific fire rated construction conditions conforming to construction assembly type, penetrating item type, annular space requirements, and fire rating involved for each separate instance.
- B. For penetrations by noncombustible items including steel pipe, copper pipe, rigid steel conduit, and electrical metallic tubing (EMT), the following materials are acceptable:
 1. Hilti FAS 601 Elastomeric Firestop Sealant
 2. STI SpecSeal Sealant SSS 100

3. 3M Fire Barrier CP25
 4. The RectorSeal Corp. Metacaulk 1000, 950, 835, Putty, & Mortar.
 5. Fyre-Sil, Tremco, Inc.
 6. Biofireshield K10 and K2 Mortar, Biostop 500+, Biootherm 100/22200 & Biostop Putty, The RectorSeal Corp.
- C. For penetrations by combustible items (penetrants consumed by high heat and flame) including insulated metal pipe, PVC jacketed, flexible cable or cable bundles and plastic pipe (closed piping systems) the following materials are acceptable:
1. STI Wrap Strip SSW12
 2. Hilti FS One Intumescent Firestop Sealant
 3. 3M Fire Barrier FS-195 Wrap Strip
 4. Metacaulk Wrap Strip, Firestop Collars, Metacaulk 1000, 950 & 835.
 5. Biostop Wrap Strip, Collar, and Biostop 500+.
- D. For large size/complex penetrations made to accommodate cable trays, multiple steel and copper pipes, electrical busways in raceways, the following materials are acceptable:
1. STI SpecSeal lightweight mortar SSM22B or putty
 2. Hilti FS635 Trowelable Firestop Compound
 3. 3M Fire Barrier FS-195 Composite Sheet
 4. Biofireshield K-10 & K2 mortar
 5. Metacaulk Firestop Mortar
- E. For fire-rated construction joints and other gaps with movement, the following materials are acceptable:
1. Hilti FS 601 Elastomeric Firestop Sealant
 2. STI Pensil 300
 3. 3M (Dow Corning Fire Stop Sealant 2000)
 4. Fyre-Sil, Tremco, Inc.
 5. Biofireshield, Biostop 700, Biostop 500+
 6. Metacaulk 1000 & 1100
- F. Provide a firestopping system with an "F" rating as determined by UL 1479 or ASTM E814 which is equal to the time rating of construction being penetrated.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of firestopping. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Surface Cleaning: Clean out openings and joints immediately prior to installing firestopping to comply with recommendations of firestopping manufacturer and the following requirements:
 - 1. Remove all foreign materials form surfaces of opening and joint substrates and from penetrating items that could interfere with adhesion of firestopping.
 - 2. Clean opening and joint substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with firestopping. Remove loose particles remaining from cleaning operation.
 - 3. Remove laitance and form release agent from concrete.

3.03 INSTALLING THROUGH-PENETRATION FIRESTOPS

- A. General: Comply with the manufacturer's installation instructions and drawings pertaining to products and applications indicated.
- B. Install forming/damming materials and other accessories of types required to support fill materials during their application and in the position needed to produce the cross sectional shapes and depths required to achieve fire ratings of designate through-penetration firestop systems. After installing fill materials, remove combustible forming materials and other accessories not indicated as permanent components of firestop systems.
- C. Install fill materials for through-penetration firestop systems by proven techniques to produce the following results:
 - 1. Completely fill voids and cavities formed by openings, forming materials, accessories, and penetrating items.

2. Apply materials so they contact and adhere to substrate formed by openings and penetrating items.
3. For fill materials that will remain exposed after completing work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.04 INSTALLING FIRE RESISTIVE JOINT SEALANTS

- A. General: Comply with the manufacturer's installation instructions and drawings pertaining to products and application indicated.

3.05 CLEANING

- A. Clean off excess fill materials and sealant adjacent to openings and joints as work progresses by methods and with cleaning materials approved by manufacturers of firestopping products and of products in which opening and joints occur.

END OF SECTION 07840

SECTION 07910 - JOINT FILLERS AND GASKETS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

- A. Attention is directed to Division 0, Bidding and Contract Requirements, and to Division 1, General Requirements, which are hereby made a part of this Section.

1.02 DESCRIPTION OF WORK:

- A. The extent of each type of joint filler and gasket work is indicated on the drawings and by provisions of this section, and is hereby defined to include required fillers and gaskets not specified in other sections of these specifications.
- B. The required applications of joint fillers and gaskets include, but are not necessarily limited to, the following general types and locations:
 - 1. Isolation and expansion joint fillers in structural concrete.
 - 2. Floor construction/expansion joint fillers.
 - 3. Joint fillers around penetrations of equipment and services through walls, floors and roofs.

1.03 SUBMITTALS:

- A. Product Data:
 - 1. Submit manufacturer's specifications, installation instructions and recommendations for each type of material required.
- B. Samples:
 - 1. Submit (3) three, 12 inches long samples of each joint filler or gasket.

PART 2 - PRODUCTS

2.01 MATERIALS, GENERAL:

- A. Size and Shape: Provide sizes and shapes of units as shown or, if not shown, as recommended by manufacturer for joint size and condition shown. Where joint movement is a factor in a determination of size, consult with Architect to determine nature and magnitude of anticipated joint movements for the temperature and condition of project at time of installation.
- B. Compressibility: Specified hardness and compressibilities are intended to establish requirements for normal or average conditions of installation and use. Where a range of hardness or compressibility is available for a product, comply with manufacturer's recommendations for specific condition of use.
- C. Color: Provide each concealed material in manufacturer's standard color which has best overall performance characteristics for application shown. Provide exposed materials in black, except where another color is indicated.
- D. Compatibility: Before purchase of each filler or gasket material, confirm that it is compatible with substrate, sealants and other materials in joint system.
- E. Adhesives: Pressure sensitive adhesives, compatible with each material in joint system may be applied (at installer's option) to one face of joint fillers and gaskets to facilitate installation and permanent anchorage. Do not allow adhesives to contaminate sealant bond surface (if any) in joint system.

2.02 CELLULAR/FOAM EXPANSION JOINT FILLERS:

- A. Closed-Cell PVC Joint Filler:
 - 1. Provide flexible expanded polyvinyl chloride complying with ASTM D 1667. Grade VE 41 BL (3.0 psi compression deflection); except provide higher compression deflection grades as may be necessary to withstand installation forces.
 - 2. Provide one of the following products:
 - a. FF2 PVC: Progress Unlimited, Inc.
 - b. Vinyl "U" 1000 Series: Williams Products, Inc.

2.03 GASKETS:

A. Molded Neoprene Gasket:

1. Provide extruded neoprene or EPDM gaskets complying with ASTM D 2000, Designation 2BC 415 to 3BC 620, black (40 to 60 Shore A durometer hardness); of the profile shown or, if not shown, as required by the joint shape, size and movement characteristics to maintain a watertight and airtight seal.
2. Provide products by one of the following manufacturers:
 - a. D.S. Brown Company
 - b. Hohmann & Barnard, Inc.
 - c. Kirkhill Rubber Company
 - d. Progress Unlimited, Inc.
 - e. JD Russell
 - f. Williams Products, Inc.

2.04 MISCELLANEOUS MATERIALS:

A. Oakum Joint Filler:

1. Provide untreated hemp or jute fiber rope, free of oil, tar and other compounds which might stain surfaces, contaminate joint walls or not be compatible with sealants.

B. Fire-Resistant Joint Filler:

1. Glass fiber or other inorganic non-combustible fiber formed with minimum of binder into resilient joint filler strips or blankets of sizes and shapes indicated, recommended by manufacturer specifically for increasing fire resistance or endurance of joint systems of type indicated, for service temperatures up to 2300 degrees F, 80% (min.) recovery 50% compression.

PART 3 - EXECUTION

3.01 INSPECTION:

- A. Installer must examine joint surfaces of units to receive fillers or gaskets and conditions under which the work is to be performed and notify the General Contractor, in writing, of conditions detrimental to proper completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

3.02 INSTALLATION:

- A. Comply with manufacturer's instructions and recommendations for installation of each type of joint filler or gasket required, unless more stringent requirements are shown or specified.
- B. Set units at proper depth of position in joint to coordinate with other work, including installation of bond breakers, backer rods, and sealants. Do not leave voids or gaps between ends of joint filler units.
- C. Recess exposed edges or faces of gaskets and exposed joint filler slightly behind adjoining surfaces, unless otherwise shown, so that compressed units will not protrude from joints.
- D. Bond ends of gaskets together with adhesive or by means as recommended by manufacturer to ensure continuous watertight and airtight performance. Miter-cut and bond ends at corners except where molded corner units are provided.

END OF SECTION 07910

SECTION 07920 - SEALANTS AND CAULKING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

- A. Attention is directed to Division 0, Bidding and Contract Requirements, and to Division 1, General Requirements, which are hereby made a part of this Section.

1.02 DESCRIPTION OF WORK:

- A. The extent of each type of sealant and caulking work is indicated on the drawings and by provisions of this section.
- B. The required applications of sealants and caulking include, but are not necessarily limited to, the following general locations:
 - 1. Exterior wall joints.
 - 2. Interior sound-sealed and air-sealed joints.
 - 3. Isolation joints, between structure and other elements.
 - 4. Joints at penetrations of walls, decks and floors by piping and other services and equipment.
 - 5. Joints between dissimilar materials.
 - 6. Joints between items of equipment and other construction.

1.03 QUALITY ASSURANCE:

- A. Manufacturers: Firms with not less than 5 years of successful experience in production of types of sealants and caulking compounds required for this project.
 - 1. Obtain elastomeric sealants from a manufacturer which will, upon request, send a qualified technical representative to the project site for purpose of advising installer on proper procedures for use of products.
- B. Installer: A firm with a minimum of (5) years of successful experience in application of types of materials required.

1.04 SUBMITTALS:

A. Product Data:

1. Submit manufacturer's specifications, recommendations and installation and instructions for each type of sealant, caulking compound and associated miscellaneous material required.

B. Samples:

1. Submit (3) three, 12" long samples of each color required (except black) for each type of sealant and caulking compound exposed to view. Install sample between (2) two strips of material similar to or representative of typical surfaces where compound will be used, held apart to represent typical joint widths.

1.05 JOB CONDITIONS:

- A. Pre-Installation Meeting: At General Contractor's direction, installer, sealant manufacturer's technical representative, and other trades involved in coordination with sealant work shall meet with the General Contractor at project site to review procedures and time schedule proposed for installation of sealants in coordination with other work. Review each major sealant application required on project.

- B. Weather Conditions: Do not proceed with installation of sealants under adverse weather conditions, or when temperatures are below or above manufacturer's recommended temperature range for installation. Proceed with the work only when forecasted weather conditions are favorable for proper cure and development of high early bond strength. Where joint width is affected by ambient temperature variations, install elastomeric sealants only when temperatures are in lower third of the manufacturer's recommended installation temperature range, so that sealant will not be subjected to excessive elongation and bond stress at subsequent low temperatures. Coordinate time schedule with General Contractor to avoid delay of project.

- C. Statement of Non-Compliance: Where it is necessary to proceed with installation of sealants or caulking compound under conditions which do not fully comply with requirements (because of time schedule or other reasons which the General Contractor determines to be crucial to project), prepare written statement for Owner's record (with copy to Architect) indicating the nature of non-compliance, reasons for proceeding, precautionary measures taken to ensure best possible work and names of individuals concurring with decision to proceed with installation.

1.06 SPECIAL PROJECT WARRANTY (GUARANTEE):

- A. Sealant Warranty: Provide written warranty, signed by the General Contractor/installer, agreeing to, within warranty period of (10) ten years (or maximum warranty provided by manufacturer for polyurethane sealants) after date of substantial completion, replace/repair defective materials and workmanship defined to include: Instances of significant leakage of water or air; failures in joint adhesion, material cohesion, abrasion resistance, strain resistance or general durability; failure to perform as required and the general appearance of deterioration in any other manner not clearly specified in manufacturer's published product literature as an inherent characteristic of the sealant material. Warranty includes responsibility for removal and replacement of other work (if any) which conceals or obstructs the replacement of sealants.

PART 2 - PRODUCTS

2.01 MATERIALS, GENERAL:

- A. Colors: Provide black or other natural color where no other standard or custom color is available. Where material is not exposed to view, provide manufacturer's standard color which has best overall performance characteristics for application shown.
1. Provide manufacturer's standard colors as selected by Architect from manufacturer's standard colors.

- B. Hardnesses shown and specified are intended to indicate general range necessary for overall performance. Consult manufacturer's technical representative to determine actual hardness recommended for conditions of installation and use. Upon request, Architect will furnish information concerning anticipated joint movement related to actual joint width and installation temperature. Except as otherwise indicated or recommended, provide compounds within the following range of hardness (Shore A, fully cured, at 75 degrees F.).
1. 5 to 20 for high percentage of movement and minimum exposure to weather and abrasion (including no exposure to vandalism).
 2. 15 to 35 for moderate percentage of movement and moderate exposure to weather and abrasion.
 3. 30 to 60 for low percentage of movement and maximum exposure to weather and abrasion (including foot traffic on horizontal joints).
- C. Modulus of Elasticity: For joints subjected to movement, either thermal expansion or dynamic movement, select sealants from among available variations which have lowest modulus of elasticity which is consistent with exposure to abrasion or vandalism. For horizontal joints subject to traffic, select sealants with high modulus of elasticity as required to withstand indentation by stiletto heels. Comply with manufacturer's recommendations where no other requirements are indicated.
- D. Compatibility: Before selection and purchase of each specified sealant, investigate its compatibility with joint surfaces, joint fillers and other materials in joint system. Provide only materials (manufacturer's recommended variation of specified materials) which are known to be fully compatible with actual installation conditions as shown by manufacturer's published data or certification.

2.02 SEALANTS:

- A. One Part Elastomeric Sealant (Silicone)
 - 1. One component elastomeric sealant, complying with ASTM C 920, Class 25, Type NS (nonsag), unless Type S (self-leveling) recommended by manufacturer for the application shown.
 - a. Acceptable Standard
 - 1. "Pecora 864 Architectural Silicone Sealant; Pecora Corp.
 - 2. Dow Corning Dowsil 791; Dow Corning Corp.
 - 3. Silpruf; General Electric
 - 4. MasterSeal NP100, BASF Corp. Building Systems Inc.
 - 5. Spectrem 2; Tremco Mfg. Co.
 - 6. Sikasil WS 295; Sika Corp.
 - 2. One Component high movement joints (+100/-50): Where locations of high movement are indicated.
 - a. Dow Corning Dowsil 790; Dow Corning Corp.,
 - b. Spectrem 1; Tremco
 - c. Sikasil WS 290; Sika Corp.
- B. Elastomeric Sealant (Polyurethane)
 - 1. One component polyurethane sealant, complying with ASTM C 920, Type S, Grade NS, Class 25 (nonsag).
 - a. Acceptable Standard
 - 1. MasterSeal NP 1; BASF Corp. Building Systems
 - 2. Dymonic; Tremco Mfg. Co.
 - 3. Dynatrol I; Pecora Corp.
 - 4. Vulkem 921; Mameco
 - 5. CS 2130; Hilti
 - 6. Sikaflex 1A; Sika Corp.
 - 7. Sikaflex 15LM; Sika Corp.
 - 2. Two Component polyurethane sealant, complying with ASTM C 920, Type M, Grade NS, Class 25 (nonsag).
 - a. Acceptable Standard
 - 1. MasterSeal NP 2; BASF Corp. Building Systems
 - 2. Dymeric; Tremco Mfg. Co.
 - 3. Dynatrol II; Pecora Corp.
 - 4. Vulkem 922; Mameco
 - 5. Sikaflex 2cNSEZ; Sika Corp.

- C. One-part self-leveling polyurethane sealant (for traffic areas).
 - 1. One Component polyurethane self-leveling sealant, complying with ASTM C 920, Type S, Grade P, Class 25.
 - a. Acceptable Standard
 - 1. MasterSeal SL 1; BASF Corporation Building Systems, Inc.
 - 2. NR-201 Urexpan; Pecora Corp.
 - 3. Vulkem 45; Mameco
 - 4. Sikaflex 1cSL; Sika Corp.
 - 2. Two-component polyurethane self-leveling sealant, complying with ASTM C 920, Type M, Grade P, Class 25.
 - a. Acceptable Standard
 - 1. MasterSeal SL 2; BASF Corporation Building System, Inc.
 - 2. NR-200 Urexpan; Pecora Corp.
 - 3. Vulkem 245; Mameco
 - 4. THC900/THC901; Tremco
 - 5. Sikaflex 2cSL; Sika Corp.
- D. Security Sealant (Polyurethane)
 - 1. One component or two component polyurethane sealant, complying with ASTM C 920, Grade NS, Class 12.5, with a Shore A Hardness of 55.
 - a. Acceptable Standard
 - 1. Dynaflex; Pecora Corp.
 - 2. MasterSeal CR-195; BASF Corp. Building Systems

2.04 CAULKING COMPOUNDS:

- A. Caulking Compounds: (Acrylic Latex Sealant)
 - 1. Latex rubber modified, acrylic emulsion polymer sealant compound; manufacturer's standard, one part, nonsag, mildew resistant, acrylic emulsion sealant complying with ASTM C 834, formulated to be paintable and recommended for exposed applications on interior locations involving joint movement of not more than plus or minus 5 percent.
 - 2. Acceptable Standard
 - a. MasterSeal NP520; BASF Corp. Building Systems
 - b. Acrylic Latex Caulk 834, Tremco Inc.
 - c. Acrylic Latex Caulk with Silicone, DAP
 - d. AC-20, Pecora Corp.

2.05 MISCELLANEOUS MATERIALS:

- A. Joint Cleaner: Provide type of joint cleaning compound recommended by sealant or caulking compound manufacturer, for joint surfaces to be cleaned.
- B. Joint Primer/Sealer: Provide type of joint primer/sealer recommended by sealant manufacturer, for joint surfaces to be primed or sealed.
- C. Bond Breaker Tape: Polyethylene tape or other plastic tape as recommended by sealant manufacturer, to be applied to sealant-contact surfaces where bond to substrate or joint filler must be avoided for proper performance of sealant. Provide self-adhesive tape where applicable.
- D. Sealant Backer Rod: Compressible rod stock polyethylene foam, polyethylene jacketed polyurethane foam butyl rubber foam, neoprene foam or other flexible, permanent, durable non-absorptive material as recommended for compatibility with sealant by the sealant manufacturer.
- E. Provide size and shape of rod which will control joint depth for sealant placement, break bond of sealant at bottom of joint, form optimum shape of sealant bead on back side, and provide a highly compressible backer to minimize possibility of sealant extrusion when joint is compressed.

PART 3 - EXECUTION

3.01 EXAMINATION:

- A. The installer must examine joint surfaces, backing and anchorage of units forming sealant rabbet and condition under which sealant work is to be performed and notify the General Contractor in writing of conditions detrimental to proper completion of the work and performance by sealants. Do not proceed with sealant work until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.

3.02 SELECTION OF MATERIAL

- A. Caulking compounds shall be used for interior nonmoving joints and at locations indicated.

- B. One component elastomeric silicone sealants shall be used at interior joints where thermal or dynamic movement is anticipated including, but not limited to, the following locations:
 - 1. Metal to metal joints.
 - 2. Sheet metal flashing, preformed metal caps, fascias, extenders, trim and panels.

- C. One or two component elastomeric polyurethane sealants shall be used at interior joints where weatherproofing or waterproofing is required and at joints between dissimilar materials including, but not limited to, the following locations:
 - 1. Side of hollow metal frames to adjacent materials.
 - 2. Exterior side of aluminum frames to adjacent dissimilar materials.
 - 3. Lintels and shelf angles to masonry construction.
 - 4. Sealant in pipe sleeves where materials must perforate the floor slab.
 - 5. Exterior locations which are noted "caulked" or "sealant" and not specifically listed herein or included in the work of other sections of the Specifications.
 - 6. Vertical interior expansion joints and horizontal interior and expansion joints in the building.
 - 7. Interior joints between dissimilar materials where the joining of the 2 surfaces leave a gap between the meeting materials and components.

- D. Security sealant shall be used in vertical control joints in the interior side of building.

3.03 JOINT SURFACE PREPARATION:

- A. Clean joint surfaces immediately before installation of sealant or caulking compound. Remove dirt, insecure coatings, moisture and other substances which would interfere with bond of sealant or caulking compound.

- B. For elastomeric sealants, do not proceed with installation of sealant over joint surfaces which have been painted, lacquered, waterproofed or treated with water repellent or other treatment or coating unless a laboratory test for durability (adhesion), in compliance with paragraph 4.3.9. of FS TT-S-00227 has successfully demonstrated that sealant bond is not impaired by coating or treatment. If laboratory test has not been performed or shows bond interference, remove coating or treatment from joint surfaces before installing 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% solution of muriatic acid; neutralize with dilute ammonia solution, rinse thoroughly with water and allow to dry before sealant installation.
- D. Roughen joint surfaces on vitreous coated and similar non-porous materials, where sealant manufacturer's data indicated lower bond strength than for porous surfaces. Rub with fine abrasive to produce a dull sheen.

3.04 INSTALLATION:

- A. Comply with sealant manufacturer's printed instructions except where more stringent requirements are shown or specified and except where manufacturer's technical representative directs otherwise.
- B. Prime or seal joint surfaces where shown or recommended by sealant manufacturer. Do not allow primer/sealer to spill or migrate onto adjoining surfaces.
- C. Install sealant backer rod for liquid sealants, except where shown to be omitted or recommended to be omitted by sealant manufacturer for the application shown.
- D. Install bond breaker tape where shown and where required by manufacturer's recommendations to ensure that elastomeric sealants will perform properly.
- E. Employ only proven installation techniques, which will ensure that sealants will be deposited in uniform, continuous ribbons without gaps or air pockets, with complete "wetting" of joint bond surfaces equally on opposite sides. Except as otherwise indicated, fill sealant rabbet to a slightly concave surface, slightly below adjoining surfaces. Where horizontal joints are between a horizontal surface and a vertical surface, fill joint to form a slight cove, so that joint will not trap moisture and dirt.
- F. Install sealants to depths as shown or if not shown as recommended by sealant manufacturer but within the following general limitations, measured at center (thin) section of bead.

1. For normal moving joints sealed with elastomeric sealants, but not subject to traffic, fill joints to a depth equal to 50% of joint width, but neither more than 1/2" deep nor less than 1/4" deep.
 2. For joints sealed with non-elastomeric sealants and caulking compounds, fill joints to a depth in the range of 75% to 125% of joint width.
- G. Spillage: Do not allow sealants or compounds to overflow or spill onto adjoining surfaces or to migrate into voids of adjoining surfaces including exposed aggregate panels and similar rough textures. Use masking tape or other precautionary devices to prevent staining of adjoining surfaces but either primer/sealer or the sealant/caulking compound.
- H. Remove excess and spillage of compounds promptly as the work progresses. Clean adjoining surfaces by whatever means may be necessary to eliminate evidence of spillage without damage to adjoining surfaces or finishes.

3.04 CURE AND PROTECTION:

- A. Cure sealants and caulking compounds in compliance with manufacturer's instructions and recommendations to obtain high early bond strength, internal cohesive strength and surface durability. Do not cure in a manner which would significantly alter materials modulus of elasticity or other characteristics.
- B. Installer shall advise the General Contractor of procedures required for curing and protection of sealants and caulking compounds during construction period, so that they will be without deterioration or damage (other than normal wear and weathering) at time of Owner's acceptance.

END OF SECTION 07920

SECTION 08112 - HOLLOW METAL WORK

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

- A. Attention is directed to Division 0, Bidding and Contract Requirements, and to Division 1, General Requirements, which are hereby made a part of this Section.

1.02 DESCRIPTION OF WORK:

- A. The extent of hollow metal work is shown on the drawings and schedules.
- B. This section includes hollow metal doors and pressed steel frames for doors and related openings.

1.03 QUALITY ASSURANCE:

- A. Provide doors and frames complying with ANSI A258.8-1998 (SDI-100) "Recommended Specifications for Standard Steel Doors and Frames" and as herein specified.
- B. Fire-rated door assemblies shall be Underwriter Laboratory.: Where fire-rated door assemblies are indicated or required, provide fire-rated door and frame assemblies that comply with NFPA 80 "Standard for Fire Doors and Windows", and have been tested, listed, and labeled in accordance with ASTM E 152 "Standard Methods of Fire Tests for Door Assemblies". All metal labels to be riveted to door and frames mylar labels not acceptable.

1.04 SUBMITTALS:

- A. Product Data: Submit manufacturer's specifications for fabrication and installation, including data substantiating that products comply with requirements.
- B. Shop Drawings: Submit shop drawings for the fabrication and installation of hollow metal work. Include details of each frame type, elevations of door design types, conditions at openings, details of construction, location and installation requirements of finish hardware and reinforcements, and details of joints and connections.
 - 1. Provide a schedule of doors and frames using same reference numbers for details and openings as those on the contract drawings.

1.05 DELIVERY, STORAGE AND HANDLING:

- A. Deliver hollow metal work cartoned or crated to provide protection during transit and job storage.
- B. Inspect hollow metal work upon delivery for damage. Minor damages may be repaired provided the finish items are equal in all respects to new work and acceptable to the Architect; otherwise remove and replace damaged items as directed.
- C. Store doors and frames at the building site under cover. Place units on at least 4" high wood sills or on floors in a manner that will prevent rust and damage. Avoid the use of non-vented plastic or canvas shelters which could create a humidity chamber. If the cardboard wrappers on doors become wet, remove carton immediately. Provide 1/4" spaces between stacked doors to promote air circulation.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. ASTM A653/A653M - Standard Specification for sheet steel, zinc coated (galvanized) or zinc-iron alloy-coated (galvannealed) by the hot dip process (A60).
- B. ASTM A924 - Specification for general requirements for steel sheet metallic coated by the hot dip process (A60).
- C. ASTM A 1009/A1008M - Standard specification for steel sheet, cold rolled, carbon, high strength low-alloy, high strength low alloy with improved formability, solution hardened, and bake hardenable.
- D. Supports and Anchors: Fabricate of not less than 16 gage sheet metal. Galvanize after fabrication units to be built into exterior walls, complying with ASTM A 153, Class B.
- E. Inserts, Bolts and Fasteners: Manufacturer's standard units, except hot-dip galvanize items to be built into exterior walls, complying with ASTM A 153, Class C or D as applicable.
- F. Shop-Applied Paint: Rust-inhibitive enamel or paint, either air-drying or baking, suitable as base for specified finish paints on steel surfaces.

2.02 FABRICATION, GENERAL:

- A. Fabricate hollow metal units to be rigid, neat in appearance, and free from defects, warp or buckle. Accurately form metal to required sizes and profiles. Wherever practicable, fit and assemble units in the manufacturer's plant. Clearly identify work that cannot be permanently factory-assembled before shipment to assure proper assembly at the project site. Weld exposed joints continuously; grind, dress, and make smooth, flush, and invisible. Metallic filler to conceal manufacturing defects is not acceptable.
- B. Exposed Fasteners: Unless otherwise indicated, provide countersunk flat Phillips or Jackson heads for exposed screws and bolts.
- C. Finish Hardware Preparation:
 1. Prepare hollow metal units to receive mortised and concealed finish hardware, including cutouts, reinforcing, drilling, and tapping in accordance with final Finish Hardware Schedule and templates provided by hardware supplier. Comply with applicable requirements of ANSI A 115 series specifications for door and frame preparation for hardware.
 2. Reinforce hollow metal units to receive surface-applied hardware. Drilling and tapping for surface-applied finish hardware may be done at project site.
 3. Locate finish hardware as shown on final shop drawings, or if not shown, in accordance with "Recommended Locations for Builder's Hardware", published by Door and Hardware Institute.
- D. Shop Painting:
 1. Clean, treat and paint exposed surfaces of fabricated hollow metal units, including galvanized surfaces.
 2. Clean steel surfaces of mill scale, rust, oil, grease, dirt and other foreign materials before application of paint.
 3. Apply pretreatment to cleaned metal surfaces, using cold phosphate solution (SSPC-PT-2), hot phosphate solution (SSPC-PT4) or basic zinc chromate-vinyl butyral solution (SSPC-PT3).

4. Apply shop coat or prime paint within time limits recommended by pretreatment manufacturer. Apply a smooth coat of even consistency to provide a uniform dry film thickness of not less than 2.0 mils, comply with ANSI A250.18.

E. Manufacturer: Provide hollow metal work by one of the following:

1. Ceco Door Products
2. Amweld Building Products
3. Steelcraft (A Division of Ingersoll-Rand)

2.03 DOORS:

A. General:

1. Provide flush design doors, 1-3/4" thick, seamless hollow construction, unless otherwise indicated. Bevel both vertical edges 1/8" in 2".

C. Interior Doors:

1. Fabricate interior doors of two outer, cold-rolled, stretcher-leveled steel sheets not less than 14 gage. Construct doors with smooth, flush surfaces, without visible joints or seams on exposed faces or stile edges except around glazed or louvered panel inserts.
2. Reinforce inside of doors with vertical, hot-rolled, not less than 22 gage steel sections. Space vertical reinforcing 6" o.c. and extend full door height. Spot weld at not more than 5" o.c. to both face sheets.
 - a. Continuous truss-form inner core of 28 gage sheet metal reinforcing may be provided as inner reinforcement in lieu of above. Spot-weld truss-form reinforcement 3" o.c. vertically and horizontally over entire surface of both sides.
3. Reinforce tops and bottoms of doors with 14 gage, horizontal steel channels, welded continuously to outer sheets.

D. Finish Hardware Reinforcement: Reinforce doors for required finish hardware as follows:

1. Hinges: Steel plate 3/16" thick x 1-1/2" wide x 6" longer than hinge, secured by not less than 6 spot-welds.

2. Mortise Locksets and Dead Bolts: 14 gage steel sheet, secured with not less than two spot-welds.
3. Cylinder Locks: 12 gage steel sheet, secured with not less than two spot-welds.
4. Flush Bolts: 12 gage steel sheet, secured with not less than two spot-welds.
5. Surface-Applied Closers: 12 gage steel sheet, secured with not less than six spot-welds.
6. Plush Plates and Bars: 16 gage steel sheet (except when through bolts are shown or specified), secured with not less than two spot-welds.
7. Surface Panic Devices: 14 gage sheet steel (except when through bolts are shown or specified), secured with not less than two spot-welds.

2.04 FRAMES:

- A. Provide hollow metal frames for doors, side-lights, borrowed lights, and other openings of sizes and profiles as indicated.
- B. Fabricate frames of full-welded unit construction with corners mitered, reinforced, continuously welded full depth and width of frame, unless otherwise indicated.
 1. Knock-down type frames are not acceptable.
- C. Form frames of galvanized steel sheets for exterior and either cold or hot-rolled sheet steel for interior.
 1. Gage: Not less than 14, for exterior openings up to and including 4'-0" wide.
 2. Gage: Not less than 14, for interior openings up to and including 4'-0" wide.
 3. For openings over 4'-0" wide: Not less than 12 gauge.
- D. Finish Hardware Reinforcement: Reinforce frames for required finish hardware as follows:
 1. Hinges and Pivots: Steel plate 3/16" thick x 1-1/2" wide x 6" longer than hinge, secured by not less than six spot-welds.
 2. Strike Plate Clips: Steel plate 3/16" thick x 1-1/2" wide x 3" long.

3. Surface-Applied Closers: 12 gage steel sheet, secured with not less than six spot-welds.
 4. Concealed Closers: Removable steel access plate, 12 gage internal reinforcement of size and shape required, and enclosing housing to keep closer pocket free of mortar or other materials.
- E. Head Reinforcing: Where installed in masonry, leave vertical mullions in frames open at top for grouting.
- F. Jamb Anchors: Furnish jamb anchors as required to secure frames to adjacent construction, formed of not less than 18 gage galvanized steel.
1. Masonry Construction: Adjustable, flat, corrugated or perforated T-shaped to suit frame size, with leg not less than 2" wide by 10" long. Furnish at least three anchors per jamb up to 7'-6" height; four anchors up to 8'-0" jamb height; one additional anchor for each 24" or fraction thereof over 8'-0" height.
 2. Metal Stud Partitions: Insert type with notched clip to engage metal stud, welded to back of frames. Provide at least four anchors for each jamb for frames up to 7'-6" in height; five anchors up to 8'-0" jamb height; one additional anchor each 24" or fraction thereof over 8'-0" height.
 3. In-Place Concrete or Masonry: Anchor frame jambs with minimum 3/8" concealed bolts into expansion shields or inserts at 6" from top and bottom and 26" o.c., unless otherwise shown. Reinforce frames at anchor locations. Apply removable stop to cover anchor bolts unless otherwise indicated.
- G. Floor Anchors: Provide floor anchors for each jamb and mullion which extends to floor, formed of not less than 14 gage galvanized steel sheet as follows:
1. Monolithic Concrete Slabs: Clip type anchors with two holes to receive fasteners, welded to bottom of jambs and mullions.
- H. Head Anchors: Provide two anchors at head of frames exceeding 42" wide for frames mounted in steel stud walls.
- I. Head Strut Supports: Provide 3/8" x 2" vertical steel struts extending from top of frame at each jamb to supporting construction above, unless frame is anchored to

masonry or to other structural support at each jamb. Bend top of struts to provide flush contact for securing to supporting construction above. Provide adjustable bolted anchorage to frame jamb members.

- J. Structural Reinforcing Members: Provide as part of frame assembly, where indicated at mullions, transoms, or other locations which are to be built into frame.
- K. Head Reinforcing: For frames over 4'-0" wide in masonry wall openings, provide continuous steel channel or angle stiffener not less than 12 gage for full width of opening welded to back of frame at head.
- L. Spreader Bars: Provide removable spreader bar across bottom of frames, tack welded to jambs and mullions.
- M. Rubber Door Silencers: Except on weatherstripped doors, drill stops to receive three silencers on single-door frames and four silencers on double door frames. Install plastic plugs to keep holes clear during construction.
- N. Plaster Guards: Provide 26 gage steel plaster guards or dust cover boxes, welded to frame at back of finish hardware cutouts where mortar or other materials might obstruct hardware installation.

2.05 STOPS AND MOLDINGS:

- A. Provide stops around glazed panels in hollow metal units and in frames to receive doors where indicated.
- B. Form fixed stops integral with frame, unless otherwise indicated.
- C. Provide removable stops and molds where indicated or required, formed of not less than 20 gage steel sheets matching steel on frames. Secure with countersunk machine screws spaced uniformly not more than 12 o.c.. Form corners with butted hairline joints.

PART 3 - EXECUTION

3.01 INSPECTION:

- A. Installer must examine substrate and conditions under which hollow metal work is to be installed and must notify the General Contractor, in writing, of any conditions detrimental to proper and timely completion of the work. Do not proceed with the work until unsatisfactory

conditions have been corrected in a manner acceptable to Installer.

3.02 INSTALLATION:

- A. Install hollow metal units and accessories in accordance with final shop drawings, manufacturer's data, and as herein specified.
- B. Setting Masonry Anchorage Devices:
 - 1. Provide masonry anchorage devices where required for securing hollow metal frames to in-place concrete or masonry construction.
 - 2. Set anchorage devices opposite each anchor location, in accordance with details on final shop drawings and anchorage device manufacturer's instructions. Leave drilled holes rough, not reamed, and free from dust and debris.
 - 3. Floor anchors may be set with powder-actuated fasteners instead of masonry anchorage devices and machine screws, if so indicated on final shop drawings.
- C. Placing Frames:
 - 1. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After all construction is complete, remove temporary braces and spreaders leaving surfaces smooth and undamaged.
 - 2. At in-place concrete or masonry construction, set frames and secure in place with machine screws and masonry anchorage devices.
 - 3. Place frames at fire-rated openings in accordance with NFPA Standard No. 80.
 - 4. Make field splices in frames as detailed on final shop drawings, welded and finished to match factory work.
 - 5. Remove spreader bars only after frames or bucks have been properly set and secured.

D. Door Installation:

1. Fit hollow metal doors accurately in their respective frames with the following clearances:
 - a. Jams and Head: 3/32".
 - b. Meeting Edges, Pairs of Doors: 1/8".
 - c. Bottom: 1/4" at threshold or carpet.
 - d. Bottom: 1/4" to threshold or tile
2. Place fire-rated doors with clearances as specified in NFPA Standard No. 80.
3. Finish Hardware installation is specified in Section 08710.

3.03 ADJUST AND CLEAN:

- A. Final Adjustments: Check and re-adjust operating finish hardware items in hollow metal work just prior to final inspection. Leave work in complete and proper operating conditions. Remove and replace defective work, including doors or frames which are warped, bowed or otherwise unacceptable.
- B. Prime Coat Touch-Up: Immediately after erection, sand smooth any rusted or damaged areas of prime coat and apply touch-up of compatible air-drying primer.

END OF SECTION 08112

SECTION 08410 - FRP ENTRANCE DOORS-ALUMINUM FRAMING SYSTEMS

1. GENERAL

1.1. RELATED DOCUMENTS

- A. Drawings and General Provisions of contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work in this section.

1.2. DESCRIPTION OF WORK

- A. The extent of each type of door and frame is shown on the drawings and in schedules.
- B. The following types of doors and frames are required:
 - 1. FRP flush doors.
 - 2. Aluminum Framing Systems

1.3. RELATED WORK SPECIFIED ELSEWHERE

- A. For Finish Hardware, refer to Section 08710.
- B. For Sealants & Caulking, refer to Section 07920.

1.4. SYSTEM PERFORMANCE - FRP FLUSH DOORS

- A. Provide door assemblies that have been 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.
- B. Thermal Transmission (exterior doors); U-value of not more than 0.09 (BTU/Hr. x sf x degrees F.) per AAMA 1503.01.
- C. Flame Spread/Smoke Developed: Provide FRP doors and panels with the following ratings in accordance with ASTM E 84-79a: Flame Spread: Exterior faces not greater than 145 (Class C); interior faces not greater than 10 (Class A). Smoke Developed: Exterior faces not greater than 345 (Class C); interior faces not greater than 320 (Class A).

- D. Additional Criteria: Provide FRP doors and panels with the following performance:

ASTM D 256 - nominal value of 13.5
ASTM D 1242 - nominal value of .23 percent
ASTM D 570 - nominal value of .20 to .40 percent
ASTM D 2583 - nominal value of 50

1.5. QUALITY ASSURANCE - **ALL BIDDERS SHALL BE FACTORY DIRECT
AUTHORIZED DISTRIUTORS OF THE SPECIFIED PRODUCTS.**

- A. Standards: Comply with the requirements and recommendations in applicable specification and standards by NAAMM and AAMA, including the terminology definitions and specifically including the "Entrance Manual" by NAAMM, except to the extent more stringent requirements are indicated.
- B. Performance: A minimum (10) ten year record of production of frames, doors and panels and completion of similar projects in type and size.
- C. Instruction: The manufacturer or his representative will be available for consultation to all parties engaged in the project including instruction to installation personnel.
- D. Field Measurement: Field verify all information prior to fabrication and furnish of materials. Furnish and install materials omitted due to lack of verification at no additional cost to Owner.
- E. Regulation and Codes: Comply with the current edition in force at the project location of all local, state and federal codes and regulations, including the Americans with Disabilities Act- Current Regulations.

1.6. SUBMITTALS

- A. Product Data: Submit Manufacturer's product data, specifications and instructions for each type of door and frame required in accordance with Section 013400 "Shop Drawings, Product Data & Samples" and the following:

1. Include details of core, stile and rail construction, trim for lites and all other components.
 2. Include details of finish hardware mounting.
 3. Include sample of each aluminum alloy to be used on this project. Where normal finish color and texture variations are expected, include two or more samples to show the range of such variations.
 4. Include one sample of typical fabricated section, showing joints, fastenings, quality of workmanship, hardware and accessory items before fabrication of the work proceeds.
- B. Submit shop drawings for the fabrication and installation of the doors and frames, and associated components. Details to be shown full scale. Include glazing details and finish hardware schedule.
- 1.7. PRODUCT DELIVERY, STORAGE AND HANDLING
- A. Deliver materials to jobsite in their original, unopened packages with labels intact. Inspect materials for damage and advise manufacturer immediately of any unsatisfactory materials.
 - B. Package door assemblies in individual corrugated cartons so no portion of the door has contact with the outer shell of the container. Package and ship frames preassembled to the greatest possible extent.
- 1.8. PROJECT WARRANTY
- A. Provide a written warranty signed by manufacturer, installer and contractor, agreeing to replace, at no cost to the Owner, any doors, frames or factory hardware installation which fail in materials or workmanship, within the warranty period. Failure of materials or workmanship includes: excessive deflection, faulty operation of entrances, deterioration of finish, or construction in excess of normal weathering and defects in hardware installation. The minimum time period of warranty is (10) ten years from acceptance.

2. PRODUCTS

2.1. ACCEPTABLE MANUFACTURERS

- A. Manufacturer: Subject to compliance with requirements, provide products of the following:
1. Special-Lite, Inc., Decatur, Michigan.

2.2. MATERIALS AND ACCESSORIES

- A. Aluminum Members: Alloy and temper as recommended by manufacturer for strength, corrosion resistance and application of required finish and control of color; ASTM B 221 for extrusions, ASTM B 209 for sheet/plate with aluminum wall thickness of 0.125".
- B. Components: Furnish door and frame components from the same manufacturer. "Splitting" of door and frame components is not permitted.
- C. Fasteners: Aluminum, non-magnetic stainless steel or other non-corrosive metal fasteners, guaranteed by the manufacturer to be compatible with the doors, frames, stops, panels, hardware, anchors and other items being fastened. For exposed fasteners (if any) provide oval Phillips head screws with finish matching the item to be fastened.
- D. Glazing Gaskets: For glazing factory-installed glass, and for gaskets which are factory-installed in "captive" assembly of glazing stops. Manufacturer's standard stripping of molded neoprene, complying with ASTM D 2000 (Designation 2BC415 to 3BC620), or molded PVC complying with ASTM C 509 Grade 4.

2.3. FABRICATION

- A. Sizes and Profiles: The required sizes for door and frame units, and profile requirements are shown on the drawings.
- B. Coordination of Fabrication: Field measure before fabrication, and show recorded measurements on final shop drawings.

- C. Complete the cutting, fitting, forming, drilling and grinding of all metal work prior to assembly. Remove burrs from cut edges, and ease edges and corners to a radius of approximately 1/64".
- D. No welding of doors or frames is acceptable.
- E. Maintain continuity of line and accurate relation of planes and angles. Secure attachments support at mechanical joints, with hairline fit at contacting members.
- F. Attachment of all hardware shall be made using machine screws which are supplied by the manufacturer.
- G. All holes shall be drilled and tapped using the recommended drill size for the tap required.
- H. Frames stops shall be applied stops, Minimum 5/8" high x Minimum 1 1/4" wide.
- I. Door attachment points shall be minimum of 1/8" thickness.
- J. Where hardware is to be attached to frame stop (Example: exit device strike, door closer shoe, O.H. stop & Etc.) a piece of solid bar stock aluminum sized to fill the frame stop void x 18" long shall be securely attached to the frame tube
- K. Where it is to practical to have solid bar stock reinforcement at attachment points, use "RIV-NUTS for attachment of hardware items.

2.4. FIBERGLASS REINFORCED POLYESTER FRP FLUSH DOORS

A. Materials and Construction

1. Construct 1-3/4" thickness doors of 6063 T5 aluminum alloy stiles and rails minimum 25/16" depth. Provide joinery of 3/8" diameter full width tie rods through extruded splines top and bottom as standard .125" tubular shaped stiles and rails reinforced to accept hardware as specified.
2. Extrude top and bottom rail legs for interlocking continuous rail rigidity weather bar. Lock face sheet material in place with extruded interlocking edges to be flush with aluminum stiles and rails.

3. Door face sheeting. Spec Lite 3, 120" thickness fiberglass reinforced polyester. SL17 FRP/Aluminum Hybrid Door with pebble-like embossed pattern. Color: As selected by Architect.
4. Core of Door Assembly: Minimum five pounds per cubic foot density poured-in-place polyurethane free of CFC and HCFC. Minimum "R" value of 11. Meeting stiles on pairs of doors, and weather bars with nylon brush weather-stripping.
5. Manufacture doors with cutouts for visor-lites, louvers or panels as scheduled. Factory furnish and install all glass, louvers and panels prior to shipment.
6. Premachine doors in accordance with templates from the specified hardware manufacturers and approved hardware schedule. Factory install hardware.
7. Furnish FRP doors with Flush Pull SL86, color as selected by Architect.
8. Provide door with adjustable bottom brush insert.

2.5 ALUMINUM FRAMING SYSTEMS

A. Tubular Framing

1. Framing system from the door manufacturer of the size and type shown. .125" minimum wall thickness and type 6063-T5 aluminum alloy .625" high applied stops with screws and weather-stripping. Frame members are to be box type with (4) four enclosed sides. Open back framing will not be acceptable.
2. Caulk joints before assembling frame members. Secure joints with fasteners and provide a hairline butt joint appearance. Prefit doors to frame assembly at factory prior to shipment. Field fabrication of framing using "stick" material is not acceptable.

3. Anchors appropriate for wall conditions to anchor framing to wall materials. A minimum of five anchors up to 7'4" on jamb members, and one additional anchor for each foot over 7'4". Secure head and sill members of transom, sidelites and similar conditions.

2.6 GLAZING

A. Design system for replacement of panels.

1. Manufacturer's standard flush glazing system of recessed channels and captive glazing gaskets or applied stops as shown.
2. Allow for thermal expansion on exterior units.

2.7 ALUMINUM FINISHES

A. Finish/color:

1. FRP Door: Selected from manufacturers standard colors.
2. Aluminum Frame: Anodized Aluminum-Finish to be determined from manufacturer standard finishes.

3. EXECUTION

3.1. Installation

- A. Comply with manufacturer's recommendations (maintain 3/16" gap between leafs of pairs of doors) and specifications for the installation of the doors and frames. Factory install hardware, louvers in doors. Factory assemble sidelites and transoms to the greatest extent possible.
- B. Set units plumb, level and true to line, without warp or rack of doors or frames. Anchor securely in place. Separate aluminum and other metal surfaces with bituminous coatings or other means as approved by architect.
- C. Set thresholds in a bed of mastic and backseal.
- D. Clean surfaces promptly after installation of doors and frames, exercising care to avoid damage to the protective coatings.

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- E. Ensure that the doors and frames will be without damage or deterioration (other than normal weathering) at the time of acceptance.

- F. Provide Owner with all adjustment tools and instruction sheets. Arrange an in-service session to Owner at Owner's convenience. Any workmanship which is defective or deficient shall be corrected to the Owner's satisfaction and at no additional cost to the Owner per Paragraph 1.8 Project Warranty of this specification.

END OF SECTION 08410

SECTION 08710 - DOOR HARDWARE

PART 1 - GENERAL

1.1 Refer to "General and Special Conditions", and "Instructions to Bidders", Division 1 of Specifications. Requirements of these Sections and the project drawings shall govern work in this section.

1.2 Work Included:

A. Furnish all items of Finish Hardware specified, scheduled, shown or required herein except those items specifically excluded from this section of the specification.

B. Related work:

1. Division 0 - Bidding and Contract Requirements
2. Division 1 - General Requirements
3. Section 06100 - Carpentry
4. Section 08112 - Hollow Metal Work
5. Section 08410 - FRP Entrance Doors-Aluminum Framing Systems

1.3 Quality Assurance

A. Requirements of Regulatory Agencies:

1. Furnish finish hardware to comply with the requirements of laws, codes, ordinances, and regulations of the governmental authorities having jurisdiction where such requirements exceed the requirements of the Specifications.
2. Furnish finish hardware to comply with the requirements of the regulations for public building accommodations for physically handicapped persons of the governmental authority having jurisdiction and to comply with Americans with Disabilities Act.
3. Provide hardware for fire-rated openings in compliance with NFPA 80 and state and local building code requirements. Provide only hardware that has been tested and listed by UL for types and sizes of doors required and complies with requirements of door and door frame labels.

B. Hardware Supplier:

1. Shall be an established firm dealing in contract builders' hardware. He must have adequate inventory, qualified personnel on staff and be located within 100 miles of the project. The distributor must be a factory-authorized dealer for all materials required. The supplier shall be or have in employment an Architectural Hardware Consultant (AHC).

C. Electrified Door Hardware Supplier:

1. Shall be an experienced door hardware supplier who has completed projects with electrified door hardware similar in material, design, and extent to that indicated for this project, whose work has resulted in construction with a record of successful in-service performance, and who is acceptable to manufacturer of primary materials.
2. Shall prepare data for electrified door hardware, including shop drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this project.
3. Shall have experience in providing consulting services for electrified door hardware installations.

D. Pre-installation Meeting:

1. Before hardware installation, General Contractor will request a hardware installation meeting be conducted on the installation of hardware; specifically that of locksets, closers, exit devices, overhead stops and coordinators. Manufacturer's representatives of the above products, in conjunction with the hardware supplier for the project, shall conduct the meeting. Meeting to be held at job site and attended by installers of hardware for aluminum, hollow metal and wood doors. Meeting to address proper coordination and installation of hardware, per finish hardware schedule for this specific project, by using installation manuals, hardware schedule, templates, physical product samples and installation videos.

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2. When any electrical or pneumatic hardware is specified this meeting shall also include the following trades/installers: Electrical, Security, Alarm systems and Architect.
3. Convene one week or more prior to commencing work of this Section.
4. The Hardware Supplier shall include the cost of this meeting in his proposal.

E. Manufacturer:

1. Obtain each type of hardware (latch and locksets, hinges, closers, etc.) from a single manufacturer, although several may be indicated as offering products complying with requirements.
2. Provide electrified door hardware from same manufacturer as mechanical door hardware, unless otherwise indicated.

1.4 Submittals:

A. Hardware Schedule

1. Submit Hardware Schedule as directed in Division 1.
2. Follow guidelines established in Door & Hardware Institute Handbook (DHI) Sequence and Format for the Hardware Schedule unless noted otherwise.
3. Schedule will include the following:
 - a. Door Index including opening numbers and the assigned Finish Hardware set.
 - b. Preface sheet listing category only and manufacturer's names of items being furnished as follows:

CATEGORY	SPECIFIED	SCHEDULED
Hinges	Manufacturer A	Manufacturer B
Lock sets	Manufacturer X	Manufacturer X
Kick Plates	Open	Manufacturer Z

- c. Hardware Locations: Refer to Article 3.1 B.2 Locations.
- d. Opening Description: Single or pair, number, room locations, hand, active leaf, degree of swing, size, door material, frame material, and UL listing.
- e. Hardware Description: Quantity, category, product number, fasteners, and finish.
- f. Headings that refer to the specified Hardware Set Numbers.
- g. Scheduling Sequence shown in Hardware Sets.
- h. Product data of each hardware item, and shop drawings where required, for special conditions and specialty hardware.
- i. Electrified Hardware system operation description.
- j. "Vertical" scheduling format only. "Horizontal" schedules will be returned "Not Approved."
- k. Typed Copy.
- l. Double-Spacing.
- m. 8-1/2 x 11 inch sheets
- n. U.S. Standard Finish symbols or BHMA Finish symbols.

B. Product Data:

- 1. Submit, in booklet form Manufacturers Catalog cut sheets of scheduled hardware.
- 2. Submit product data with hardware schedule.

C. Samples:

- 1. Prior to submittal of the final hardware schedule and prior to final ordering of finish hardware, submit one sample, if required, of each type of exposed hardware unit, finished as required and tagged with full description for coordination with schedule.
- 2. Samples will be returned to the supplier. Units, which are acceptable and remain undamaged through submittal, review and field comparison procedures may, after final check of operation, be used in the work, within limitations of keying coordination requirements.

D. Key Schedule:

1. Submit detailed schedule indicating clearly how the Owner's final keying instructions have been followed.
2. Submit as a separate schedule.

E. Electrified Hardware Drawings:

1. Submit elevation drawings showing relationship of all electrical hardware components to door and frame. Indicate number and gage of wires required.
 - a. Include wiring drawing showing point to point wire hook up for all components.
 - b. Include system operations descriptions for each type of opening; describe each possible condition.

F. Submit to General Contractor, the factory order acknowledgement numbers for the various hardware items to be used on the project. The factory order acknowledgement numbers shall help to facilitate and expedite any service that may be required on a particular hardware item. General Contractor shall keep these order acknowledgement numbers on file in the construction trailer.

1.5 Product Delivery, Storage, and Handling:

- A. Label each item of hardware with the appropriate door number and Hardware Schedule heading number, and deliver to the installer so designated by the contractor.

1.6 Existing Conditions:

- A. Where existing doors, frames and/or hardware are to remain, conditions, preparations and functions shall be field verified to confirm compatibility with specified hardware. Where any incompatibility is discovered, notify the General Contractor immediately and provide a suggested solution based on industry standard business practices.**

1.7 Warranties:

A. Refer to Division 1 for warranty requirements.

B. Special Warranty Periods:

1. Locksets shall carry manufacturer's 3-year warranty against manufacturing defects and workmanship.
2. Exit Devices shall carry manufacturer's 3-year warranty against manufacturing defects and workmanship.
3. Balance of items shall carry a manufacturer's 1-year warranty against manufacturing defects and workmanship.

C. During the warranty period, replace defective work, including labor, materials and other costs incidental to the work.

PART 2 - PRODUCT

2.1 Furnish each category with the products of only one manufacturer unless specified otherwise; this requirement is mandatory whether various manufacturers are listed or not.

2.2 Provide the products of manufacturer designated or if more than one manufacturer is listed, the comparable product of one of the other manufacturers listed. Where only one manufacturer or product is listed, it is understood that this is the owner's Building Standard and "no substitution" is allowed.

A. Locksets and Latchsets - Mortise Type:

1. Locksets shall be manufactured from heavy gauge steel, minimum lockcase thickness 1/8", containing components of steel with a zinc dichromate plating for corrosion resistance.
2. Locks are to have a standard 2 3/4" backset with a full 3/4" throw two-piece stainless steel mechanical anti-friction latchbolt. Deadbolt shall be a full 1" throw, constructed of stainless steel.

3. Lockcase shall be easily handed without chassis disassembly by removing handing screw on lockcase and installing in opposite location on reverse side. Changing of door hand bevel from standard to reverse hand shall be done by removing the lockcase scalp plate, and pulling and rotating the latchbolt 180 degrees.
4. Lock trim shall be through-bolted to the door to assure correct alignment and proper operation. Lever trim shall have external spring cage mechanism to assist in support of the lever weight. Thumb turns shall have "EZ" thumbturn equal to Schlage L583-363.
5. Function numbers are Schlage.
 - a. Schlage L9000
6. Lockset Trim:
 - a. Schlage 03N
7. Provide strikes with extended lips where required to protect trim from being marred by latch bolt. Provide strike lips that do not project more than 1/8" beyond door frame trim at single doors and have 7/8" lip to center at pairs of 1-3/4" doors.

B. Miscellaneous:

1. Furnish items not categorized in the above descriptions but specified by manufacturer's names in Hardware Sets.

C. Fasteners:

1. Furnish fasteners of the proper type, size, quantity and finish. Use machine screws and expansion shields for attaching hardware to concrete or masonry, and wall grip inserts at hollow wall construction. Furnish machine screws for attachment to reinforced hollow metal doors and frames and reinforced aluminum doors and frames. "TEK" type screws are not acceptable.
2. **Sex bolts will not be permitted on reinforced metal doors where blocking is specified.**

2.3 Finishes:

- A. Generally, Dull Chrome, US26D / BHMA 626. Provide finish for each item as indicated in sets.

2.4 Templates and Hardware Location:

- A. Furnish hardware made to template. Supply required templates and hardware locations to the door and frame manufacturers.
- B. Refer to Article 3.1 B.2, Locations, and coordinate with templates.

2.5 Cylinders and Keying:

- A. All cylinders for this project will be supplied by one supplier regardless of door type and location.
- B. The Finish Hardware supplier will meet with Owner's Rep and/or Owner to finalize keying requirements and obtain keying instructions in writing.
 - 1. Supplier shall include the cost of this service in his proposal.
- C. Provide a cylinder for all hardware components capable of being locked.
- D. Provide cylinders master and grand master keyed to an existing Schlage Primus FSIC (Full Size Interchangeable Core) system according to Owner's instructions. Provide change keys, master keys and grand master keys as required by Owner.

PART 3 - EXECUTION

3.1 Installation

A. General:

1. Install hardware according to manufacturer's installations and template dimensions. Attach all items of finish hardware to doors, frames, walls, etc. with fasteners furnished and required by the manufacture of the item.
2. Reinforced hollow metal doors and frames will be drilled and tapped for machine screws.

B. Field Quality Inspection:

1. Inspect material furnished, its installation and adjustment, and instruct the Owner's personnel in adjustment, care and maintenance of hardware.
2. Locksets and exit devices shall be inspected after installation and after the HVAC system is in operation and balanced, to insure correct installation and proper operation.
3. Closers shall be inspected and adjusted after the HVAC system is in operation and balanced, to insure correct installation and proper operation.
4. A written report stating compliance, and also locations and kinds of noncompliance shall be forwarded to the Architect with copies to the Contractor, hardware distributor, hardware installer and building owner.

C. Technical and Warranty Information:

1. At the completion of the project, the technical and warranty information coalesced and kept on file by the General Contractor shall be given to the Owner or Owner's Agent. In addition to both the technical and warranty information, all factory order acknowledgement numbers supplied to the General Contractor during the construction period shall be given to the Owner or Owner's Agent. The warranty information and factory order acknowledgement numbers

shall serve to both expedite and properly execute any warranty work that may be required on the various hardware items supplied on the project.

2. Submit to General Contractor, two copies each of parts and service manuals and two each of any special installation or adjustment tools. Include for locksets, exit devices, door closers and any electrical products.

3.2 Hardware Sets:

Hardware Group No. 01..

C010

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
1	EA	CONT. HINGE	224XY TWP CON		711	IVE
1	EA	STOREROOM LOCK	L9080J 03N RX		626	SCH
1	EA	SURFACE CLOSER	4111 SCUSH MC ST-1586		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	SET	GASKETING	429AA-S SEC		AA	ZER
1	EA	DOOR SWEEP	39A ZAG SEC		A	ZER
1	EA	THRESHOLD	546A-223		A	ZER
1	EA	DOOR CONTACT	679-05		BLK	SCE

Hardware Group No. 02..

D037

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
2	EA	HINGE	3CB1HW 4.5 X 4.5 NRP		652	IVE
1	EA	ELECTRIC HINGE	3CB1HW 4.5 X 4.5 CON TW4		652	IVE
1	EA	EU MORTISE LOCK	L9092JEU 03N RX CON		626	SCH
1	EA	SURFACE CLOSER	4111 EDA MC		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS443		626	IVE
1	EA	ACCESS CONTROL	(BY SECURITY CONTRACTOR)			
1	EA	DOOR CONTACT	679-05		BLK	SCE

PRESENTING AN AUTHORIZED CREDENTIAL WILL UNLOCK THE OUTSIDE LEVER TO ALLOW ACCESS. FREE EGRESS IS ALWAYS ALLOWED.
 COORDINATE SYSTEM OPERATION AND COMPONENT LOCATIONS WITH THE OWNER, THE ARCHITECT AND ALL RELATED TRADES.

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Hardware Group No. 03..

D037ALT

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
5	EA	HINGE	3CB1HW 4.5 X 4.5 NRP		652	IVE
1	EA	ELECTRIC HINGE	3CB1HW 4.5 X 4.5 CON TW4		↗ 652	IVE
1	EA	CONST LATCHING BOLT	FB51T		630	IVE
1	EA	EU MORTISE LOCK	L9092JEU M63A RX CON		↗ 626	SCH
1	EA	COORDINATOR	COR X FL		628	IVE
2	EA	MOUNTING BRACKET	MB		689	IVE
2	EA	SURFACE CLOSER	4111 EDA MC		689	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS		630	IVE
2	EA	WALL STOP	WS443		626	IVE
1	EA	ACCESS CONTROL	(BY SECURITY CONTRACTOR)		↗	
2	EA	DOOR CONTACT	679-05		↗ BLK	SCE

PRESENTING AN AUTHORIZED CREDENTIAL WILL UNLOCK THE OUTSIDE LEVER TO ALLOW ACCESS. FREE EGRESS IS ALWAYS ALLOWED.

COORDINATE SYSTEM OPERATION AND COMPONENT LOCATIONS WITH THE OWNER, THE ARCHITECT AND ALL RELATED TRADES.

Hardware Group No. 04..

D042A

D042B

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
8	EA	HINGE	3CB1HW 5 X 4.5 NRP		652	IVE
1	EA	MANUAL FLUSH BOLT	FB458 (36" TOP)		626	IVE
1	EA	STOREROOM LOCK	L9080J M63A		626	SCH
1	EA	OH STOP	90S J		652	GLY
1	EA	WALL STOP	WS443		626	IVE

END OF SECTION

SECTION 09900 - PAINTING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

- A. Attention is directed to Division 0, Bidding and Contract Requirements, and to Division 1, General Requirements, which are hereby made a part of this Section.

1.02 DESCRIPTION OF WORK:

- A. The extent of painting work is shown on the drawings and schedules, and as herein specified. Note: Multiple colors, both field and accent colors will be used at each area or space.
 - 1. Coating systems for epoxy: Boiler Room walls, HM doors and frames and where else noted on drawings, exterior steel (FRP door lintel, existing grilles, etc., refer to Spec Section 09970 High Performance Coatings.
- B. The work includes painting and finishing of interior exposed items and surfaces throughout the project, except as otherwise indicated.
- C. The work includes field painting of exposed bare and covered pipe and ducts (excluding color coding), and of hangers, exposed steel and iron work, and primed metal surfaces of equipment installed under the mechanical and electrical work, except as otherwise indicated.
- D. Surface preparation, priming and coats of paint specified are in addition to shop-priming and surface treatment specified under other sections of work.
- E. "Paint" as used herein means all coating systems materials, including primers, emulsions, enamels, stains, sealers and fillers and other applied materials, whether used as prime, intermediate or finish coats.
- F. Paint all exposed surfaces in areas designated "paint" in "schedules," except where the natural finish of the material is specifically noted as a surface not to be painted. Where items or surfaces are not specifically mentioned, paint them the same as adjacent similar materials or areas.

1.03 PAINTING NOT INCLUDED:

- A. The following categories of work are not included as part of the field-applied finish work, or are included in other sections of these specifications:
1. Shop Priming: Unless otherwise specified, shop priming of ferrous metal items is included under the various sections for structural steel, miscellaneous metal, hollow metal work, and similar items.
 2. Pre-Finished Items: Unless otherwise indicated, do not include painting when factory-finishing or installer finishing is specified for such items as (but not limited to) metal toilet enclosures, acoustic materials, casework, finished mechanical and electrical equipment including light fixtures, switchgear and distribution cabinets, but not light or power panels where exposed elevator entrance frames, doors and equipment.
 3. Concealed surfaces: Unless otherwise indicated, painting is not required on surfaces such as walls or ceilings in concealed areas and generally inaccessible areas, foundation spaces, furred areas, utility tunnels, pipe spaces, duct shafts and elevator shafts.
 4. Finished Metal Surfaces: Metal surfaces of anodized aluminum, stainless steel, chromium plate, copper, bronze and similar finished materials will not require finish painting, unless otherwise indicated.
 5. Operating Parts and Labels:
 - a. Moving parts of operating units, mechanical and electrical parts such as valve and damper operators, linkages, sinkages, sensing devices, motor and fan shafts will not require finish painting unless otherwise indicated.
 - b. Do not paint over any code-required labels, such as Underwriters', Laboratories and Factory Mutual, or any equipment identification, performance rating, name or nomenclature plates.

1.04 SUBMITTALS:

A. Product Data:

1. For information only, submit PDF copy of manufacturer's technical information including paint label analysis and application instructions for each materials proposed for use. Transmit a copy of each manufacturer's instructions to the paint Applicator.

B. Samples:

1. Submit samples for Architect's review of color and texture only. Compliance with all other requirement is the Exclusive responsibility of the Contractor. Provide a listing of the materials and application for each coat of each finish sample.
 - a. On 12" x 12" hardboard, provide two samples of each color and material with texture to simulate actual conditions. Resubmit each samples as requested until acceptable sheen, color and texture is achieved.
 - b. On actual wood surfaces, provide two 4" x 8" samples of each stained wood finish as required. Label and identify each as to location and application.

1.05 DELIVERY AND STORAGE:

A. Deliver all materials to the job site in original, new and unopened packages and containers bearing manufacturer's name and label, and the following information:

1. Name or title of material.
2. Fed. Spec. Number, if applicable.
3. Manufacturer's stock number and date of manufacturer.
4. Manufacturer's name.
5. Contents by volume, for major pigment and vehicle.
6. Constituents.
7. Thinning instructions.
8. Application instructions.
9. Color name and number.

1.06 JOB CONDITIONS:

- A. Apply water-base paints only when the temperature of surfaces to be painted and the surrounding air temperatures are between 50 degrees F. and 90 degrees F., unless otherwise permitted by the paint manufacturer's printed instructions.
- B. Apply solvent-thinned paints only when the temperature of surfaces to be painted and the surrounding air temperatures are between 45 degrees F. and 95 degrees F. unless otherwise permitted by the paint manufacturer's printed instructions.
- C. Do not apply paint in snow, rain, fog or mist; or when the relative humidity exceed 85% or to damp or wet surfaces; unless otherwise permitted by the paint manufacturer's printed instructions.
 - 1. Painting may be continued during inclement weather only if the areas and surfaces to be painted are enclosed and heated within the temperature limits specified by the paint manufacturer during application and drying periods.

PART 2 - PRODUCTS

2.01 COLORS AND FINISHES:

- A. Prior to beginning work, the Architect will furnish color selections for surfaces to be painted. Colors will vary from wall to ceiling and from room to room. Final selection for gloss level will be by Architect and may not necessarily be the same as scheduled.
 - 1. Use representative colors when preparing samples for review.
 - 2. Final acceptance of colors will be from samples applied on the job.
- B. Color Pigments: Pure, non-fading, applicable types to suite the substrates and service indicated.
- C. Paint Coordination: Provide finish coats which are compatible with prime paints used. Review other sections of these specifications in which prime paints are to be provided to ensure compatibility of total coatings system for various substrates. Upon request from other trades, furnish information on characteristics of finish materials proposed for use, to ensure compatible prime coats are used. Provide barrier

coats over incompatible primers or remove and reprime as required. Notify the Architect in writing of any anticipated problems using specified coating systems with substrates primed by others.

2.02 INTERIOR PAINTING SCHEDULE:

- A. Concrete Masonry Surfaces (Semi-Gloss) (Vinyl Acrylic Latex System)
1. Primer: Vinyl Acrylic Block Filler
S-W: ProMar Interior/Exterior Block Filler, B25W25.
PPG: Aquapon7 WB Polyamide-Epoxy #98-Line Series
P & L: Prohide interior/exterior block filler Z8485
Benjamin Moore: Moorcraft interior and exterior block filler #173
 2. Finish Coats: Vinyl Acrylic Semi-Gloss Enamel (25-35 units at 60 degrees F.), 1.5 DFT/coat.
S-W: (2 coats) ProMar 200 Interior Latex Semi-Gloss Enamel, B31W200.
PPG: (1 coat) Aquapon7 WB Polyamide-Epoxy #98 - Line Series
- B. Metal-Ferrous (Semi-Gloss): (Alkyd Enamel System, Maximum VOC content 450 grams/liter) (exposed roof deck)
1. Primer: Modified Alkyd Resin Primer, 3 mils DFT/coat
S-W: Kem Kromik Universal Metal Primer, B50Z
PPG: Speedhide7 Inhibitive Primer #6-208 red or #6-212 white
 2. Finish Coats: Alkyd Enamel, Semi-Gloss (40-50 units at 60 degrees F.) 3.0 mils DFT/coat.
S-W: (2 coats) Alkyd Enamel, Semi-Gloss B34W200.
PPG: (2 coats) Speedhide7 Alkyd Semi-Gloss #6-1110 Series
- C. Metal - Galvanized (Semi-gloss): Code #5.13 (Acrylic Latex System) (exposed roof deck)
1. Finish Coats: 100 percent Acrylic, Waterborne, Semi-Gloss (30-40 units at 60 degrees F.) 3.0 mils DFT/coat.
S-W: (2 coats) DTM Acrylic coating, B66W200.
PPG: (2 coats) Pitt-TechJ Open Pack DTM Waterborne Satin Enamel #90-474 Series
P & L: (2 coats) Enducryl S/G DTM Z6600 Series
Benjamin Moore: (2 coats) DTM acrylic semi-gloss (M2a)

D. Gypsum Board (Flat): (Acrylic Latex System)

1. Primer: Vinyl Acrylic Latex, 1.1 mils DFT/coat
S-W: ProMar 200 Latex Wall Primer, B28W200.
PPG: Speedhide7 Latex Primer-Sealer #6-2
P & L: Prohide gold high hold out wall primer, Z8165
Benjamin Moore: Moorcraft undercoater (284)
2. Finish Coats: Vinyl Acrylic Flat (0-5 units at 90 degrees F.), 1.4 mils DFT/coat.
S-W: (2 coats) ProMar 200 Latex Flat Wall Paint, B30W200.
PPG: (2 coats) Speedhide7 Acrylic Latex Flat Wall Paint #6-70 Series
P & L: (1 or 2 coats) Prohide gold flat Z8100 Series
Benjamin Moore: (2 coats) Moorcraft latex flat (275)

E. Gypsum Board (Semi-Gloss): (Acrylic Latex System)

1. Primer: Vinyl Acrylic Latex, 1.1 mils DFT/coat
S-W: ProMar 200 Latex Wall Primer, B28W200.
PPG: Speedhide7 Latex Primer-Sealer #6-2
P & L: Prohide gold high hold out wall primer, Z8165.
Benjamin Moore: Moorcraft undercoater (284)
2. Finish Coats: Vinyl Acrylic Semi-Gloss (25-35 units at 60 degrees F.), 1.5 mils DFT/coat.
S-W: (2 coats) ProMar 200 Semi-Gloss Enamel, B31W200.
PPG: (2 coats) Speedhide7 Acrylic Latex Semi-Gloss Enamel #6-510 Series
P & L: Prohide gold S/G, Z8200 Series
Benjamin Moore: (2 coats) Moorcraft latex semi-gloss (276)

F. Painted Woodwork:

Two Coats of Interior Semi-Gloss Alkyd Enamel Over an alkyd Undercoater.

1. PPG Paints; 17-956 PPG Seal Grip® Interior Alkyd Enamel Undercoater
2. PPG Paints; 6-1110XI SPEEDHIDE Interior Wall and Trim Semi-Gloss Oil

G. Stained Woodwork:

Two Coats of Semi-Gloss Oil Polyurethane over an Oil based Stain and One Coat of Sanding Sealer.

1. PPG Paints; OLYMPIC 41570 Premium Interior Fast Dry Wood Stain Oil Based
2. PPG Paints; Deft DFT60 Interior Oil Based Sanding Sealer
3. PPG Paints; Deft DFT224 Interior Semi-Gloss Oil Polyurethane

PART 3 - EXECUTION

3.01 INSPECTION:

- A. Applicator must examine the areas and conditions under which painting work is to be applied and notify the Construction Manager in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the Applicator.
- B. Starting of painting work will be construed as the Applicator's acceptance of the surfaces and conditions within any particular area.
- C. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions otherwise detrimental to the formation of a durable paint film.

3.02 SURFACE PREPARATION:

- A. General:
 1. Perform preparation and cleaning procedure in strict accordance with the paint manufacturer's instructions and as herein specified for each particular substrate condition.
 2. Remove all hardware, hardware accessories, machined surfaces, plates, lighting fixtures, and similar items in place and not to be finish-painted, or provide surface-applied protection prior to surface preparation and painting operations. Remove, if necessary for the complete painting of the items and adjacent surfaces. Following completion of painting of each space or area, reinstall the removed items by workmen skilled in the trades involved.

3. Clean surfaces to be painted before applying paint or surface treatments. Remove oil and grease prior to mechanical cleaning. Program the cleaning and painting so that contaminants from the cleaning process will not fall onto wet, newly-painted surfaces.

B. Cementitious Materials:

1. Prepare cementitious surfaces to be painted by removing all efflorescence, chalk, dust, grease, oils, and by roughening as required to remove glaze, conforming to SSPC13.
2. Determine the alkalinity and moisture content of the surfaces to be painted by performing appropriate tests. If the surfaces are found to be sufficiently alkaline to cause blistering and burning of the finish paint, correct this condition before application of paint. Do not paint over surfaces where the moisture content exceeds that permitted by the manufacturer's printed directions.

C. Wood:

1. Clean wood surfaces to be painted of all dirt, oil, or other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sandpaper smooth those finished surfaces exposed to view and dust off. Scrape and clean small, dry, seasoned knots and apply a thin coat of white shellac or other recommended knot sealer before application of the priming coat. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood filler. Sandpaper smooth when dried.
2. Prime, stain, or seal wood required to be job painted immediately upon delivery to job. Prime edges, ends, faces, undersides, and backsides of such wood, including cabinets, counters, cases, paneling, etc.
3. When transparent finish is required, use spar varnish for backpriming.
4. Seal tops, bottoms, and cut-outs of unprimed wood doors with a heavy coat of varnish or equivalent sealer immediately upon delivery to job.

D. Ferrous Metals:

1. Clean ferrous surfaces, which are not galvanized or shop-coated of oil, grease, dirt, loose mill scale and other foreign substances by solvent or mechanical cleaning conforming to SSPC SP-1 and NACE-No. 4, SSPC SP-2, SSPC SP-3 or SSPC SP-7 (brush off blast cleaning).

E. Galvanized Surfaces:

1. Clean free of oil and surface contaminants with an acceptable non-petroleum based solvent per SSPC SP-1.

3.03 MATERIALS PREPARATION:

- A. Mix and prepare painting materials in accordance with manufacturer's directions.
- B. Store materials not in actual use in tightly covered containers. Maintain containers used in storage, mixing and application of paint in a clean condition, free of foreign materials and residue.
- C. Stir materials before application to produce a mixture of uniform density and stir as required during the application of the materials. Do not stir surface film into the material. Remove the film and if necessary, strain the material before using.

3.04 APPLICATION:

A. General:

1. Apply paint in accordance with the manufacturer's directions. Use applicators and techniques best suited for the substrate and type of material being applied.
2. Apply additional coats when undercoats, stains or other conditions show through the final coat of paint, until the paint film is of uniform finish, color and appearance. Give special attention to insure that all surfaces, including edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.

3. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Paint surfaces behind permanently-fixed equipment or furniture with prime coat only before final installation of equipment.
4. Paint interior surfaces of ducts where visible through registers or grilles with a flat, non-specular black paint.
5. Paint the back sides of access panels and removable or hinged covers to match the exposed surfaces.
6. Sand lightly between each succeeding enamel or varnish coat.
7. Omit the first coat (primer) on metal surfaces which have been shop-primed and touch-up painted, unless otherwise indicated.

B. Scheduling Painting:

1. Apply the first-coat material to surfaces that have been cleaned, pretreated or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
2. Allow sufficient time between successive coatings to permit proper drying. Do not recoat until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and the application of another coat of paint does not cause lifting or loss of adhesion of the undercoat.

C. Minimum Coating Thickness:

1. Apply each material at not less than the manufacturer's recommended spreading rate to establish a total dry film thickness as indicated or, if not indicated, as recommended by coating manufacturer.

D. Mechanical and Electrical Work:

1. Painting of mechanical and electrical work is limited to those items exposed in occupied spaces and includes all exterior exposed work.

E. Prime Coats:

1. Apply a prime coat of material which is required to be painted or finished, and which has not been prime coated by others.
2. Recoat primed and sealed surfaces where there is evidence of suction spots or unsealed areas in first coat, to assure a finish coat with no burn-through or other defects due to insufficient sealing.

F. Pigmented (Opaque) Finishes:

1. Completely cover the provide an opaque, smooth surface of uniform finish, color, appearance and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness or other surface imperfections will not be acceptable.

G. Transparent (Clear) Finishes:

1. Use multiple coats to produce glass-smooth surface film of each luster. Provide a finish free of laps, cloudiness, color, irregularity, runs, brush marks, orangpeel, nail holes, or other surface imperfections.
2. Provide satin finish for final coats, unless otherwise indicated.

H. Completed Work:

1. Match approved samples for color, texture and coverage. Remove, refinish or repaint work not in compliance with specified requirements.

3.05 CLEAN-UP AND PROTECTION:

A. Clean-up:

1. During the progress of the work, remove from the site all discarded paint materials, rubbish, cans and rags at the end of each work day.
2. Upon completion of painting work, clean window glass and other paint-spattered surfaces. Remove spattered paint by proper methods of washing and scraping, using care no to scratch or otherwise damage finished surfaces.

B. Protection:

1. Protect work of other trades, whether to be painted or not, against damage by painting and finishing work. Correct any damage by cleaning, repairing or replacing and repainting, as acceptable to the Architect.
2. Provide "Wet Paint" signs as required to protect newly-painted finishes. Remove temporary protective wrappings provided by others for protection of their work, after completion of painting operations.
3. At the completion of work of other trades, touch-up and restore all damaged or defaced painted surfaces.

END OF SECTION 09900

SECTION 09970 - TNEMEC COATING SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Coating systems for new hollow doors and frames, exterior existing steel lintels above new FRP doors, existing grilles, Boiler Room walls.

1.2 REFERENCES

- A. ASTM D 16 - Terminology Relating to Paint, Varnish, Lacquer and Related Products.
- B. SSPC-SP 2 - Hand Tool Cleaning.
- C. SSPC-SP 3 - Power Tool Cleaning.
- D. SSPC-SP 6/NACE 3 - Commercial Blast Cleaning.
- E. SSPC-SP 11 - Power Tool Cleaning to bare metal.
- F. SSPC-SP 13/NACE 6 Surface Preparation of Concrete
- G. ICRI - Concrete Surface Preparation Standards

1.3 DEFINITIONS

- A. Definitions of Painting Terms: ASTM D 16, unless otherwise specified.
- B. Dry Film Thickness (DFT): Thickness of a coat of paint in fully cured state measured in mils (1/1000 inch).
- C. Concrete Surface Standard (CSP): Standard for roughness of the surface profile of the concrete measured 1-9 with 9 being the roughest measured with a visual mold.

1.4 SUBMITTALS

- A. Comply with Section 01340 - "Shop Drawings, Product Data and Samples".

- B. Product Data: Submit manufacturer's product data for each coating, including generic description, complete technical data, surface preparation and application instructions.
- C. Color Samples: Submit manufacturer's color samples showing full range of standard colors.
- D. Manufacturer's Quality Assurance: Submit manufacturer's certification that coatings comply with specified requirements and are suitable for intended application.
- E. Applicator's Quality Assurance: Submit list of a minimum of 5 completed projects of similar size and complexity to this Work. Include for each project:
 - 1. Project name and location.
 - 2. Name of owner.
 - 3. Name of contractor.
 - 4. Name of architect.
 - 5. Name of coating manufacturer.
 - 6. Approximate area of coatings applied.
 - 7. Date of completion.
- F. Warranty: Submit manufacturer's standard warranty.

1.5 QUALITY ASSURANCE

- A. Manufacturer's Qualifications:
 - 1. Specialize in manufacture of coatings with a minimum of 10 years successful experience.
 - 2. Able to demonstrate successful performance on comparable projects.
 - 3. Single Source Responsibility: Coatings and coating application accessories shall be products of a single manufacturer.
- B. Applicator's Qualifications:
 - 1. Experienced in application of specified coatings for a minimum of 5 years on projects of similar size and complexity to this Work.
 - 2. Applicator's Personnel: Employ persons trained for application of specified coatings.
- C. Preapplication Meeting: Convene a pre-application meeting [2] two weeks before start of application of coating systems. Require attendance of parties directly affecting work of this section, including Contractor, Architect, applicator and manufacturer's representative. Review the following:

1. Environmental requirements.
2. Protection of surfaces not scheduled to be coated.
3. Surface preparation.
4. Application.
5. Repair.
6. Field quality control.
7. Cleaning.
8. Protection of coating systems.
9. One-year inspection.
10. Coordination with other work.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying:
1. Coating or material name.
 2. Manufacturer.
 3. Color name and number.
 4. Batch or lot number.
 5. Date of manufacture.
 6. Mixing and thinning instructions.
- B. Storage:
1. Store materials in a clean dry area and within temperature range in accordance with manufacturer's instructions.
 2. Keep containers sealed until ready for use.
 3. Do not use materials beyond manufacturer's shelf life limits.
- C. Handling: Protect materials during handling and application to prevent damage or contamination.

1.7 ENVIRONMENTAL REQUIREMENTS

- A. Weather:
1. Air and Surface Temperatures: Prepare surfaces and apply and cure coatings within air and surface temperature range in accordance with manufacturer's instructions.
 2. Surface Temperature: Minimum of 5 degrees F (3 degrees C) above dew point.
 3. Relative Humidity: Prepare surfaces and apply and cure coatings within relative humidity range in accordance with manufacturer's instructions.

- B. Ventilation: Provide ventilation during coating evaporation stage in confined or enclosed areas in accordance with manufacturer's instructions.
- C. Dust and Contaminants:
 - 1. Schedule coating work to avoid excessive dust and airborne contaminants.
 - 2. Protect work areas from excessive dust and airborne contaminants during coating application and curing.

PART 2 PRODUCTS

2.1 MANUFACTURER

- A. Tnemec Company Incorporated, 6800 Corporate Drive, Kansas City, Missouri 64120-1372. Toll Free (800) 863-6321. Phone (816) 483-3400. Fax (816) 483-3969. Web Site www.tnemec.com. Contact Trent McNutt, Cell: (419) 346-8795. Office: (614) 850-8160.

2.2 NEW PAINTED INTERIOR STEEL (METAL DOORS, METAL FRAMES, ETC.)

- A. Chemical Exposure, Physical Abuse:
 - 1. System Type: Modified aromatic polyurethane/waterborne epoxy-amine adduct/ceramic modified waterborne aliphatic polyurethane.
 - 2. Surface Preparation: Clean, dry and free of oil, grease and other contaminants.
 - 3. Prime Coat: By manufacturer of doors and frames.
 - 4. Intermediate Coat: Tnemec Series 297 enviro-glaze at 2.0 to 3.0 mils DFT.
 - 5. Finish Coat: Tnemec Series 297 enviro-glaze at 2.0 to 3.0 mils DFT.

2.3 INTERIOR WALLS - EXISTING CONCRETE MASONRY UNITS-BOILER ROOM

- A. Chemical Exposure, Physical Abuse:
 - 1. System Type: Waterborne cementitious acrylic/waterborne acrylic epoxy.
 - 2. Surface Preparation: Clean and dry.

Tnemec

- 1. Prime Coat: Tnemec Series 130 envirofill at manufacturers recommended spreading rate.
- 2. Intermediate Coat: Tnemec Series 113 H.B. tne-me-tufcoat at 4.0 to 6.0 mils DFT.
- 3. Finish Coat: Tnemec Series 113 H.B. tne-me-tufcoat at 4.0 to 6.0 mils DFT.

2.4 PAINTED EXTERIOR EXPOSED STEEL

A. Chemical Exposure, Physical Abuse:

1. System Type: Surface Tolerant High Solids Epoxy / Polyester Acrylic Polyurethane System.
2. Surface Preparation: SSPC-SP 2/3 hand/power tool cleaning.

Tnemec

Surface Preparation: SSPC-SP2 Hand Tool Cleaning / SSPC SP-3

1. Prime Coat: Tnemec Series 1 Omnithane at 2.0 to 3.0 mils DFT.
2. Intermediate Coat: Series V69 Hi-Build Epoxoline II at 4.0-6.0 mils DFT
3. Finish Coat: Tnemec Series 1094 Endura-Shield at 2.0-5.0 mils DFT

2.5 ACCESSORIES

A. Coating Application Accessories:

1. Accessories required for application of specified coatings in accordance with manufacturer's instructions, including thinners.
2. Products of coating manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

- ##### A.
- Examine areas and conditions under which coating systems are to be applied. Notify the General Contractor in writing of areas or conditions not acceptable. Do not begin surface preparation or application until unacceptable areas or conditions have been corrected.

3.2 PROTECTION OF SURFACES NOT SCHEDULED TO BE COATED

- ##### A.
- Protect surrounding areas and surfaces not scheduled to be coated from damage during surface preparation and application of coatings.
- ##### B.
- Immediately remove coatings that fall on surrounding areas and surfaces not scheduled to be coated.

3.3 SURFACE PREPARATION OF STEEL

- A. Prepare steel surfaces in accordance with manufacturer's instructions.
- B. Fabrication Defects:
 - 1. Correct steel and fabrication defects revealed by surface preparation.
 - 2. Remove weld spatter and slag.
 - 3. Round sharp edges and corners of welds to a smooth contour.
 - 4. Smooth weld undercuts and recesses.
 - 5. Grind down porous welds to pinhole-free metal.
 - 6. Remove weld flux from surface.
- C. Ensure surfaces are dry.
- D. Interior Steel Surfaces, Moderate to Severe Exposure: Remove visible oil, grease, dirt, dust, mill scale, rust, paint, oxides, corrosion products and other foreign matter in accordance with SSPC-SP6.
- E. Abrasive Blast-Cleaned Surfaces: Coat abrasive blast-cleaned surfaces with primer before visible rust forms on surface. Do not leave blast-cleaned surfaces uncoated for more than 8 hours.
- F. Primer: Prepare field primer to receive field coat in accordance with manufacturer's instructions.

3.4 SURFACE PREPARATION OF CONCRETE/MASONRY

- A. Prepare concrete surfaces in accordance with manufacturer's instructions.
- B. Defects
 - 1. Remove spalled or deteriorated areas.
 - 2. Remove deteriorated mortar joints in masonry. Tuckpoint and cure per manufacturer's recommendations.
- C. Ensure surfaces are dry.
- D. Remove visible oil, grease, dirt, dust, rust stains, paint, and other foreign matter in accordance with SSPC - SP13/NACE 6 surface preparation of concrete.
- E. Primer: Prepare field primer to receive field coat in accordance with manufacturer's instructions.

3.5 APPLICATION

- A. Apply coatings in accordance with manufacturer's instructions.
- B. Mix and thin coatings, including multi-component materials, in accordance with manufacturer's instructions.
- C. Keep containers closed when not in use to avoid contamination.
- D. Do not use mixed coatings beyond pot life limits.
- E. Use application equipment, tools, pressure settings and techniques in accordance with manufacturer's instructions.
- F. Uniformly apply coatings at spreading rate required to achieve specified DFT.
- G. Apply coatings to be free of film characteristics or defects that would adversely affect performance or appearance of coating systems.
- H. Stripe paint with brush critical locations on steel such as welds, corners and edges using specified primer.

3.6 REPAIR

- A. Materials and Surfaces Not Scheduled To Be Coated: Repair or replace damaged materials and surfaces not scheduled to be coated.
- B. Damaged Coatings: Touch-up or repair damaged coatings. Touch-up of minor damage shall be acceptable where result is not visibly different from adjacent surfaces. Recoat entire surface where touch-up result is visibly different, either in sheen, texture or color.
- C. Coating Defects: Repair in accordance with manufacturer's instructions coatings that exhibit film characteristics or defects that would adversely affect performance or appearance of coating systems.

3.7 FIELD QUALITY CONTROL

- A. Inspector's Services:
 - 1. Verify coatings and other materials are as specified.
 - 2. Verify surface preparation and application are as specified.

3. Verify DFT of each coat and total DFT of each coating system are as specified using wet film and dry film gauges.
4. Coating Defects: Check coatings for film characteristics or defects that would adversely affect performance or appearance of coating systems.
 - a. Check for holidays on interior steel immersion surfaces using holiday detector.
5. Report:
 - a. Submit written reports describing inspections made and actions taken to correct nonconforming work.
 - b. Report nonconforming work not corrected.
 - c. Submit copies of report to Architect, Owner's Representative and General Contractor.

B. Manufacturer's Field Services: Manufacturer's representative shall provide technical assistance and guidance for surface preparation and application of coating systems.

3.8 CLEANING

- A. Remove temporary coverings and protection of surrounding areas and surfaces.

3.9 PROTECTION OF COATING SYSTEMS

- A. Protect surfaces of coating systems from damage during construction.

3.10 ONE-YEAR INSPECTION

- A. Owner will set date for one-year inspection of coating systems.
- B. Inspection shall be attended by Owner, Contractor, Architect and manufacturer's representative.
- C. Repair deficiencies in coating systems as determined by Architect in accordance with manufacturer's instructions.

END OF SECTION 09970

**SECTION 22 00 05
BASIC PLUMBING REQUIREMENTS**

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. This section applies to all sections of Division 22.
- B. Drawings and general provisions of the contract, including Division 00 and Division 01 specification sections, apply to work of this section.
- C. Provide all items, articles, materials, operations or methods listed, mentioned or scheduled on drawings and/or herein, including all labor, materials, equipment and incidentals necessary and required for their completion.
- D. The items in this section are supplementary to the requirements set forth in other portions of the specifications as indicated under item "A" above.

1.02 APPLICATION

- A. This section applies to all plumbing work. The contractors involved shall check all sections of the specifications in addition to the particular section covering their specific trade. Each distinct section of the specifications aimed for one trade may have detailed information with regards to other trades, therefore, it is imperative that all sections be reviewed to get a complete picture of all other trades' functions and work required.
- B. The plumbing contractor is responsible for the installation and operation of the plumbing systems.
- C. The plumbing contractor is responsible for receiving, unloading and placement of all of the owner provided equipment.

1.03 INSPECTION OF SITE

- A. Each Contractor shall visit the site prior to bid submission to determine all existing conditions that may affect his work and shall make appropriate allowances for such conditions in his bid. Failure to visit the site shall not be cause for a request for additional compensation later in the project during construction.
- B. The submitting of a proposal implies that the contractor has visited the site and understands the conditions under which the work must be conducted.
- C. Install Work in locations shown on Drawings, unless prevented by Project conditions.
- D. Prepare drawings showing proposed rearrangement of Work to meet Project conditions, including changes to Work specified in other Sections. Obtain permission of Owner before proceeding.

1.04 ALTERNATES AND SUBSTITUTIONS

- A. Refer to Division 01 - General Requirements for procedures to submit products by a Manufacturer that is not listed as approved equal in the Specifications.

1.05 DEVIATIONS FROM BASIS OF DESIGN MANUFACTURER

- A. Products identified within the schedules and details are used as the basis of design for laying out and coordinating with other trades such as structural, architectural, and electrical. Should Division 22 Contractor submit products by a manufacturer other than that indicated as Basis of Design in the Drawings, Contractor shall then be responsible for evaluating the impacts of the proposed Manufacturer's equipment, even if the Manufacturer is listed in the specifications as an approved equal. This includes the proposed Manufacturer's electrical, architectural and structural requirements and their subsequent impacts on the current design and coordination of any differing dimensions and clearances with all other trades. This evaluation shall be included as part of the proposed product submittal.

1.06 MATERIALS

- A. Plumbing equipment is to be furnished with motors, electrical controls and protective devices, and integral operating devices which are normally included by the manufacturer or required by the Contract Documents.
- B. The Plumbing trades shall provide all control wiring, 120 volts and less, for the equipment and devices furnished under Division 22 of these specifications, including all wiring devices, transformers, conduit, etc. Any conduits used for control wiring shall meet the specifications as indicated in Division 26.
- C. Power wiring 120 volts and greater shall be by the Electrical Trades.

1.07 CODES, PERMITS AND FEES

- A. Unless otherwise indicated, all required permits, licenses, inspections, approvals and fees for plumbing work shall be secured and paid for by the contractor. All work shall conform to all applicable codes, rules and regulations. Applicable publications listed in all sections of Division 22 shall be the latest issue, unless otherwise noted.
- B. Rules of local utility companies and municipalities shall be complied with. Check with the utility company and/or municipality supplying service to the installation and determine all devices including, but not limited to: meters, regulators, valves which will be required and include the cost of all such items in the proposal.
- C. All work shall be executed in accordance with the rules and regulations set forth in local and state codes. Prepare any detailed drawings or diagrams which may be required by the governing authorities. Where the drawings and/or specifications indicate materials or construction in excess of code requirements, the drawings and/or specifications shall govern.

1.08 MAINTENANCE

- A. Provide 8 hours of instruction to the owner's designated personnel in the maintenance and operation of equipment and systems.
- B. Provide complete maintenance and operating instructional manuals covering all mechanical equipment herein specified, together with parts lists. Maintenance and operating instructional manuals shall be job specific to this project. Generic manuals are not acceptable. Manuals shall be submitted in electronic format for review. When approved, four (4) bound hard copies and an indexed electronic PDF shall be provided to the owner. Maintenance and operating instructional manuals shall be provided when construction is approximately 75% complete.

1.09 WARRANTY AND GUARANTEE

- A. Contractor shall guarantee all work installed by him or his subcontractors to be free from defect in material and workmanship for a period of one year from date of final acceptance of the work, unless a longer period is stipulated under specific headings. Contractor shall repair or replace at no additional cost to the owner, any material or equipment developing defects and shall also make good any damage caused by such defects or the correction of defects. Repairs or replacements shall bear additional guarantee, as originally called for, dated from the final acceptance of the repair or replacement. This requirement shall be binding even though it will exceed product guarantees normally furnished by some manufacturers. Contractor shall submit his own and each equipment manufacturers written certificates, warranting that each item of equipment furnished complies with all requirements of the drawings and specifications. Note that guarantee shall run from date of final acceptance of the work, not from date of installation of a device or piece of equipment.

1.10 SUBMITTALS

- A. Shop drawings and samples shall be submitted in compliance with the Conditions of the Contract and Division 1 General Requirements.
- B. Contractor shall provide submittals where items are referred to by symbolic designation on the drawings. All submittals shall bear the same designation (plumbing piping, plumbing fixtures, etc.). Refer to other sections of the electrical specifications for additional requirements.

- C. Shop Drawings: Each piece of equipment shall be identified by the number shown in the schedules and by specification article number pertaining to the item. Shop drawings shall as a minimum be 1/4" equals 1' 0" scale, and shall be newly prepared by the Contractor and not reproduced from the Architect's drawings. Layouts shall be made for all floor plans including all ductwork, piping, electrical distribution and other mechanical equipment. Layouts shall show clearances of piping, ducts, etc., above floor.
- D. Contractor shall obtain Engineer's approval on all the work before any equipment is purchased, or any work installed. Contractor shall also secure approval of the Governmental Authorities having jurisdiction on all equipment and on the layout of the complete system.
- E. The Engineer's review and approval of shop drawings is a gratuitous assistance and in no way does it relieve the Contractor from responsibility for errors or omissions which may exist on the shop drawings. Where such errors or omissions are discovered later, they must be made good by the Contractor, without any additional cost to the Owner, irrespective of any approval by the Engineer.
 - 1. The Contractor shall incorporate with his shop drawings, a letter indicating all deviations from the plans and/or specifications. If in the opinion of the Architect, the deviations are not equal, the Contractor will be required to furnish the item as specified and as indicated on the drawings.
 - 2. Record documents shall be submitted in compliance with the requirements of the Specifications.
- F. Engineer WILL NOT REVIEW:
 - 1. Submittals not specified.
 - 2. Submittals not reviewed by Contractor; including Contractor stamp with signature comments.
 - 3. Submittals made after work is delivered to site and/or installed.
 - 4. Submittal resubmissions unless resubmission is required by Architect/Engineer.
- G. Installation of any item that requires submittal approval by the engineer shall be installed at the contractors risk. The contractor, at his cost, shall remove all work installed prior to approval of the submittal.
- H. The engineer will not be responsible for errors in quantities, or dimensions required to fit the job condition, details of fabrication to insure proper assembly at the job, or for errors resulting from errors in submittals.
- I. For underground piping, record dimensions and invert elevations of all piping, including all offsets, fittings, cathodic protection and accessories. Locate dimensions from benchmarks that will be preserved after construction is complete.

1.11 RECORD DRAWINGS

- A. Refer to Division 01 - General Requirements for procedures. All literature shall be furnished in accordance with requirements listed in Division 01.
- B. Contractor shall provide the following record drawings as part of the Project closeout document process:
 - 1. Contract Documents, specifications and submittals, indicating "As-Built" conditions and actual products selected for use.
 - 2. Product and Maintenance manuals for all equipment listed within this specification manual and in Contract Documents. Provide with parts lists as applicable.

1.12 QUALITY ASSURANCE

- A. Other referenced standards:
 - 1. Comply with referenced standards, guidelines, data sheets from various associations, including NFPA, ANSI, ASTM, ASME, ASHRAE.

PART 2 PRODUCTS

2.01 SLEEVES AND ESCUTCHEONS

- A. Provide sleeves wherever pipes pass through exterior wall and floors. Sleeves shall be schedule 40 steel pipe cut to length. Sleeves shall terminate flush with walls, partitions and ceilings in finished areas. All sleeves through floor shall extend 2" above floor. Provide cast brass nickel-plated escutcheons with positive catches on each visible sleeve penetration. Sleeves are to be sealed at each installation with a 3M approved sealant. The space between the inside of the sleeve and the outside of the pipe or conduit within the sleeve shall be sealed at each installation with a 3M approved sealant.

2.02 DIELECTRIC UNIONS

- A. Dielectric unions shall be used to connect dissimilar metals (such as steel and copper) to prevent electrolytic action.
- B. Dielectric waterway fittings shall be a copper-silicon casting conforming to UNS C87850, and UL classified in accordance with ANSI / NSF-61 for potable water service.

2.03 BUILDING ATTACHMENTS FOR PLUMBING WORK SUPPORTS

- A. General Requirements:
1. Provide building attachments required for supporting plumbing work, suitably selected and installed for the loads applied with a minimum additional safety factor of 3.
 2. Where specified attachments are not suitable for conditions, submit to Engineer for approval, proposal for alternate building attachments.
 3. If specially designed building attachments are required, retain the services of a licensed structural engineer to design such building attachments.
 4. Approved Manufacturers: Grinnell, or equivalent products by Michigan Hanger and B-Line.
 5. Provide supplemental trapeze supports where necessary. Design trapeze to support all trades. Coordinate loads, and supports with all trades. Size trapeze for maximum deflection of 1/64 of the span.
- B. Attachments to Structural Steel:
1. Support plumbing work from building structural steel where possible and approved. No welding or bolting to structural steel is permitted unless authorized by Architect. C-clamps are not permitted.
 - a. Center beam clamp - for loads over 120 lb.: Malleable center hung Grinnell Fig. 228.
 - b. Side beam clamp with retaining clips - for loads up to 120 lb.
- C. Cast in Place Concrete Inserts:
1. Provide inserts selected for applied load of present load plus 100% for future, and coordinated with concrete work. Except as detailed on drawings, inserts shall be Unistrut or Grinnell. Plan, lay out and coordinate setting of inserts prior to concrete pour. Use Grinnell Fig. 285 lightweight concrete insert for loads up to 400# or Grinnell Fig. 281 Wedge Type concrete insert for loads up to 1200#
- D. Drilled Insert Anchors:
1. Where plumbing work cannot be supported from structural steel, or cast in place concrete inserts, provide drilled concrete insert anchors. Submit for approval, project specific installation drawings for all loads over 100 lbs. Install inserts in web of beam if possible and approved. Insert depth shall not exceed two thirds the thickness of the concrete. Where existing concrete appears to be deteriorating, or where applied load at insert exceeds 1000 lbs., conduct test of concrete to determine derated capacity of insert. Anchors may be adhesive or expansion type up to 1000 lbs., and shall be adhesive type for loads over 1000 lbs.

PART 3 EXECUTION

3.01 GENERAL

- A. Existing piping: when encountered during the course of work, protect, brace and support existing piping where required for proper execution of the work.
- B. Interruption of existing active piping: when the course of work makes shut-down of services unavoidable, the plumbing contractor shall schedule the shut-down at such time as approved

by the owners representative, which will cause least interference with established operating routine.

- C. Arrange work accordingly, providing such fittings as duct transitions traps, valves and accessories necessary to complete all construction in an orderly fashion.
- D. Install all equipment in strict accordance all directions and recommendations furnished by the manufacturer.

3.02 INTERPRETATION OF CONTRACT DOCUMENTS

- A. Should there be discrepancy or a question of intent, refer matter to Architect/Engineer for decision before ordering any equipment or materials or before starting any related work.
- B. Drawings and Specifications are to be taken together. Work specified and not shown or work shown and not specified shall be performed or furnished as though mentioned in both Specifications and Drawings. If there is discrepancy between Drawings and Specifications as to quantity or quality to be provided, the greater quantity or better quality shall be provided.
- C. Minor items and accessories or devices reasonably inferable as necessary to complete and proper installation and operation of any system shall be provided by Contractor for such system whether or not specifically called for by Specifications or Drawings.
- D. Architect/Engineer may change location of any equipment 5' and any piping, ductwork, conduit, etc. 10' in any direction without extra charge, provided such changes are made before installation.
- E. Locations of items not definitely fixed by dimensions are approximate only and exact locations necessary to secure the best conditions and results shall be determined at the site and shall be subject to review and approval by Architect/Engineer.
- F. Follow drawings in laying out work, check drawings of other trades to verify spaces in which work will be installed, and maintain maximum headroom and space conditions at all points.
 - 1. Where headroom or space conditions appear inadequate, notify Architect or Owner's field representative before proceeding with installation.
 - 2. Pipe/duct rerouting and size changes shall be made at no additional cost to the Owner.
- G. Furnish advance information on locations and sizes of frames, boxes, sleeves and openings needed for the work, and also furnish information and shop drawings necessary to permit installation of other work without delay.
- H. Where there is evidence that parts of the Work specified in Divisions 21, 22, and 23 will interfere with other work, assist in working out space conditions to make satisfactory adjustments, revise and submit coordinated shop drawings.
- I. After review and without additional cost to the Owner, make minor modifications in the work as required by structural interferences, by interferences with work of other sections or for proper execution of the work.
- J. Work installed before coordinating with other work so as to cause interference with other work shall be changed and corrected without additional cost to the Owner.
- K. Drawings are diagrammatic in nature and are a graphic representation of requirements and shall be followed as closely as actual building construction will permit. All changes from the plans necessary to make the work conform to the building as constructed and to fit the work of other trades or to conform to rules of the Governmental Authorities having jurisdiction, NFPA, OSHA and the Owner's Insurance Underwriters, shall be made by the Contractor without extra cost to the Owner.
- L. The layout of the piping, ductwork, equipment, etc., as shown on the drawings shall be checked and exact locations shall be determined by the dimensions of the equipment approved and the Contractor shall obtain approval for the revised layout before the apparatus is installed. The Contractor shall field measure or consult existing record Architectural and Structural Drawings if available for all dimensions, locations of partitions, locations and sizes of structural supports, foundations, etc.

- M. Omission in the Drawings and/or Specifications of any items necessary for the proper completion or operation of the work outlined in this specification shall not relieve the Contractor from furnishing same without additional cost to the Owner.
- N. The Equipment Shop Drawings should be furnished to the installing Contractor by the purchasing Contractor before roughing in. Contractor shall not install any piping or ductwork for said equipment until he has received approved shop drawings for same.

3.03 ALTERATIONS IN PRESENT BUILDING AND SYSTEMS

- A. Contractor shall take particular note of the revisions and alterations to the existing systems, facilities and equipment due to the new construction as indicated on the Drawings and/or in Specification. Contractor shall remove, reroute or alter all services, ductwork, etc., as required or as indicated on the drawings.
- B. The Contractor shall maintain all services in the existing building. In case, where new service connections are to be made to existing services and service interruptions can in no way be avoided, the service interruptions shall be with the minimum of inconvenience to the Owner and the work shall be done at such time of any day, Saturday and Sunday included, and only as directed by the Owner or the Architect.

3.04 ACCESSIBILITY

- A. Do not locate traps, valves, controls, unions, cleanouts, etc. in any system at a location that will be inaccessible after construction is completed. Maintain accessibility for all components in plumbing systems.

3.05 ACCESS PANELS:

- A. Refer to Division 08 - Openings; Provide access doors in locations as required by applicable codes and as indicated below. Coordinate locations with architectural trades.
- B. Submit shop drawings for review before ordering panels. Where fire rating is required, furnish label doors compatible with fire rating of assembly.
- C. Contractor shall confer with other trades with respect to access panel locations, and shall wherever practical group valves, traps, dampers, etc. in such way as to be accessible from single panel and eliminate as many access panels as possible.
- D. Furnish access panels to access valves, traps, control valves or devices, dampers, damper motors, etc. Access panels shall be sized as necessary for ample access, or as indicated on drawings, but no smaller than 12" x 12" where devices are within easy reach of operator, and at least 24"x24" when operator must pass through opening in order to reach the devices. Architectural Trades shall install access panels coordinated with Mechanical Trades.
- E. Access panels in fire rated walls or ceiling must be U.L. labeled for intended use. Unless otherwise indicated on plans, access doors shall be hinged flush type steel framed panel, 14 gauge minimum for frame, and with anchor straps. Only narrow border shall be exposed. Hinges shall be concealed type. Locking device shall be flush type and screw driver operated. Metal surfaces shall be prime coated with rust-inhibitive paint. Panels shall be compatible with architectural adjacent materials.

3.06 PROTECTION OF ELECTRICAL EQUIPMENT

- A. Contractor shall furnish and install sheet metal drain pans beneath piping that is routed above electrical equipment and/or above the 3' access space in front of such equipment. Electrical equipment, for the purpose of addressing drain pan requirements, shall be defined as free-standing or wall-mounted switchgear, transformers, distribution boards or motor control centers.
 - 1. Drain pans shall be 20 gauge galvanized sheet metal with a minimum 4" high turned up edge. Bottom of drain pan shall slope to a single drainage point at $\frac{1}{8}$ " per foot. A 1" diameter clear plastic tube shall allow collected fluid to drain to the nearest open site floor drain. Secure plastic tubing to building structure only.
 - 2. Drain pan shall be hung from building structure with angle iron trapeze hangers (no hanger shall penetrate the drain pan). Consider drain pan to be full of water for hanger load calculations.

- 3. Drain pans shall include liquid detectors with alarms only if noted on the drawings. Liquid detectors shall be specified in Section 22 10 06 Plumbing Piping Specialties.
- B. Contractor shall include provisions to adjust the local lighting layout, at no extra cost to Owner, in order to accommodate any detrimental effect the drain pan has on the illumination of the electrical equipment and access space.

3.07 CUTTING, PATCHING AND DAMAGE TO OTHER WORK

- A. Refer to Division 01 - General Requirements.
- B. All cutting required shall be done by the contractor whose work is involved, without extra cost the owner. All patching and restoration including the furnishing and installation of access panels in ceiling, walls; etc. Within the building lines shall be done by the respective, responsible contractor. No cutting of structural steel, concrete, or wood shall be done without prior approval and explicit directions of the architect patched by the respective, responsible contractor.
- C. The contractor, under whose jurisdiction the work may fall, shall provide labor, material, and tools required to cut, repair, protect, cap, or relocate existing pipes, conduits, or utilities interfering with or uncovered during work, per regulations of the authorities having jurisdiction.

3.08 EXCAVATION AND BACKFILLING

- A. Provide all excavation, trenching, tunneling, removal of materials, de-watering and backfilling required for the proper laying of pipes and plumbing work. Coordinate the work with other excavating and backfilling in same area.

3.09 ROUGH-IN FOR CONNECTION TO EQUIPMENT

- A. It shall be the responsibility of each contractor to study the architectural, structural, electrical, and mechanical drawings, conferring with the various trades involved and checking with the supplier of equipment in order to properly rough-in for all equipment.

3.10 MATERIAL AND EQUIPMENT

- A. All material and equipment shall be new and of the best quality used for the purpose in good commercial practice, and shall be the standard product of reputable manufacturers. The material and equipment must meet approval of state and local codes in the area it is being used. Roof decks shall not be used to support piping, conduit, equipment, devices, etc.

3.11 SEAL PENETRATIONS

- A. Seal the space around pipes in sleeves and around duct openings through walls, floors and ceilings. Provide adequate clearance to allow for proper sealing.

3.12 SOUND CONTROL

- A. Penetrations shall be maintained airtight to prevent sound transfer.
- B. Piping shall pass through sleeves. Pack sleeves tight with glass fiber or oakum and caulked on both sides with non-hardening acoustical sealant.

3.13 FIRESTOPPING

- A. Refer to Division 07 - Thermal and Moisture Protection for more information.
- B. Provide UL classified firestopping system for plumbing penetrations through rated walls and floors to maintain the fire rating.

3.14 CONTROL WIRING

- A. All control wiring for plumbing and electrical equipment, including motor starters, shall be 120 volt maximum and wired with one side of the coil grounded and the operating contacts in the north side of the circuit. All control wiring shall be installed in conduit.

3.15 CLEANING, FLUSHING, AND INSPECTING

- A. Refer to Division 01 - General Requirements; all plumbing equipment and components shall be cleaned as frequently as necessary through the construction process and again prior to project completion.

- B. Clean exterior surfaces of installed piping systems of superfluous materials and prepare for application of specified coatings (if any). Flush out piping systems with clean water before proceeding with required tests. Inspect each run of each system for completion of joints, supports and accessory items.
- C. Sufficient flushing water shall be introduced into the mains to produce a velocity of not less than 4' per second and this flow rate shall be continued until the discharge is clean and clear and does not show evidences of silt or foreign matter when a sample is visually inspected.
- D. Inspect pressure piping in accordance with procedures of ASME B31.

3.16 DELIVERY, STORAGE AND PROTECTION OF EQUIPMENT AND MATERIALS

- A. Refer to Division 01 - General Requirements; all equipment and materials shall be delivered, stored and secured per manufacturer's recommendations.
- B. On-site storage shall be coordinated with Construction Manager/General Contractor and be performed in a manner as to avoid damage, deterioration and loss.
- C. Contractor shall provide temporary protection for installed equipment prior to project completion.
- D. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- E. All equipment shall be inspected prior to installation to assure that equipment is free from defect and damage.
- F. Protect plumbing fixtures and piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

3.17 PIPING TESTS

- A. Test pressure piping in accordance with ASME B31.
- B. General: Provide temporary equipment for testing, including pump and gauges. Test piping systems before insulation is installed wherever feasible and remove control devices before testing. Test each natural section of each piping system independently, but do not use piping system valves to isolate sections where test pressure exceeds valve pressure rating. Fill each section with water and pressurize for indicated pressure and time.
 - 1. Test each piping system at 150% of operating pressure, or other pressure as required by Authority Having Jurisdiction, whichever is greater.
 - a. Domestic water systems and equipment vents shall be tested hydrostatically for minimum of four hours at 1½ times design pressure for that system, or 100 psig minimum, whichever is greater, unless otherwise specified.
 - b. Storm, soil, waste and vent piping shall be tested with water for minimum of 24 hours at 10 feet head.
 - c. Acid resistant waste and vent systems shall be tested as per manufacturer's recommendations.
 - 2. Observe each test section for leakage at end of test period. Test fails if leakage is observed or if pressure drop exceeds 5% of test pressure.
- C. Repair piping systems sections which fail required piping test, by disassembly and re-installation, using new materials to extent required to overcome leakage. Do not use chemicals, stop-leak compounds, mastics or other temporary repair methods.
- D. Drain test water from piping systems after testing and repair work has been completed.

END OF SECTION

**SECTION 22 05 05
SELECTIVE DEMOLITION FOR PLUMBING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Demolition and extension of existing plumbing work.

1.02 RELATED REQUIREMENTS

- A. Division 01 - General Requirements: Project administrative and procedural requirements.
- B. Division 02 - Existing Conditions: Demolition, cleaning and disposal requirements, cutting and patching requirements, repairs.

1.03 SUMMARY

- A. The work covered under this section consists of the furnishing of all necessary labor, supervision, materials, equipment, and services to completely execute the system of minor electrical demolition as described in this specification.
- B. The demolition documents plans and specification have been prepared from existing non-as built documents and cursory non-invasive field investigation.
- C. It is the contractors obligation to become familiar with the extent of demolition and the existing condition before submitting their bid.
- D. During demolition if the contractor discovers unforeseen significant non-code compliance conditions of the existing installation they shall notify the Architect and Engineer immediately in writing.
- E. The contractor shall become familiar with the drawings and scope of work of other trades as the work scope of those trades relates to mechanical equipment and connection requirements.
- F. During demolition the contractor shall record on site as-builts all plumbing sanitary, waste and domestic hot, cold and hot water recirculation capped branches for reuse in renovated project space.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Materials and equipment for patching and extending work: As specified in individual sections.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that piping to be demolished serve only equipment and facilities within the demolition areas.
- B. Demolition drawings are based on casual field observation and existing record documents.
- C. Report discrepancies to Owner before disturbing existing installation.
- D. Beginning of demolition means installer accepts existing conditions.

3.02 PREPARATION

- A. Identify locations for capping plumbing piping before any demolition work commences.
- B. Coordinate utility service shut-downs with Utility Companies.
- C. Provide temporary connections to maintain existing systems in service during construction.
- D. Confirm isolation valve locations for domestic water piping. Repair leaking isolation valves or replace inoperable valves before commencing piping demolition.

3.03 DEMOLITION AND EXTENSION OF EXISTING PLUMBING WORK

- A. In general plumbing remodeling work is shown on Drawings but carefully study all drawings for all contracts for "demolition" and "remodeling" work in existing building and field check to verify locations where such work is being done to determine exact extent of work required. No extra

will be allowed for additional work required because of demolition or remodeling whether or not work is specifically noted, itemized or shown on Drawings.

- B. Remove existing equipment and materials pertaining to contract as specified or as required, whether shown on Drawings or not, to prepare for new work of all contracts.
- C. Where necessary, reroute piping, ducts, etc. from within walls, floors, ceilings, etc. being removed. Contractor involved with interrupted service shall be responsible for accomplishing required work whether shown on Drawings or not.
- D. Remove, relocate, and extend existing plumbing piping to accommodate new construction.
- E. Remove domestic water piping back to main and provide isolation valve and cap. DEAD LEGS ARE NOT ALLOWED.
- F. Remove sanitary and waste piping to branch connection fitting to negate any dead legs.

3.04 CLEANING AND REPAIR

- A. Refer to Division 01 - General Requirements for procedures.
- B. Clean and repair existing materials and equipment that remain or that are to be reused.

END OF SECTION

**SECTION 22 05 17
SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Pipe sleeves.
- B. Manufactured sleeve-seal systems.

1.02 RELATED REQUIREMENTS

- A. Section 07 84 00 - Firestopping.

1.03 REFERENCE STANDARDS

- A. ASTM C592 - Standard Specification for Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type) 2022a.
- B. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems 2023a.

PART 2 PRODUCTS

2.01 PIPE SLEEVES

- A. Sheet Metal: Pipe passing through interior walls, partitions, and floors, unless steel or brass sleeves are specified below.
- B. Clearances:
 - 1. Provide allowance for insulated piping.
 - 2. All Rated Openings: Caulked tight with fire stopping material complying with ASTM E814 in accordance with Section 07 84 00 to prevent the spread of fire, smoke, and gases.

2.02 MANUFACTURED SLEEVE-SEAL SYSTEMS

- A. Modular/Mechanical Seal:
 - 1. Synthetic rubber interlocking links continuously fill annular space between pipe and wall/casing opening.
 - 2. Provide watertight seal between pipe and wall/casing opening.
 - 3. Elastomer element size and material in accordance with manufacturer's recommendations.
 - 4. Glass reinforced plastic pressure end plates.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.
- B. Install piping to conserve building space, to not interfere with use of space and other work.
- C. Install piping and pipe sleeves to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- D. Manufactured Sleeve-Seal Systems:
- E. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

END OF SECTION

**SECTION 22 05 19
METERS AND GAUGES FOR PLUMBING PIPING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Pressure gauges and pressure gauge taps.
- B. Thermometers and thermometer wells.

1.02 REFERENCE STANDARDS

- A. ASME B40.100 - Pressure Gauges and Gauge Attachments 2013.
- B. ASTM E1 - Standard Specification for ASTM Liquid-in-Glass Thermometers 2014.
- C. ASTM E77 - Standard Test Method for Inspection and Verification of Thermometers 2014, with Editorial Revision (2017).
- D. UL 393 - Indicating Pressure Gauges for Fire-Protection Service Current Edition, Including All Revisions.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide list that indicates use, operating range, total range and location for manufactured components.

1.04 FIELD CONDITIONS

- A. Do not install instrumentation when areas are under construction, except for required rough-in, taps, supports and test plugs.

PART 2 PRODUCTS

2.01 PRESSURE GAUGES

- A. Pressure Gauges: ASME B40.100, UL 393 drawn steel case, phosphor bronze bourdon tube, rotary brass movement, brass socket, with front recalibration adjustment, black scale on white background.
 - 1. Case: Steel with brass bourdon tube.
 - 2. Size: 4-1/2 inch diameter.
 - 3. Mid-Scale Accuracy: One percent.
 - 4. Scale: Psi and kPa.

2.02 PRESSURE GAUGE TAPPINGS

- A. Gauge Cock: Tee or lever handle, brass for maximum 150 psi.

2.03 STEM TYPE THERMOMETERS

- A. Thermometers - Adjustable Angle: Red- or blue-appearing non-toxic liquid in glass; ASTM E1; lens front tube, cast aluminum case with enamel finish, cast aluminum adjustable joint with positive locking device; adjustable 360 degrees in horizontal plane, 180 degrees in vertical plane.
 - 1. Size: 9 inch scale.
 - 2. Window: Clear Lexan.
 - 3. Accuracy: 2 percent, per ASTM E77.
 - 4. Calibration: Degrees F.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install pressure gauges with pulsation dampers. Provide gauge cock to isolate each gauge. Extend nipples to allow clearance from insulation.

- C. Install gauges and thermometers in locations where they are easily read from normal operating level. Install vertical to 45 degrees off vertical.
- D. Adjust gauges and thermometers to final angle, clean windows and lenses, and calibrate to zero.

3.02 SCHEDULES

- A. Pressure Gauges, Location and Scale Range:
 - 1. Pumps, 0 to 120 psi.
 - 2. Pressure reducing valves, 0 to 120 psi.
- B. Stem Type Thermometers, Location and Scale Range:
 - 1. Domestic hot water supply and recirculation, 0 to 180 degrees F.

END OF SECTION

**SECTION 22 05 23
DUTY VALVES FOR PLUMBING PIPING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Applications.
- B. General requirements.
- C. Ball valves.
- D. Butterfly valves.
- E. Check valves.
- F. Gate valves.
- G. Manual balancing valves.
- H. Automatic balancing valves.
- I. Pressure reducing valves.
- J. Plug valves.
- K. Drain valves.
- L. Relief valves.

1.02 RELATED REQUIREMENTS

- A. Section 08 3100 - Access Doors and Panels.
- B. Section 22 0553 - Identification for Plumbing Piping and Equipment.
- C. Section 22 0719 - Plumbing Piping Insulation.
- D. Section 22 1005 - Plumbing Piping.

1.03 ABBREVIATIONS AND ACRONYMS

- A. CWP: Cold working pressure.
- B. EPDM: Ethylene propylene copolymer rubber.
- C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.
- D. PTFE: Polytetrafluoroethylene.
- E. TFE: Tetrafluoroethylene.

1.04 REFERENCE STANDARDS

- A. ASME B1.20.1 - Pipe Threads, General Purpose (Inch) 2013 (Reaffirmed 2018).
- B. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250 2015.
- C. ASME B16.5 - Pipe Flanges and Flanged Fittings NPS 1/2 Through NPS 24 Metric/Inch Standard 2017.
- D. ASME B16.10 - Face-to-Face and End-to-End Dimensions of Valves 2017.
- E. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings 2018.
- F. ASME B16.34 - Valves - Flanged, Threaded and Welding End 2017.
- G. ASME B31.9 - Building Services Piping 2020.
- H. ASME BPVC-IX - Qualification Standard for Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing, and Fusing Operators - Welding Brazing and Fusing Qualifications 2019.
- I. ASTM A48/A48M - Standard Specification for Gray Iron Castings 2003 (Reapproved 2016).
- J. ASTM A126 - Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings 2004 (Reapproved 2019).

- K. ASTM A536 - Standard Specification for Ductile Iron Castings 1984 (Reapproved 2014).
- L. ASTM B62 - Standard Specification for Composition Bronze or Ounce Metal Castings 2017.
- M. AWWA C606 - Grooved and Shouldered Joints 2015.
- N. MSS SP-67 - Butterfly Valves 2017.
- O. MSS SP-70 - Cast Iron Gate Valves, Flanged and Threaded Ends 2011.
- P. MSS SP-71 - Cast Iron Swing Check Valves, Flanged and Threaded Ends 2018.
- Q. MSS SP-72 - Ball Valves with Flanged or Butt-Welding Ends for General Service 2010a.
- R. MSS SP-78 - Cast Iron Plug Valves, Flanged and Threaded Ends 2011.
- S. MSS SP-80 - Bronze Gate, Globe, Angle and Check Valves 2013.
- T. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends 2010.
- U. NSF 61 - Drinking Water System Components - Health Effects 2020.
- V. NSF 372 - Drinking Water System Components - Lead Content 2020.

1.05 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on valves including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.
- C. Grooved joint valves shall be referred to on drawings and product submittals, and be identified by the manufacturer's listed model or series designation.

1.06 QUALITY ASSURANCE

- A. Manufacturer:
 - 1. Obtain valves for each valve type from single manufacturer.
- B. Welding Materials and Procedures: Comply with ASME BPVC-IX.
- C. Grooved end valves shall be of the same manufacturer as the adjoining couplings.
- D. All castings used for valve bodies shall be date stamped for quality assurance and traceability.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Use the following precautions during storage:
 - 1. Maintain valve end protection and protect flanges and specialties from dirt.
 - a. Provide temporary inlet and outlet caps.
 - b. Maintain caps in place until installation.

PART 2 PRODUCTS

2.01 APPLICATIONS

- A. Provide the following valves for the applications if not indicated on drawings:
 - 1. Shutoff: Ball or butterfly.
 - a. Gate valves shall only be used on shut off for pumped sanitary/storm piping only.
 - b. Plug valves or ball valves can be used for natural gas shutoff.
 - 2. Dead-End: Single-flange butterfly (lug) type.
 - 3. Swing Check:
 - a. 2 NPS and Smaller: Bronze swing check valves with bronze or nonmetallic disc.
 - b. 2-1/2 NPS and Larger for Domestic Water: Iron swing check valves with closure control, metal or resilient seat check valves.
 - c. 2-1/2 NPS and Larger for Sanitary Waste and Storm Drainage: Iron swing check valves with lever and weight or spring.
 - 4. Spring Loaded Check: At pump discharge.
 - 5. Automatic Balancing Valves: At all domestic hot water connections to hot water return piping.

6. Manual Balancing Valves: At hot water return pump discharge only.
- B. Substitutions of valves with higher CWP classes or SWP ratings for same valve types are permitted when specified CWP ratings or SWP classes are not available.
- C. Required Valve End Connections for Non-Wafer Types:
 1. Steel Pipe:
 - a. 2 NPS and Smaller: Threaded ends.
 - b. 2-1/2 NPS to 4 NPS: Grooved or flanged ends except where threaded valve-end option is indicated in valve schedules below.
 - c. 5 NPS and Larger: Grooved or flanged ends.
 - d. Grooved-End Copper Tubing and Steel Piping: Grooved.
 2. Copper Tube:
 - a. 2 NPS and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.
 - b. 2-1/2 NPS to 4 NPS: Grooved or flanged ends except where threaded valve-end option is indicated in valve schedules below.
 - c. 5 NPS and Larger: Grooved or flanged ends.
- D. Domestic, Hot and Cold Water Valves:
 1. 2 NPS and Smaller:
 - a. Bronze: Provide with solder-joint or threaded ends.
 - b. Ball: Two piece, full port, bronze with bronze or stainless steel trim.
 - 1) Heat treated DZR brass valves by Jomar are allowed as specified below.
 - c. Bronze Swing Check: Class 125, bronze disc.
 2. 2-1/2 NPS and Larger:
 - a. Iron, 2-1/2 NPS to 4 NPS: Provide with threaded or flanged ends.
 - b. Iron Ball: Class 150.
 - c. Iron Single-Flange Butterfly: 200 CWP, EPDM seat, aluminum-bronze disc.
 - d. Grooved End, Cast Brass Butterfly: 300 CWP, Fluoroelastomer pressure-responsive seat, aluminum-bronze disc.
- E. Sanitary Waste and Storm Drainage Water Valves:
 1. 2 NPS and Smaller:
 - a. Bronze: Provide with solder-joint or threaded.
 - b. Ball: Two piece, full port, bronze with bronze or stainless steel trim.
 - c. Bronze Spring Loaded Check: Class 125, nonmetallic disc.
 - d. Bronze Gate: Class 125, NRS.
 2. 2-1/2 NPS and Larger:
 - a. Iron, 2-1/2 NPS to 4 NPS: Provide with threaded or flanged ends.
 - b. Iron Ball: Class 150.
 - c. Iron Swing Check with Closure Control: Class 125, lever and spring.
 - d. Iron Gate: Class 125, NRS.
- F. Natural Gas Valves:
 1. Ball Valve: 4 NPS and Smaller:
 - a. Bronze: Provide with solder-joint or threaded ends with union.
 - b. Ball: Class 150, regular port, teflon seats.
 2. Plug: 2-1/2 NPS and Larger:
 - a. Lubricated Plug: Class 125, regular gland.

2.02 GENERAL REQUIREMENTS

- A. Valve Pressure and Temperature Ratings: No less than rating indicated; as required for system pressures and temperatures.
- B. Valve Sizes: Match upstream piping unless otherwise indicated.
- C. Valve Actuator Types:
 1. Gear Actuator: Quarter-turn valves 8 NPS and larger.

2. Handwheel: Valves other than quarter-turn types.
 3. Hand Lever: Quarter-turn valves 6 NPS and smaller.
- D. Valves in Insulated Piping: With 2 NPS stem extensions and the following features:
1. Ball Valves: Extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.
 2. Butterfly Valves: Extended neck.
 3. Memory Stops: Fully adjustable after insulation is installed.
- E. Valve-End Connections:
1. Threaded End Valves: ASME B1.20.1.
 2. Flanges on Iron Valves: ASME B16.1 for flanges on iron valves.
 3. Pipe Flanges and Flanged Fittings 1/2 NPS through 24 NPS: ASME B16.5.
 4. Solder Joint Connections: ASME B16.18.
 5. Grooved End Connections: Copper-tube dimensions, similar to AWWA C606.
- F. General ASME Compliance:
1. Ferrous Valve Dimensions and Design Criteria: ASME B16.10 and ASME B16.34.
 2. Solder-joint Connections: ASME B16.18.
 3. Building Services Piping Valves: ASME B31.9.
- G. Valve Materials for Potable Water: NSF 61 and NSF 372.
- H. Bronze Valves:
1. Fabricate from dezincification resistant material.
 2. Copper alloys containing more than 15 percent zinc are not permitted.
- I. Source Limitations: Obtain each valve type from a single manufacturer.

2.03 BRONZE BALL VALVES

- A. Two Piece, Full Port with Bronze or Stainless Steel Trim:
1. Comply with MSS SP-110.
 2. SWP Rating: 150 psig.
 3. CWP Rating: 600-1000 psig.
 4. Body: Lead Free Bronze.
 5. Ends: Threaded.
 6. Seats: PTFE or TFE.
 7. Manufacturers:
 - a. Apollo Valves: www.apollovalves.com/#sle.
 - b. Nibco: www.nibco.com
 8. Jomar Valves with heat treated DZR brass - CW511 alloy body and end connection and CW510L brass alloy ball and stem and TEA coated ball are allowed.
 - a. Substitutions: See Section 01 6000 - Product Requirements.
- B. For Natural Gas Service: Two Piece, Regular Port with Bronze, Chrome Plated Brass or Stainless Steel Trim:
1. Comply with MSS-SP110.
 2. SWP Rating: 150 psig.
 3. CWP Rating: 400 psig.
 4. Body: Bronze
 5. Ends: Threaded or Solder with union.
 6. Stem: Blow-out proof
 7. Manufacturers:
 - a. Apollo Valves: www.apollovalves.com
 - b. Jomar Valves: www.jomarvalve.com
 - c. Viega: www.viega.us
 - d. Substitutions: See Section 01 6000-Product Requirements.

2.04 IRON BALL VALVES - NOT FOR DOMESTIC

- A. Class 125, Full Port, Stainless Steel Trim:
 - 1. Comply with MSS SP-72.
 - 2. CWP Rating: 200 psig.
 - 3. Body: ASTM A536 Grade 65-45-12, ductile iron.
 - 4. Ends: Flanged.
 - 5. Seats: PTFE, TFE, or Teflon.
 - 6. Operator: Lever, with locking handle.
 - 7. Manufacturers:
 - a. Apollo Valves: www.apollovalves.com/#sle.
 - b. Ferguson Enterprises Inc: www.fnw.com/#sle.
 - c. Substitutions: See Section 01 6000 - Product Requirements.

2.05 IRON, SINGLE FLANGE BUTTERFLY VALVES

- A. Lug type: Bi-directional dead-end service without use of downstream flange.
 - 1. Comply with MSS SP-67, Type I.
 - 2. CWP Rating: 200 psig.
 - 3. Body: ASTM A126, cast iron or ASTM A536, ductile iron.
 - 4. Stem: One or two-piece stainless steel.
 - 5. Seat: EPDM.
 - 6. Disc: Bronze or Stainless Steel.
 - 7. Manufacturers:
 - a. Apollo Valves: www.apollovalves.com/#sle.
 - b. Jomar valves: www.jomarvalve.com.
 - c. Nibco: www.nibco.com.
 - d. Substitutions: See Section 01 6000 - Product Requirements.

2.06 BRASS, GROOVED-END BUTTERFLY VALVES

- A. Grooved Ends: Bi-directional dead-end service.
 - 1. CWP Rating: 300 psig.
 - 2. Body: Cast brass, UNS C87850.
 - 3. Stem: Stainless steel, offset from the disc centerline to provide complete 360-degree circumferential seating.
 - 4. Seat: Pressure responsive Fluoroelastomer.
 - 5. Disc: Aluminum-bronze.
 - 6. UL classified in accordance with NSF-61 for potable water service, and meets the lead requirements of NSF-372.
 - 7. Manufacturer: Victaulic

2.07 BRONZE SWING CHECK VALVES

- A. Class 125: CWP Rating: 200 psig (1380 kPa).
 - 1. Comply with MSS SP-139, Type 3.
 - 2. Design: Horizontal flow.
 - 3. Body: Bronze, ASTM B62.
 - 4. Ends: Threaded or soldered as indicated.
 - 5. Disc: Lead Free Bronze ASTM B584.
 - 6. Manufacturers:
 - a. Apollo Valves: www.apollovalves.com/#sle.
 - b. Milwaukee: www.milwaukeevalve.com.
 - c. Jomar: www.jomarvalve.com.
 - d. Nobco: www.nibco.com
 - e. Substitutions: See Section 01 6000 - Product Requirements.

2.08 BRONZE SPRING LOADED CHECK VALVES

- A. Class 125: CWP Rating 200 psig (1380 kPa).
 - 1. Design: Vertical flow.
 - 2. Body: Bronze, ASTM B61 or ASTM B62
 - 3. Spring: Bronze
 - 4. Ends: Threaded or soldered as indicated.
 - 5. Disc: Nonmetallic
 - 6. Manufacturers:
 - a. Milwaukee: www.milwaukeevalve.com
 - b. Apollo Valves[<>]: www.apollovalves.com/#sle.
 - c. Substitutions: See Section 01 6000-Product Requirements.

2.09 IRON SWING CHECK VALVES WITH CLOSURE CONTROL

- A. Class 125 with Lever and Spring-Closure Control.
 - 1. Comply with MSS SP-71, Type I.
 - 2. Description:
 - a. CWP Rating: 200 psig.
 - b. Design: Clear or full waterway.
 - c. Body: ASTM A126, gray iron or ductile iron with bolted bonnet.
 - d. Ends: Flanged or threaded as indicated.
 - e. Spring: Stainless steel.
 - f. Trim: Bronze or stainless steel.
 - g. Gasket: Asbestos free.
 - h. Closer Control: Factory installed, exterior lever, and spring.
 - 3. Manufacturers:
 - a. Apollo Valves: www.apollovalves.com/#sle.
 - b. Flomatic Valves: www.flomatic.com/#sle.
 - c. Nibco: www.nibcoc.com.
 - d. Substitutions: See Section 01 6000 - Product Requirements.

2.10 BRONZE GATE VALVES - PUMPED SANITARY/STORM ONLY

- A. Non-Rising Stem (NRS) or Rising Stem (RS):
 - 1. Comply with MSS SP-80, Type I.
 - 2. Class 125: CWP Rating: 200-285 psig.
 - 3. Body: ASTM B584 Lead Free, bronze with integral seat and screw-in bonnet.
 - 4. Ends: Threaded or solder joint .
 - 5. Stem: Bronze.
 - 6. Disc: Solid wedge; bronze.
 - 7. Packing: Asbestos free.
 - 8. Handwheel: Malleable iron, bronze, or aluminum.
 - 9. Manufacturers:
 - a. Apollo Valves: www.apollovalves.com/#sle.
 - b. Ferguson Enterprises Inc: www.fnw.com/#sle.
 - c. Jomar Valve: www.jomarvalve.com.
 - d. Nibco: www.nibco.com
 - e. Substitutions: See Section 01 6000 - Product Requirements.

2.11 IRON GATE VALVES - PUMPED SANITARY/STORM ONLY

- A. NRS or OS & Y:
 - 1. Comply with MSS SP-70, Type I.
 - 2. Class 125: CWP Rating: 200-285 psig.
 - 3. Body: ASTM A126, gray iron or ductile iron with bolted bonnet.
 - 4. Ends: Flanged.
 - 5. Trim: Bronze or stainless steel.
 - 6. Disc: Solid wedge.

7. Packing and Gasket: Asbestos free.
8. Manufacturers:
 - a. Apollo Valves: www.apollovalves.com/#sle.
 - b. Ferguson Enterprises Inc: www.fnw.com/#sle.
 - c. Nibco: www.nibco.com.
 - d. Substitutions: See Section 01 6000 - Product Requirements.

2.12 PVC COMBINATION CHECK AND BALL VALVE - PUMPED SANITARY/STORM ONLY

- A. Rated for 25 psi (58 ft of head)
 1. Full flow PVC check valve, ball valve, union combination
 2. Gasket & Flapper: Neoprene, replaceable flapper
 3. Backing plates & rivet: Stainless steel
 4. Screws: Stainless steel
 5. Manufacturers:
 - a. Zoeller: www.zoellerpumps.com
 - b. Manufacturer of sanitary/storm pump
 - c. Substitutions: See Section 01 6000-Product Requirements.

2.13 LUBRICATED PLUG VALVES

- A. Regular Gland with Threaded or Flanged Ends.:
 1. Comply with MSS SP-78, Type II.
 2. Class 125: CWP Rating: 200 psig.
 3. Body: ASTM A48/A48M or ASTM A126, cast iron with lubrication sealing system.
 4. Pattern: Regular or short.
 5. Plug: Cast iron or bronze with sealant groove.
 6. Manufacturers:
 - a. Homestead: www.homesteadvalve.com.
 - b. Norgas Controls: www.norgascontrols.com.
 - c. Flowserve Corporation: www.flowserve.com.
 - d. Substitutions: See Section 01 6000 - Product Requirements.

2.14 MANUAL BALANCING VALVES

- A. Construction: Class 125, Lead free brass or bronze body with union on inlet and outlet, temperature and pressure test plug on inlet and outlet, blowdown/backflush drain, calibrated nameplate with memory stop.
- B. Calibration: Control flow within 5 percent of selected rating, over operating pressure range of 10 times minimum pressure required for control, maximum minimum pressure 3.5 psi.
- C. Manufacturers:
 1. ITT Bell & Gossett: www.bellgossett.com/#sle.
 2. Jomar Valve: www.jomarvalve.com
 3. Caleffi; www.caleffi.com
 4. Nibco: www.nibco.com
 5. Substitutions: See Section 01 6000 - Product Requirements.

2.15 AUTOMATIC BALANCING VALVES

- A. Thermostatic balancing valves:
 1. Manufacturers:
 - a. ITT Bell & Gossett; Temp Setter: www.bellgossett.com
 - b. Caleffi; Thermostat: www.caleffi.com
 - c. Substitutions: See Section 01 6000 - Product Requirements.
 2. The valve shall be certified lead free according to NSF/ANSI 61 standards.
 3. The valve body shall be constructed out of 316 stainless steel or DZR low-lead brass
 4. The valve shall be rated for 145 PSIG working pressure.

5. The valve shall have a temperature adjustment dial in degrees F. The dial shall have an adjustment range of 98°F (37°C) to 140°F (60°C).
6. The valve shall include a pre-formed thermal insulation block/shell.

2.16 WATER PRESSURE REDUCING VALVES

- A. Valves over 2 inches: ASSE 1003, cast iron body with interior lining complying with AWWA C550, bronze fitted, elastomeric diaphragm and seat disc, flanged.
 1. Manufacturers:
 - a. Amtrol: www.amtrol.com
 - b. Apollo valves: www.apollovalves.com
 - c. Watts Regulator Company: www.wattsregulator.com
 - d. Substitutions: See Section 01 6000 - Product Requirements.

2.17 DRAIN VALVES

- A. Drain Valve with hose thread and chain and dust cap; chrome plated ball, blow-out-proof stem, and adjustable packing gland.
- B. Manufacturers:
 1. Hammond: www.hammondvalve.com
 2. Apollo valves: www.apollovalves.com
 3. Nibco: www.nibco.com/valves
 4. Milwaukee: www.milwaukeevalve.com
 5. Substitutions: See Section 01 6000 - Product Requirements.

2.18 RELIEF VALVES

- A. Pressure Relief Valves: Bronze body, teflon seat, steel stem and springs, automatic, direct pressure actuated, capacities ASME certified and labeled.
- B. Manufacturers:
 1. CASH (A.W.) Valve Manufacturing Corp: www.cashvalve.net
 2. Zurn Industries; Wilkins-Regulator Division: www.zurn.com
 3. Watts Regulator Company: www.wattsregulator.com
 4. Substitutions: See Section 01 6000 - Product Requirements.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Provide unions or flanges with valves to facilitate equipment removal and maintenance while maintaining system operation and full accessibility for servicing.
- B. Provide separate valve support as required and locate valve with stem at or above center of piping, maintaining unimpeded stem movement.
- C. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
- D. Provide access where valves and fittings are not exposed.
- E. Install check valves where necessary to maintain direction of flow as follows:
 1. Spring Loaded Check: Install with stem plumb and vertical.
 2. Swing Check: Install horizontal maintaining hinge pin level.
- F. Provide chainwheels on operators for valves 4 NPS and larger where located 96 NPS or more above finished floor, terminating 60 NPS above finished floor.
- G. Install valves with stems upright or horizontal, not inverted.

END OF SECTION

**SECTION 22 05 53
IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Nameplates.
- B. Pipe markers.

1.02 REFERENCE STANDARDS

- A. ASME A13.1 - Scheme for the Identification of Piping Systems 2020.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturers catalog literature for each product required.

PART 2 PRODUCTS

2.01 IDENTIFICATION APPLICATIONS

- A. Piping: Pipe markers.
- B. Pumps: Nameplates.
- C. Equipment and Tanks: Nameplates.
- D. Valves: Tags.

2.02 NAMEPLATES

- A. Manufacturers:
 - 1. Brimar Industries, Inc: www.pipemarker.com/#sle.
 - 2. Kolbi Pipe Marker Co: www.kolbipipemarkers.com/#sle.
 - 3. Seton Identification Products: www.seton.com/#sle.
 - 4. Substitutions: See Section 01 6000 - Product Requirements.
- B. Description: Laminated three-layer plastic with engraved letters.

2.03 TAGS

- A. Manufacturers:
 - 1. Brimar Industries, Inc: www.pipemarker.com/#sle.
 - 2. Kolbi Pipe Marker Co: www.kolbipipemarkers.com/#sle.
 - 3. Seton Identification Products: www.seton.com/#sle.
 - 4. Substitutions: See Section 01 6000 - Product Requirements.
- B. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.

2.04 PIPE MARKERS

- A. Manufacturers:
 - 1. Brimar Industries, Inc: www.pipemarker.com/#sle.
 - 2. Kolbi Pipe Marker Co: www.kolbipipemarkers.com/#sle.
 - 3. Seton Identification Products: www.seton.com/#sle.
 - 4. Substitutions: See Section 01 6000 - Product Requirements.
- B. Comply with ASME A13.1.
- C. Plastic Pipe Markers: Factory fabricated, flexible, semi- rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.
- D. Underground Plastic Pipe Markers: Bright colored continuously printed plastic ribbon tape, minimum 6 inches wide by 4 mil thick, manufactured for direct burial service.

PART 3 EXECUTION

3.01 PREPARATION

- A. Degrease and clean surfaces to receive adhesive for identification materials.

3.02 INSTALLATION

- A. Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.
- B. Install tags with corrosion resistant chain.
- C. Install plastic pipe markers in accordance with manufacturer's instructions.
 - 1. Install in clear view and align with axis of piping.
 - 2. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.
- D. Install underground plastic pipe markers 6 to 8 inches below finished grade, directly above buried pipe.

END OF SECTION

**SECTION 22 07 19
PLUMBING PIPING INSULATION**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Piping insulation.
- B. Jackets and accessories.

1.02 RELATED REQUIREMENTS

- A. Section 07 8400 - Firestopping.
- B. Section 22 1005 - Plumbing Piping: Placement of hangers and hanger inserts.

1.03 REFERENCE STANDARDS

- A. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus 2019.
- B. ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement 2007 (Reapproved 2013).
- C. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form 2020a.
- D. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation 2019.
- E. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel 2008 (Reapproved 2018).
- F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2021.
- G. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials 2016.
- H. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

- A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.02 GLASS FIBER

- A. Manufacturers:
 - 1. CertainTeed Corporation: www.certainteed.com/#sle.
 - 2. Johns Manville Corporation: www.jm.com/#sle.
 - 3. Knauf Insulation: www.knaufinsulation.com/#sle.
 - 4. Owens Corning Corporation: www.ocbuildingspec.com/#sle.
 - 5. Substitutions: See Section 01 6000 - Product Requirements.
- B. Insulation: ASTM C547 and ASTM C795; rigid molded, noncombustible.
 - 1. K Value: ASTM C177, 0.24 at 75 degrees F.
 - 2. Maximum Service Temperature: 850 degrees F.
 - 3. Maximum Moisture Absorption: 0.2 percent by volume.
- C. Vapor Barrier Jacket: White Kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm-inches.

- D. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.
- E. Vapor Barrier Lap Adhesive: Compatible with insulation.
 - 1. Vapor Barrier Lap Adhesive shall be compatible with the insulation and as recommended by the insulation manufacturer.
- F. Insulating Cement/Mastic: ASTM C195; hydraulic setting on mineral wool.
- G. Indoor Vapor Barrier Finish:
 - 1. Vinyl emulsion type acrylic, compatible with insulation, white color.

2.03 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

- A. Manufacturers:
 - 1. Aeroflex USA, Inc: www.aeroflexusa.com/#sle.
 - 2. Armacell LLC: www.armacell.us/#sle.
 - 3. K-Flex USA LLC: www.kflexusa.com/#sle.
 - 4. Substitutions: See Section 01 6000 - Product Requirements.
- B. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1; use molded tubular material wherever possible.
 - 1. Minimum Service Temperature: Minus 40 degrees F.
 - 2. Maximum Service Temperature: 220 degrees F.
 - 3. Connection: Waterproof vapor barrier adhesive.
- C. Elastomeric Foam Adhesive: Air dried, contact adhesive, compatible with insulation.

2.04 JACKETS

- A. PVC Plastic.
 - 1. Manufacturers:
 - a. Johns Manville Corporation: www.jm.com/#sle.
 - b. Proto Corporation: www.protocorporation.com.
 - c. Substitutions: See Section 01 6000 - Product Requirements.
 - 2. Jacket: One piece molded type fitting covers and sheet material, off-white color.
 - a. Minimum Service Temperature: 0 degrees F.
 - b. Maximum Service Temperature: 150 degrees F.
 - c. Moisture Vapor Permeability: 0.002 perm inch, maximum, when tested in accordance with ASTM E96/E96M.
 - d. Thickness: 10 mil.
 - e. Connections: Brush on welding adhesive.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that piping has been tested before applying insulation materials.
- B. Verify that surfaces are clean and dry, with foreign material removed.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install in accordance with North American Insulation Manufacturers Association (NAIMA) National Insulation Standards.
- C. Exposed Piping: Locate insulation and cover seams in least visible locations.
- D. Insulated pipes conveying fluids below ambient temperature: Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.
- E. Glass fiber insulated pipes conveying fluids below ambient temperature:
 - 1. Provide vapor barrier jackets, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.

2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.
- F. Glass fiber insulated pipes conveying fluids above ambient temperature:
 1. Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples.
 2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.
- G. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions.
- H. Heat Traced Piping: Insulate fittings, joints, and valves with insulation of like material, thickness, and finish as adjoining pipe. Size large enough to enclose pipe and heat tracer. Cover with aluminum jacket with seams located on bottom side of horizontal piping.

3.03 SCHEDULES

- A. Plumbing Systems:
 1. Domestic Hot Water Supply & Recirculation:
 - a. Pipe Size Range: 1/2 to 1-1/4 inch
 - 1) Thickness: 1 inch
 - b. Pipe Size Range: 1-1/2 to 8 inch
 - 1) Thickness: 1-1/2 inch
 2. Domestic Cold Water: 1 inch thick.
 3. Roof Drain Bodies: 1/2 inch thick.
 4. Roof Drainage Above Grade: 1/2 inch thick with PVC jacket.
 5. Plumbing Vents Within 10 Feet of the Exterior: 1/2 inch thick with PVC jacket.
- B. Cooling Systems:
 1. Condensate Drains from Cooling Coils: 1 inch thick.
- C. Other Systems:
 1. Piping Exposed to Freezing with Heat Tracing: 1 inch or as recommended by heat tracing manufacturer.

END OF SECTION

**SECTION 22 10 05
PLUMBING PIPING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Pipe, pipe fittings, specialties, and connections for piping systems.
 - 1. Domestic water.
 - 2. Natural Gas
 - 3. Flanges, unions, and couplings.
 - 4. Pipe hangers and supports.
 - 5. Valves.
 - 6. Check.
 - 7. Water pressure reducing valves.

1.02 RELATED REQUIREMENTS

- A. Section 22 05 53 - Identification for Plumbing Piping and Equipment.
- B. Section 22 07 19 - Plumbing Piping Insulation.

1.03 REFERENCE STANDARDS

- A. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300 2021.
- B. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings 2021.
- C. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings 2021.
- D. ASME B31.1 - Power Piping 2022.
- E. ASME B31.9 - Building Services Piping 2020.
- F. ASME BPVC-IV - Boiler and Pressure Vessel Code, Section IV - Rules for Construction of Heating Boilers 2023.
- G. ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Qualification Standard for Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing, and Fusing Operators 2023.
- H. ASSE 1003 - Water Pressure Reducing Valves for Potable Water Distribution Systems 2023.
- I. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless 2022.
- J. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service 2023a.
- K. ASTM B32 - Standard Specification for Solder Metal 2020.
- L. ASTM B88 - Standard Specification for Seamless Copper Water Tube 2022.
- M. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric) 2020.
- N. ASTM B813 - Standard Specification for Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube 2016.
- O. ASTM B828 - Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings 2016.
- P. ASTM D2665 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings 2020.
- Q. AWWA C651 - Disinfecting Water Mains 2014, with Addendum (2020).
- R. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation 2018, with Amendment (2019).
- S. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends 2010, with Errata .

1.04 SUBMITTALS

- A. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.
- B. Welder Certificate: Include welders certification of compliance with ASME BPVC-IX.
- C. Sustainable Design Documentation: For soldered copper joints, submit installer's certification that the specified installation method and materials were used.
- D. Project Record Documents: Record actual locations of valves.

1.05 QUALITY ASSURANCE

- A. Perform work in accordance with applicable codes.
- B. Welding Materials and Procedures: Comply with ASME BPVC-IX and applicable state labor regulations.
- C. Welder Qualifications: Certified in accordance with ASME BPVC-IX.

1.06 FIELD CONDITIONS

- A. Do not install underground piping when bedding is wet or frozen.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Potable Water Supply Systems: Provide piping, pipe fittings, and solder and flux (if used), that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

2.02 DOMESTIC WATER PIPING, ABOVE GRADE

- A. Copper Tube: ASTM B88 (ASTM B88M), Type L (B), Drawn (H).
 - 1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
 - 2. Fittings: Cast iron, coated.
 - 3. Joints: ASTM B32, alloy Sn95 solder.
 - 4. Mechanical Press Sealed Fittings: Double pressed type, NSF 61 and NSF 372 approved or certified, utilizing EPDM, non toxic synthetic rubber sealing elements.

2.03 NATURAL GAS PIPING, ABOVE GRADE

- A. Steel Pipe: ASTM A53/A53M Schedule 40 black.
 - 1. Fittings: ASME B16.3, malleable iron, or ASTM A234/A234M, wrought steel welding type.
 - 2. Joints: Threaded or welded to ASME B31.1.

2.04 FLANGES, UNIONS, AND COUPLINGS

- A. Unions for Pipe Sizes 3 Inches (80 mm) and Under:
 - 1. Ferrous pipe: Class 150 malleable iron threaded unions.

2.05 PIPE HANGERS AND SUPPORTS

- A. Provide hangers and supports that comply with MSS SP-58.
 - 1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
 - 2. Overhead Supports: Individual steel rod hangers attached to structure or to trapeze hangers.
 - 3. Trapeze Hangers: Welded steel channel frames attached to structure.
 - 4. Vertical Pipe Support: Steel riser clamp.
- B. Plumbing Piping - Water:
 - 1. Hangers for Pipe Sizes 1/2 Inch (15 mm) to 1-1/2 Inches (40 mm): Malleable iron, adjustable swivel, split ring.
 - 2. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

2.06 BALL VALVES

- A. Manufacturers:
 - 1. Tyco flow control: www.tycoflowcontrol.com
 - 2. Nibco, Inc: www.nibco.com
 - 3. Milwaukee Valve Company: www.milwaukeevalve.com
- B. Construction, 4 Inches (100 mm) and Smaller: MSS SP-110, Class 150, 400 psi (2760 kPa) CWP, bronze body, chrome plated brass ball, regular port, teflon seats and stuffing box ring, blow-out proof stem, lever handle with balancing stops, solder ends with union.

2.07 PIPING SPECIALTIES

- A. Flow Controls:
 - 1. Manufacturers:
 - a. ITT Bell & Gossett: www.bellgossett.com/#sle.
 - b. Griswold Controls: www.griswoldcontrols.com/#sle.
 - c. Taco, Inc: www.taco-hvac.com/#sle.

2.08 WATER PRESSURE REDUCING VALVES

- A. Manufacturers:
 - 1. Tyco Flow Control: www.tycoflowcontrol.com
 - 2. Watts Regulator Company; _____: www.wattsregulator.com
 - 3. ITT Bell & Gossett: www.bellgossett.com

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that excavations are to required grade, dry, and not over-excavated.

3.02 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and dirt, on inside and outside, before assembly.
- C. Prepare piping connections to equipment with flanges or unions.

3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
- C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.
- D. Install piping to maintain headroom, conserve space, and not interfere with use of space.
- E. Group piping whenever practical at common elevations.
- F. Establish elevations of buried piping outside the building to ensure not less than 4 ft (____ m) of cover.
- G. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.
- H. Install valves with stems upright or horizontal, not inverted. Refer to Section 22 05 23.
- I. Copper Pipe and Tube: Make soldered joints in accordance with ASTM B828, using specified solder, and flux meeting ASTM B813; in potable water systems use flux also complying with NSF 61 and NSF 372.
- J. Sleeve pipes passing through partitions, walls and floors.
- K. Inserts:
 - 1. Provide inserts for placement in concrete formwork.
 - 2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.

3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches (100 mm).
 4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
 5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut above slab.
- L. Pipe Hangers and Supports:
1. Install in accordance with ASME B31.9.
 2. Support horizontal piping as indicated.
 3. Install hangers to provide minimum 1/2 inch (15 mm) space between finished covering and adjacent work.
 4. Place hangers within 12 inches (300 mm) of each horizontal elbow.
 5. Use hangers with 1-1/2 inch (40 mm) minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
 6. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.
 7. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
 8. Provide copper plated hangers and supports for copper piping.
 9. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.
 10. Support cast iron drainage piping at every joint.

3.04 APPLICATION

- A. Install unions downstream of valves and at equipment or apparatus connections.
- B. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.
- C. Install ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.
- D. Install globe valves for throttling, bypass, or manual flow control services.

3.05 TOLERANCES

- A. Drainage Piping: Establish invert elevations within 1/2 inch (10 mm) vertically of location indicated and slope to drain at minimum of 1/8 inch per foot (1:100) slope.
- B. Water Piping: Slope at minimum of 1/32 inch per foot (1:400) and arrange to drain at low points.

3.06 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

- A. Prior to starting work, verify system is complete, flushed and clean.
- B. Ensure acidity (pH) of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).
- C. Inject disinfectant, free chlorine in liquid, powder, tablet or gas form, throughout system to obtain 50 to 80 mg/L residual.
- D. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.
- E. Maintain disinfectant in system for 24 hours.
- F. If final disinfectant residual tests less than 25 mg/L, repeat treatment.
- G. Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L.
- H. Take samples no sooner than 24 hours after flushing, from 10 percent of outlets and from water entry, and analyze in accordance with AWWA C651.

3.07 SCHEDULES

- A. Pipe Hanger Spacing:
 1. Metal Piping:

MACOMB COUNTY JAIL

LAUNDRY HOT WATER STORAGE TANKS

AND BOILER REPLACEMENT

231997

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- a. Pipe Size: 1/2 inches (15 mm) to 1-1/4 inches (32 mm):
 - 1) Maximum Hanger Spacing: 6.5 ft (2 m).
 - 2) Hanger Rod Diameter: 3/8 inches (9 mm).

END OF SECTION

**SECTION 22 10 06
PLUMBING PIPING SPECIALTIES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Back water valves.
- B. Backflow preventers.
- C. Double check valve assemblies.

1.02 RELATED REQUIREMENTS

- A. Section 22 10 05 - Plumbing Piping.

1.03 REFERENCE STANDARDS

- A. ASSE 1012 - Performance Requirements for Backflow Preventers with an Intermediate Atmospheric Vent 2021.
- B. ASSE 1013 - Performance Requirements for Reduced Pressure Principle Backflow Prevention Assemblies 2021.
- C. NSF 61 - Drinking Water System Components - Health Effects 2022, with Errata.
- D. NSF 372 - Drinking Water System Components - Lead Content 2022.

1.04 SUBMITTALS

- A. Product Data: Provide component sizes, rough-in requirements, service sizes, and finishes.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Specialties in Potable Water Supply Systems: Provide products that comply with NSF 61 and NSF 372 for maximum lead content.

2.02 BACKFLOW PREVENTERS

- A. Manufacturers:
 - 1. Apollo Valves: www.apollovalves.com
 - 2. Watts Regulator Company, a part of Watts Water Technologies: www.wattsregulator.com/
 - 3. Zurn Industries, LLC: www.zurn.com

2.03 DOUBLE CHECK VALVE ASSEMBLIES

- A. Manufacturers:
 - 1. Apollo Valves; _____: www.apollovalves.com
 - 2. Watts Regulator Company, a part of Watts Water Technologies; _____: www.wattsregulator.com
 - 3. Zurn Industries, LLC; _____: www.zurn.com/
- B. Double Check Valve Assemblies:
 - 1. ASSE 1012; Bronze body with corrosion resistant internal parts and stainless steel springs; two independently operating check valves with intermediate atmospheric vent.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install approved potable water protection devices on plumbing lines where contamination of domestic water may occur; on boiler feed water lines, janitor rooms, fire sprinkler systems, premise isolation, irrigation systems, flush valves, interior and exterior hose bibbs.
- C. Pipe relief from backflow preventer to nearest drain.

END OF SECTION

**SECTION 22 30 00
PLUMBING EQUIPMENT**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Diaphragm-type compression tanks.
- B. In-line circulator pumps.

1.02 RELATED REQUIREMENTS

- A. Section 26 0583 - Wiring Connections: Electrical characteristics and wiring connections.

1.03 REFERENCE STANDARDS

- A. ANSI Z21.10.1 - Gas Water Heaters - Volume I - Storage Water Heaters with Input Ratings of 75,000 Btu per Hour or Less 2014.
- B. ASME BPVC-VIII-1 - Boiler and Pressure Vessel Code, Section VIII, Division 1: Rules for Construction of Pressure Vessels 2019.
- C. ICC (IPC) - International Plumbing Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum) 2020.
- E. UL 174 - Standard for Household Electric Storage Tank Water Heaters Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittals procedures.
- B. Product Data:
 - 1. Provide dimension drawings of water heaters indicating components and connections to other equipment and piping.
 - 2. Indicate pump type, capacity, power requirements.
 - 3. Provide certified pump curves showing pump performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable.
 - 4. Provide electrical characteristics and connection requirements.
- C. Project Record Documents: Record actual locations of components.
- D. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
- E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 6000 - Product Requirements, for additional provisions.
 - 2. Extra Pump Seals: One of each type and size.
 - 3. Extra Water Softener Salt: 50 pounds.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.
- B. Certifications:
 - 1. All products in contact with potable water: NSF approved.
 - 2. Gas Water Heaters: Certified by CSA International to ANSI Z21.10.1, as applicable, in addition to requirements specified elsewhere.
 - 3. Electric Water Heaters: UL listed and labeled to UL 174.
 - 4. Pressure Vessels for Heat Exchangers: ASME labeled to ASME BPVC-VIII-1.
 - 5. Water Tanks: ASME labeled to ASME BPVC-VIII-1.
 - 6. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

- C. Identification: Provide pumps with manufacturer's name, model number, and rating/capacity identified by permanently attached label.
- D. Performance: Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, operate within 25 percent of midpoint of published maximum efficiency curve.

1.06 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Provide five year manufacturer warranty for domestic water heaters.

PART 2 PRODUCTS

2.01 WATER HEATERS

- A. Manufacturers:
 - 1. O. Smith Water Products Co: www.hotwater.com/#sle.
 - 2. PVI: www.pvi.com/#sle.
 - 3. Lochinvar: www.lochinvar.com/#sle.
 - 4. Substitutions: See Section 01 6000 - Product Requirements.
- B. Performance:
 - 1. The water heater shall comply with the energy efficiency requirements of the latest edition of the ASHRAE 90.1 standard.
 - 2. The water heater's efficiency shall be verified through third party testing by AHRI and listed in the AHRI Certification Directory.
 - 3. Minimum hot water storage temperature shall be 140 degrees F, unless otherwise noted on Schedules.

2.02 DIAPHRAGM-TYPE COMPRESSION TANKS

- A. Manufacturers:
 - 1. Amtrol Inc: www.amtrol.com/#sle.
 - 2. Bell & Gossett, a xylem brand: www.bellgossett.com/#sle.
 - 3. Taco, Inc: www.taco-hvac.com/#sle.
 - 4. Lochinvar: www.lochinvar.com.
 - 5. Substitutions: See Section 01 6000 - Product Requirements.
- B. Construction: Welded steel, tested and stamped in accordance with ASME BPVC-VIII-1; supplied with National Board Form U-1, rated for working pressure of 150 psi and 240 degrees F max working temperature, with heavy duty butyl fixed diaphragm sealed into tank, and steel legs or saddles.
- C. Accessories: Pressure gauge and air-charging fitting, tank drain; precharge to 12 psig.

2.03 IN-LINE CIRCULATOR PUMPS

- A. Manufacturers:
 - 1. Armstrong Fluid Technology: www.armstrongfluidtechnology.com/#sle.
 - 2. Bell & Gossett, a xylem brand: www.bellgossett.com/#sle.
 - 3. Taco: www.tacomfort.com.
 - 4. Grundfos Pumps: www.grundfos.com
 - 5. Substitutions: See Section 01 6000 - Product Requirements.
- B. Small Circulator Pump:
 - 1. The pumps shall be of the high efficiency type specifically designed for quiet operation
 - 2. Pump to be suitable for 203°F (95°C) operation at 150 psig (10.3 Bar) working pressure
 - 3. The pumps shall have a ceramic ball bearing lubricated by the system fluid.
 - 4. Pump body shall be lead-free (less than 0.25% Pb) brass
 - 5. Pump to have built-in adjustable thermostat from 68°F to 158°F (20°C to 70°C)
 - 6. Motor shall be spherical permanent magnet electrically commutated motor (ECM)

7. Motor shall be non-overloading at any point on the pump curve and shall have built in overload protection
 8. Accessories:
 - a. Pre-wired 6 foot electrical plug.
 - b. Timer
- C. Small Variable Speed Shaft-less Wet Rotor Inline Pump:
1. The pumps shall be of the high efficiency type specifically designed for quiet operation.
 2. Pump shall have sensorless control to automatically adjust pump performance as required.
 3. Pump to be suitable for 203°F (110°C) operation at 150 psi (10 Bar) working pressure
 4. The pumps shall have a shaft-less, wet rotor design with a ceramic ball bearing lubricated by the system fluid.
 5. Pump body shall be stainless steel.
 6. Pump to have three standard operating modes; Proportional Pressure, Constant Pressure and Constant Speed and two auxiliary modes; the Automatic Air Purge and Standby.
 7. Pump shall be supplied with an integral check valve
 8. Motor shall be spherical electronically commutated motor, permanent magnet (ECM/PM).
 9. Motor shall be non-overloading at any point on the entire pump curve.
 10. Pumps shall be capable of speed modulation across the full speed range.
- D. Wet Rotor Inline Pump:
1. The pump shall be of the horizontal system lubricated type specifically designed and guaranteed for quiet operation.
 2. Pump to be suitable for 225 degrees F (107 degrees C) operation at 150 psig working pressure.
 3. The pump shall have a ceramic shaft supported by carbon bearings. Bearings are to be lubricated by the circulating fluid.
 4. Pump body shall be lead-free bronze.
 5. Motor stator to be isolated from circulating fluid through use of stainless steel can. Rotor to be sheathed in stainless steel.
 6. Motors shall be non-overloading at any point on the pump curve. Motors shall have built-in thermal protection or impedance protection.
 7. Accessories:
 - a. Check valve
 - b. Automatic timer kit - to turn pump on and off automatically at preset times.
 - c. Aquastat kit - to thermostatically turn on pump on at 100 degrees F and off at 120 degrees F.
- E. Large Inline Circulator with EC Motor:
1. The pumps shall be a wet rotor inline pump, lead free bronze body construction specifically designed for quiet operation. Suitable standard operations at 230° F and 175 PSIG working pressure. The pump internals shall be capable of being serviced without disturbing piping connections.
 2. The pump internals shall be capable of being serviced without disturbing piping connections.
 3. Pump shall be equipped with a water-tight seal to prevent leakage.
 4. Pump volute shall be of a cast iron design for heating systems or lead free bronze for domestic water systems. The connection style on the cast iron and bronze pumps shall be flanged.
 5. Motor shall be a synchronous, permanent-magnet (PM) motor and tested with the pump as one unit. Conventional induction motors will not be acceptable.
 6. Each motor shall have an Integrated Variable Frequency Drive tested as one unit by the manufacturer.
 7. Integrated motor protection shall be verified by UL to protect the pump against over/under voltage, over temperature of motor and/or electronics, over current, locked rotor and dry

run (no load condition).

8. Pump shall have BACnet connections built into the VFD as standard options.
 9. Pumps shall be UL 778 listed and bear the UL Listed Mark for USA and Canada with on-board thermal overload protection.
 10. Pump integral controls shall allow for proportional pressure or constant temperature operating mode to vary the speed of the pump in order to maintain a differential pressure based on flow demand or constant temperature of the fluid media. Refer to schedule on plans for which operating mode is desired for this project.
 - a. Pump controls shall allow for Alternate Operation for 2 pump system such that only one pump runs at a time. The working time is switched every 24 hours.
- F. Performance: Refer to Schedules.
- G. Notify engineer upon start-up and commissioning of pumps to ensure proper setpoints are used.

2.04 ELECTRICAL WORK

- A. Provide electrical motor driven equipment specified complete with motors, motor starters, controls, and wiring.
- B. Electrical characteristics to be as specified or indicated.
- C. Supply manual or automatic control and protective or signal devices required for the operation specified, and any control wiring required for controls and devices not shown.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install plumbing equipment in accordance with manufacturer's instructions, as required by code, and complying with conditions of certification, if any.
- B. Coordinate with plumbing piping and related gas venting and electrical work to achieve operating system.
- C. Provide for the service of a competent factory-trained supervising agent from the equipment manufacturer to inspect the completed installation, start the system and acquaint the operators with the proper operation and maintenance of the equipment.
- D. Notify engineer upon start-up and commissioning of pumps to ensure proper setpoints are used.
- E. Domestic Water Storage Tanks:
 1. Provide steel pipe support, independent of building structural framing members.
 2. Clean and flush prior to delivery to site. Seal until pipe connections are made.
- F. Pumps:
 1. Provide line sized isolating valve and strainer on suction and line sized soft seated check valve, balancing valve and isolating valve on discharge.
 2. Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.
 3. Reduction from line size to pump connection size shall be made with eccentric reducers attached to the pump with tops flat to allow continuity of flow and to avoid air pockets.
 4. Provide temperature and pressure gauges where and as detailed or directed.
 5. All piping shall be brought to equipment and pump connections in such a manner so as to prevent the possibility of any load or stress being applied to the connections or piping.
 6. Power wiring, as required, shall be the responsibility of the electrical contractor. All wiring shall be performed per manufacturer's instruction and per applicable state, federal, and local codes.
 7. Control wiring for remote mounted switches and sensor / transmitters shall be the responsibility of the control's contractor. All wiring shall be performed per manufacturer's instructions and applicable state, federal, and local codes.
 8. Power and control wiring shall run in separate channel.

9. Pumps that are supplied with an integrated VFD and should not be used with any external VFDs.
 10. Pumps shall NOT be run dry to check rotation.
- G. Floor Mounted Equipment:
1. Install the system level and in accordance with manufacturer's published recommendations.
 2. Locate equipment with allowance for manufacturer's recommended clearances around unit.
 3. Set entire unit on 4" high reinforced concrete equipment pad.
 4. Pipe discharge from all relief valves, drains and individual pump thermal purge protection solenoid valves, indirectly to floor drain having adequate capacity to accept discharge.
- H. Booster Pumps: Provide, Type "L" copper branch feed to the bladder tank (if required) with isolation valve from system distribution main as shown on the Contract Drawings.

END OF SECTION

**SECTION 23 00 05
BASIC HVAC REQUIREMENTS**

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. This section applies to all sections of Division 23.
- B. Drawings and general provisions of the contract, including Division 00 and Division 01 specification sections, apply to work of this section.
- C. Provide all items, articles, materials, operations or methods listed, mentioned or scheduled on drawings and/or herein, including all labor, materials, equipment and incidentals necessary and required for their completion.
- D. The items in this section are supplementary to the requirements set forth in other portions of the specifications as indicated under item "A" above.

1.02 APPLICATION

- A. This section applies to all mechanical work. The contractors involved shall check all sections of the specifications in addition to the particular section covering their specific trade. Each distinct section of the specifications aimed for one trade may have detailed information with regards to other trades, therefore, it is imperative that all sections be reviewed to get a complete picture of all other trades' functions and work required.
- B. The mechanical contractor is responsible for the installation and operation of the hvac systems and temperature control systems.
- C. The mechanical contractor is responsible for receiving, unloading and placement of all of the owner provided equipment.

1.03 INSPECTION OF SITE

- A. Visit the site, examine and verify the conditions under which the work must be conducted before submitting proposal.
- B. The submitting of a proposal implies that the contractor has visited the site and understands the conditions under which the work must be conducted.

1.04 ALTERNATES AND SUBSTITUTIONS

- A. Refer to Division 01 - General Requirements for procedures.

1.05 DEVIATION FROM BASIS OF DESIGN MANUFACTURER

- A. Products identified within the schedules and details are used as the basis of design for laying out and coordinating with other trades such as structural, architectural, and electrical. Should the Division 23 Contractors submit equipment by a Manufacturer other than that indicated as the Basis of Design in the Drawings, Contractor shall then be responsible for evaluating the impacts of the proposed Manufacturer's equipment, even if the Manufacturer is listed in the specifications as an approved equal. This includes the proposed Manufacturer's electrical, architectural and structural requirements and their subsequent impacts on the current design (roof openings, curbs, structural support, etc.) and coordination of any differing dimensions and clearances with all other trades.

1.06 MATERIALS

- A. Mechanical equipment is to be furnished with motors, electrical controls and protective devices, and integral operating devices which are normally included by the manufacturer or required by the Contract Documents.
- B. The Mechanical Trades shall provide all control wiring, 120 volts and less, for the equipment and devices furnished under Division 22, and 23 of these specifications, including all wiring devices, conduit, etc.
- C. Power wiring 120 volts and greater shall be by the Electrical Trades.

1.07 DRAWINGS

- A. The drawings are diagrammatic and show the general location and arrangement of all equipment, piping and related items. They shall be followed as closely as elements of the construction will permit.
- B. Examine the drawings of other trades and verify the conditions governing the work on the job site. The mechanical and electrical contractor shall check all documents including architectural, structural, plumbing, HVAC and electrical to avert possible installation conflicts. Arrange work accordingly, providing such fittings, traps, valves and accessories as may be required to meet such conditions.
- C. Deviations from the drawings, with the exception of minor changes in routing and other such incidental changes that do not affect the functioning or serviceability of the systems, shall not be made without the written approval of the Architect/Engineer.
- D. The architectural and structural drawings take precedence in all matters pertaining to the building structure, mechanical drawings in all matters pertaining to mechanical trades and electrical drawings in all matters pertaining to electrical trades. Where there are conflicts or differences between the drawings for the various trades, report such conflicts or differences to the Architect/Engineer for resolution.
- E. Do not scale drawings for measurements.
- F. Field verifications of actual existing conditions are required by the contractor since actual locations, distances, and levels will be governed by actual field conditions. All measurements shall be verified at the site.
- G. If during field verification, the contractor identifies that there may require substantial changes from the original plans, the contractor shall notify the architect for agreement on necessary adjustment before the installation is started
- H. Discrepancies shown between plans, or between plans and actual field conditions, or between plans and specifications shall promptly be brought to the attention of the Architect/Engineer for a decision.
- I. Drawings and specifications are intended to cover the completed installation of systems to function as described. The omission of the expressed reference to any item of labor and material necessary to comply with practice codes, ordinances, etc., shall not relieve the contractor from providing such additional labor and material at no cost to Owner.

1.08 CODES, PERMITS AND FEES

- A. Unless otherwise indicated, all required permits, licenses, inspections, approvals and fees for mechanical work shall be secured and paid for by the contractor. All work shall conform to all applicable codes, rules and regulations. Applicable publications listed in all sections of Division 23 shall be the latest issue, unless otherwise noted.
- B. Rules of local utility companies and municipalities shall be complied with. Check with the utility company and/or municipality supplying service to the installation and determine all devices including, but not limited to: meters, regulators, valves which will be required and include the cost of all such items in the proposal.
- C. All work shall be executed in accordance with the rules and regulations set forth in local and state codes. Prepare any detailed drawings or diagrams which may be required by the governing authorities. Where the drawings and/or specifications indicate materials or construction in excess of code requirements, the drawings and/or specifications shall govern.

1.09 MAINTENANCE

- A. Provide 40 hours of instruction to the owner's designated personnel in the maintenance and operation of equipment and systems.
- B. Provide complete maintenance and operating instructional manuals covering all mechanical equipment herein specified, together with parts lists. Maintenance and operating instructional manuals shall be job specific to this project. Generic manuals are not acceptable. Four (4) copies of all literature shall be furnished for owner and shall be bound in book or ring binder

form. Maintenance and operating instructional manuals shall be provided when construction is approximately 75% complete.

1.10 WARRANTY AND GUARANTEE

- A. Contractor shall guarantee all work installed by themselves or their subcontractors to be free from defect in material and workmanship for a period of one year from date of final acceptance of the work, unless a longer period is stipulated under specific headings. Contractor shall repair or replace at no additional cost to the owner, any material or equipment developing defects and shall also make good any damage caused by such defects or the correction of defects. Repairs or replacements shall bear additional guarantee, as originally called for, dated from the final acceptance of the repair or replacement. This requirement shall be binding even though it will exceed product guarantees normally furnished by some manufacturers. Contractor shall submit his own and each equipment manufacturers written certificates, warranting that each item of equipment furnished complies with all requirements of the drawings and specifications. Note that guarantee shall run from date of final acceptance of the work, not from date of installation of a device or piece of equipment.

1.11 SUBMITTALS

- A. Refer to Division 01 - General Requirements for procedures.
- B. Contractor shall provide submittals where items are referred to by symbolic designation on the drawings. All submittals shall bear the same designation (hvac equipment, piping equipment, etc.). Refer to other sections of the mechanical specifications for additional requirements.
- C. Engineer WILL NOT REVIEW:
1. Submittals not specified.
 2. Submittals not reviewed by Contractor, including Contractor stamp with signature comments.
 3. Submittals made after work is delivered to site and/or installed.
 4. Submittal resubmissions unless resubmission is required by Architect/Engineer.
- D. Types of submittals include the following:
1. Shop Drawings
 2. Product Data Sheets
 3. Samples
 4. Manufacturers Instructions
 5. Maintenance Data
 6. Warranty
- E. Installation of any item that requires submittal approval by the engineer shall be installed at the contractors risk. The contractor, at his cost, shall remove all work installed prior to approval of the submittal.
- F. The engineer will not be responsible for errors in quantities, or dimensions required to fit the job condition, details of fabrication to insure proper assembly at the job, or for errors resulting from mistakes in submittals.

1.12 RECORD DRAWINGS

- A. Refer to Division 01 - General Requirements for procedures.
- B. Contractor shall provide the following record drawings as part of the Project closeout document process:
1. Contract Documents, specifications and submittals, indicating "As-Built" conditions and actual products selected for use.
 2. Product and Maintenance manuals for all equipment listed within this specification manual and in Contract Documents. Provide with parts lists as applicable.
- C. Record drawings shall be maintained by the contractor up to date as the project progresses.
- D. Recording all deviations from the contract documents, indicate exact locations of all buried services both inside and outside of the building; include concealed piping and equipment in the

entire contract. Final record drawings shall reflect the as-built conditions.

1.13 QUALITY ASSURANCE

- A. Other referenced standards:
 - 1. Comply with referenced standards, guidelines, data sheets from various associations, including NFPA, ANSI, ASTM, ASME, ASHRAE

PART 2 PRODUCTS

2.01 SLEEVES AND ESCUTCHEONS

- A. Provide sleeves wherever pipes pass through exterior wall, and floors. Sleeves shall be schedule 40 steel pipe cut to length. Sleeves shall terminate flush with walls, partitions and ceilings in finished areas. All sleeves through floor shall extend 2" above floor. Provide cast brass nickel-plated escutcheons with positive catches on each visible sleeve penetration. Sleeves are to be sealed at each installation with a 3M approved sealant. The space between the inside of the sleeve and the outside of the pipe or conduit within the sleeve shall be sealed at each installation with a 3M approved sealant.

2.02 DIELECTRIC UNIONS

- A. Dielectric unions shall be used to connect dissimilar metals (such as steel and copper) to prevent electrolytic action.

2.03 FILTERS

- A. Provide and maintain filters in air handling systems throughout the construction period and prior to final acceptance of the building. Do not run air handling equipment without all prefilters and final filters as specified. Immediately prior to final building acceptance by the owner, contractor shall replace all disposable type air filters with new.

2.04 BUILDING ATTACHMENTS FOR MECHANICAL WORK SUPPORTS

- A. General Requirements:
 - 1. Provide building attachments required for supporting mechanical work, suitably selected and installed for the loads applied with a minimum additional safety factor of 3.
 - 2. Where specified attachments are not suitable for conditions, submit to Engineer for approval, proposal for alternate building attachments.
 - 3. If specially designed building attachments are required, retain the services of a licensed structural engineer to design such building attachments.
 - 4. Approved Manufacturers: Grinnell, or equivalent products by Michigan Hanger and B-Line.
 - 5. Provide supplemental trapeze supports where necessary. Design trapeze to support all trades. Coordinate loads, and supports with all trades. Size trapeze for maximum deflection of 1/64 of the span.
- B. Attachments to Structural Steel:
 - 1. Support mechanical work from building structural steel where possible and approved. No welding or bolting to structural steel is permitted unless authorized by Architect. C-clamps are not permitted.
 - a. Center beam clamp - for loads over 120 lb.: Malleable center hung Grinnell Fig. 228.
 - b. Side beam clamp with retaining clips - for loads up to 120 lb.
- C. Cast in Place Concrete Inserts:
 - 1. Provide inserts selected for applied load of present load plus 100% for future, and coordinated with concrete work. Except as detailed on drawings, inserts shall be Unistrut or Grinnell. Plan, lay out and coordinate setting of inserts prior to concrete pour. Use Grinnell Fig. 285 lightweight concrete insert for loads up to 400# or Grinnell Fig. 281 Wedge Type concrete insert for loads up to 1200#
- D. Drilled Insert Anchors:
 - 1. Where mechanical work cannot be supported from structural steel, or cast in place concrete inserts, provide drilled concrete insert anchors. Submit for approval, project specific installation drawings for all loads over 100 lbs. Install inserts in web of beam if

possible and approved. Insert depth shall not exceed two thirds the thickness of the concrete. Where existing concrete appears to be deteriorating, or where applied load at insert exceeds 1000 lbs., conduct test of concrete to determine derated capacity of insert. Anchors may be adhesive or expansion type up to 1000 lbs., and shall be adhesive type for loads over 1000 lbs.

2. Manufacturers: Hilti

PART 3 EXECUTION

3.01 GENERAL

- A. Existing piping and ductwork: when encountered during the course of work, protect, brace and support existing piping and ductwork where required for proper execution of the work.
- B. Interruption of existing active piping and ductwork: when the course of work makes shut-down of services unavoidable, the mechanical contractor shall schedule the shut-down at such time as approved by the owners representative, which will cause least interference with established operating routine.
- C. Arrange work accordingly, providing such fittings as duct transitions traps, valves and accessories necessary to complete all construction in an orderly fashion.
- D. Install all equipment in strict accordance all directions and recommendations furnished by the manufacturer.

3.02 ACCESSIBILITY

- A. Do not locate valves, traps, controls, unions, dampers, etc. in any system at a location that will be inaccessible after construction is completed. Maintain accessibility for all components in mechanical, electrical, and plumbing systems.

3.03 ACCESS DOORS AND PANELS

- A. Refer to Division 08 - Openings; Provide access doors in locations as required by applicable codes and as indicated below. Coordinate locations with architectural trades.
- B. Furnish access panels to access valves, traps, control valves or devices, dampers, damper motors, etc. Access panels shall be sized as necessary for ample access, or as indicated on drawings, but no smaller than 12" x 12" where devices are within easy reach of operator, and at least 24"x24" when operator must pass through opening in order to reach the devices. Architectural Trades shall install access panels coordinated with Mechanical Trades.
- C. Access panels in fire rated walls or ceiling must be U.L. labeled for intended use. Unless otherwise indicated on plans, access doors shall be hinged flush type steel framed panel, 14 gauge minimum for frame, and with anchor straps. Only narrow border shall be exposed. Hinges shall be concealed type. Locking device shall be flush type and screw driver operated. Metal surfaces shall be prime coated with rust-inhibitive paint. Panels shall be compatible with architectural adjacent materials Manufacturer: Milcor, Bilco.

3.04 CUTTING AND PATCHING

- A. Refer to Division 01 - General Requirements and Division 02 - Existing Conditions.
- B. All cutting required shall be done by the contractor whose work is involved, without extra cost the owner. All patching and restoration including the furnishing and installation of access panels in ceiling, walls; etc. Within the building lines shall be done by the respective, responsible contractor. No cutting of structural steel, concrete, or wood shall be done without prior approval and explicit directions of the architect patched by the respective, responsible contractor.
- C. The contractor, under whose jurisdiction the work may fall, shall provide labor, material, and tools required to cut, repair, protect, cap, or relocate existing pipes, conduits, or utilities interfering with or uncovered during work, per regulations of the authorities having jurisdiction.

3.05 ROUGH-IN FOR CONNECTION TO EQUIPMENT

- A. It shall be the responsibility of each contractor to study the architectural, structural, electrical, and mechanical drawings, conferring with the various trades involved and checking with the

supplier of equipment in order to properly rough-in for all equipment.

3.06 MATERIAL AND EQUIPMENT

- A. All material and equipment shall be new and of the best quality used for the purpose in good commercial practice, and shall be the standard product of reputable manufacturers. The material and equipment must meet approval of state and local codes in the area it is being used. Roof decks shall not be used to support piping, conduit, equipment, devices, etc.

3.07 SEAL PENETRATIONS

- A. Seal the space around pipes in sleeves and around duct openings through walls, floors and ceilings. Provide adequate clearance to allow for proper sealing.

3.08 SOUND CONTROL

- A. Penetrations shall be maintained airtight to prevent sound transfer.
- B. Piping, ductwork, etc. shall pass through sleeves. Pack sleeves tight with glass fiber or oakum and caulked on both sides with non-hardening acoustical sealant.

3.09 FIRESTOPPING

- A. Refer to Division 07 - Thermal and Moisture Protection for more information.
- B. Provide UL classified firestopping system for mechanical penetrations through rated walls and floors to maintain the fire rating.

3.10 DELIVERY, STORAGE AND HANDLING OF EQUIPMENT AND MATERIALS

- A. Refer to Division 01 - General Requirements; All equipment and materials shall be delivered, stored and secured per manufacturer's recommendations.
- B. On-site storage shall be coordinated with Construction Manager and be performed in a manner as to avoid damage, deterioration and loss.
- C. Contractor shall provide temporary protection for installed equipment prior to project completion.
- D. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- E. All equipment shall be inspected prior to installation to assure that equipment is free from defect and damage.
- F. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.
- G. Protect dampers, grilles, louvers from damage to operating linkages and blades.

3.11 CLEANING

- A. Refer to Division 01 - General Requirements; all mechanical equipment and components shall be cleaned as frequently as necessary through the construction process and again prior to project completion.

3.12 CONTROL WIRING

- A. All control wiring for mechanical and electrical equipment, including motor starters, shall be 120 volt maximum and wired with one side of the coil grounded and the operating contacts in the north side of the circuit. All control wiring shall be installed in conduit.

END OF SECTION

**SECTION 23 05 05
SELECTIVE DEMOLITION FOR HVAC**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Demolition and extension of existing mechanical work.

1.02 RELATED REQUIREMENTS

- A. Division 01 - General Requirements: Project administrative and procedural requirements.
- B. Division 02 - Existing Conditions: Demolition, cleaning and disposal requirements, cutting and patching requirements, repairs.

1.03 SUMMARY

- A. The work covered under this section consists of the furnishing of all necessary labor, supervision, materials, equipment, and services to completely execute the system of minor electrical demolition as described in this specification.
- B. The demolition documents plans and specification have been prepared from existing non-as built documents and cursory non-invasive field investigation.
- C. It is the contractors obligation to become familiar with the extent of demolition and the existing condition before submitting their bid.
- D. During demolition if the contractor discovers unforeseen significant non-code compliance conditions of the existing installation they shall notify the Architect and Engineer immediately in writing.
- E. The contractor shall become familiar with the drawings and scope of work of other trades as the work scope of those trades relates to mechanical equipment and connection requirements.
- F. During demolition the contractor shall record on site as-builts all hydronic system piping capped branches, capped supply air, return air and exhaust ducts for reuse in renovated project space.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Materials and equipment for patching and extending work: As specified in individual sections.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that piping and ductwork to be demolished serve only equipment and facilities within the demolition areas.
- B. Demolition drawings are based on casual field observation and existing record documents.
- C. Report discrepancies to Owner before disturbing existing installation.
- D. Beginning of demolition means installer accepts existing conditions.

3.02 PREPARATION

- A. Identify locations for capping piping and ductwork before any demolition work commences.
- B. Confirm isolation valve locations for hydronic piping. Repair leaking isolation valves or replace inoperable valves before commencing piping demolition.
- C. Cap and seal air-tight supply, return and exhaust air ductwork at shaft walls before commencing sheet metal demolition

3.03 DEMOLITION AND EXTENSION OF EXISTING MECHANICAL WORK

- A. Remove, relocate, and extend existing mechanical piping or sheet metal work to accommodate new construction.
- B. Remove hydronic water piping back to isolation valve.
- C. Remove all supply, return and exhaust air ductwork back to main connection.

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AND BOILER REPLACEMENT

231997

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3.04 CLEANING AND REPAIR

- A. Refer to Division 01 - General Requirements for procedures.
- B. Clean and repair existing materials and equipment that remain or that are to be reused.

END OF SECTION

**SECTION 23 51 00
BREECHINGS, CHIMNEYS, AND STACKS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Type B double wall gas vents (Special AL-294C Gas Vent)

1.02 REFERENCE STANDARDS

- A. NFPA 54 - National Fuel Gas Code 2021.
- B. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible 2020.

1.03 DEFINITIONS

- A. Breeching: Vent connector.
- B. Vent: That portion of a venting system designed to convey flue gases directly outdoors from a vent connector or from an appliance when a vent connector is not used.
- C. Vent Connector: That part of a venting system that conducts the flue gases from the flue collar of an appliance to a chimney or vent, and may include a draft control device.

1.04 SUBMITTALS

- A. Product Data: Provide data indicating factory built chimneys, including dimensional details of components and flue caps, dimensions and weights, electrical characteristics and connection requirements.
- B. Shop Drawings: Indicate general construction, dimensions, weights, support and layout of breechings. Submit layout drawings indicating plan view and elevations where factory built units are used.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. AMPCO by Hart & Cooley, Inc: www.ampcostacks.com
- B. DuraVent: www.duravent.com
- C. Metal-Fab, Inc: www.mtlfab.com
- D. Selkirk Corporation: www.selkirkcommercial.com

2.02 BREECHINGS, CHIMNEYS, AND STACKS - GENERAL REQUIREMENTS

- A. Regulatory Requirements:
 - 1. Comply with applicable codes for installation of natural gas burning appliances and equipment.

2.03 TYPE B DOUBLE WALL GAS VENTS (SPECIAL AL-294C GAS VENT)

- A. Vent shall be factory-built special gas type, double wall, engineered and designed for use on Category IV appliances, or as specified by the equipment manufacturer. Comply with UL 1738.
- B. Vent shall be listed for an internal static pressure of 15.0" w.g. and tested to 37.0" w.g.
- C. Vent shall be constructed with an inner conduit constructed of AL29-4C or 29-4 superferritic stainless steel with a minimum thickness of .015" for diameters 3"-8" and .020" for diameters 10"-16".
- D. Design, fabricate and install gas-tight preventing products of combustion from leaking into the building.
 - 1. All inner wall conduit components shall be manufactured from AL29-4C or 29-4. Joints shall not use screws or fasteners that penetrate the inner conduit.
 - 2. Inner wall joints shall be designed with a male and female overlapping metal-metal connection to maintain condensate on the AL29-4C stainless steel. Proper ¼" per foot pitch must be maintained at all times and condensate should flow back toward the appliance to the required number of drains

- E. The outer wall casing shall be constructed of 430 stainless steel that shall not require additional surface preparation, such as painting, in order to withstand the outdoors or high humidity environments.
- F. Inner conduit and outer wall casing shall be constructed with a one-inch air space between them and in such a fashion that prevents cross-alloy contamination.
- G. Provide with appliance adapter, drain sections, supports clamps, rain cap, storm color, and other accessories to provide a complete system.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Support breechings from building structure, rigidly with suitable ties, braces, hangers and anchors to hold to shape and prevent buckling. Support vertical breechings, chimneys, and stacks at 12 foot (4 m) spacing, to adjacent structural surfaces, or at floor penetrations. Refer to SMACNA (DCS) for equivalent duct support configuration and size.
- C. Pitch breechings with positive slope up from fuel-fired equipment to chimney or stack.
- D. For Type B double wall gas vents, maintain UL listed minimum clearances from combustibles. Assemble pipe and accessories as required for complete installation.
- E. Install vent dampers, locating close to draft hood collar, and secured to breeching.
- F. Clean breechings, chimneys, and stacks during installation, removing dust and debris.
- G. At appliances, provide slip joints permitting removal of appliances without removal or dismantling of breechings, breeching insulation, chimneys, or stacks.

END OF SECTION

**SECTION 26 00 05
BASIC ELECTRICAL REQUIREMENTS**

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. This section applies to all sections of Division 26 and Division 28.
- B. Drawings and general provisions of the contract, including Division 00 and Division 01 specification sections, apply to work of this section.
- C. Provide all items, articles, materials, operations or methods listed, mentioned or scheduled on drawings and/or herein, including all labor, materials, equipment and incidentals necessary and required for their completion.
- D. The items in this section are supplementary to the requirements set forth in other portions of the specifications as indicated under Item "A" above.

1.02 DRAWINGS

- A. The drawings show the location and general arrangement of equipment, electrical systems and related items. They shall be followed as closely as elements of the construction will permit.
- B. Examine the drawings of other trades and verify the conditions governing the work on the job site. Arrange work accordingly, providing such fittings, conduit, junction boxes and accessories as may be required to meet such conditions.
- C. Deviations from the drawings, with the exception of minor changes in routing and other such incidental changes that do not affect the functioning or serviceability of the systems, shall not be made without the written approval of the Architect/Engineer.
- D. The architectural and structural drawings take precedence in all matters pertaining to the building structure, mechanical drawings in all matters pertaining to mechanical trades and electrical drawings in all matters pertaining to electrical trades. Where there are conflicts or differences between the drawings for the various trades, report such conflicts or differences to the Architect/Engineer for resolution.

1.03 INSPECTION OF SITE

- A. Visit the site, examine and verify the conditions under which the work must be conducted before submitting proposal.
- B. The submitting of a proposal implies that the contractor has visited the site and understands the conditions under which the work must be conducted.

1.04 TEMPORARY FACILITIES

- A. Provide and remove upon completion of the project, in accordance with the general conditions, a complete temporary electrical and telephone service during construction.

1.05 ALTERNATES

- A. Refer to Division 01 - General Requirements for procedures.

1.06 GUARANTEE

- A. Contractor guarantees that the installation is free from defects and agrees to replace or repair, any part of this installation which becomes defective within a period of one year following final acceptance, unless noted otherwise, provided that such failure is due to defects in the equipment, material or installation or to follow the specifications and drawings. File with the Owner any and all guarantees from the equipment manufacturers.

1.07 CODES, PERMITS AND FEES

- A. Unless otherwise indicated, all required permits, licenses, inspections, approvals and fees for electrical work shall be secured and paid for by the contractor. All work shall conform to all applicable codes, rules and regulations. Applicable publications listed in all sections of Division 26 shall be the latest issue, unless otherwise noted.

- B. Rules of local utility companies shall be complied with. Check with the utility company supplying service to the installation and determine all devices including, but not limited to, all current and potential transformers, meter boxes, C.T. cabinets and meters which will be required and include the cost of all such items in proposal.
- C. All work shall be executed in accordance with the rules and regulations set forth in local and state codes. Prepare any detailed drawings or diagrams which may be required by the governing authorities. Where the drawings and/or specifications indicate materials or construction in excess of code requirements, the drawings and/or specifications shall govern.

1.08 STANDARDS OF MATERIAL AND WORKMANSHIP:

- A. All materials shall be new, unless noted otherwise. The electrical and physical properties of all materials, and the design, performance characteristics, and methods of construction of all items of equipment, shall be in accordance with the latest issue of the various, applicable standard specifications of the following recognized authorities:
 - 1. N.S.I. - American National Standards Institute
 - 2. S.T.M. - American Society for Testing Materials
 - 3. C.E.A. - Insulated Cable Engineers Association
 - 4. E.E.E. - Institute of Electrical and Electronics Engineers
 - 5. E.C. - National Electrical Code (NFPA 70)
 - 6. E.C.A. - National Electrical Contractors Association
 - 7. E.M.A. - National Electrical Manufacturer's Association
 - 8. F.P.A. - National Fire Protection Association
 - 9. L. - Underwriters Laboratories, Inc.
- B. Perform all work in a first class and workmanlike manner, in accordance with the latest accepted standards and practices for the Trades involved.
- C. All equipment of the same or similar systems shall be by the same manufacturer.

1.09 RECORD DRAWINGS

- A. Refer to Division 01 - General Requirements for procedures. All literature shall be furnished in accordance with requirements listed in Division 01.
- B. Contractor shall provide the following record drawings as part of the Project closeout document process:
 - 1. Contract Documents, specifications and submittals, indicating "As-Built" conditions and actual products selected for use.
 - 2. Product and Maintenance manuals for all equipment listed within this specification manual and in Contract Documents. Provide with parts lists as applicable.

1.10 SUBMITTALS

- A. Refer to Division 01 - General Requirements for procedures.
- B. Contractor shall provide submittals where items are referred to by symbolic designation on the drawings. All submittals shall bear the same designation (light fixtures, wiring devices, etc.). Refer to other sections of the electrical specifications for additional requirements.
- C. Engineer WILL NOT REVIEW:
 - 1. Submittals not specified.
 - 2. Submittals which do not indicate optional equipment being provided.
 - 3. Submittals not reviewed by Contractor; including Contractor stamp with signature comments.
 - 4. Submittals made after work is delivered to site and/or installed.
 - 5. Submittal resubmissions unless resubmission is required by Architect/Engineer.

1.11 MANUFACTURERS LISTED

- A. The listing of specific manufacturers does not imply acceptance of their products that do not meet the specified ratings, features and functions. Manufacturers listed are not relieved from meeting these specifications in their entirety.

- B. Products in compliance with the specification and manufactured by others not named will be considered only if pre-approved by the Engineer five (5) days prior to bid date.

1.12 USE OF EQUIPMENT

- A. The use of any equipment, or any part thereof for purposes other than testing even with the Owner's consent, shall not be construed to be an acceptance of the work on the part of the Owner, nor be construed to obligate the Owner in any way to accept improper work or defective materials.
- B. Do not use Owner's light fixtures for temporary lighting except as allowed and directed by the Owner.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 INSTALLATION OF EQUIPMENT

- A. Install all equipment in strict accordance with all directions and recommendations furnished by the manufacturer. Where such directions are in conflict with the drawings and specifications, report such conflicts to the Architect/Engineer for resolution.
- B. Equipment location shall be as close as practical to locations shown on the drawings.
- C. Working clearances shall not be less than specified in NFPA 70 (National Electric Code).

3.02 COORDINATION

- A. Install work to avoid interference with work of other trades including, but not limited to, architectural and mechanical trades. Remove and relocate any work that causes an interference at Contractor's expense. Disputes regarding the cause of an interference will be resolved by the Construction Manager or Architect/Engineer.

3.03 CUTTING, PATCHING AND DAMAGE TO OTHER WORK

- A. Refer to Division 01 - General Requirements and Division 02 - Existing Conditions.
- B. All cutting, patching and repair work shall be performed by the contractor through approved, qualified subcontractors. Contractor shall include full cost of same in bid.

3.04 EXCAVATION AND BACKFILLING

- A. Provide all excavation, trenching, tunneling, dewatering and backfilling required for the electrical work. Coordinate the work with other excavating and backfilling in the same area.
- B. Where conduit is installed less than 30" below the surface of pavement, provide concrete encasement, 4" minimum coverage, all around or as shown on the electrical drawings.
- C. Backfill all excavations inside building, under drives and parking areas with well-tamped granular material. Backfill all excavations under wall footings with lean mix concrete up to underside of footings and extend concrete within excavation a minimum of four (4) feet each side of footing. Granular backfill shall be placed in layers not more than 8 inches in thickness, 95 percent compaction throughout with approved compaction equipment. Tamp, roll as required. Excavated material shall not be used.
- D. Backfill outside building with granular material to a height 12 inches over top of pipe compacted to 95 percent compaction as specified above. Backfill remainder of excavation with unfrozen, excavated material in such a way to prevent settling. Tamp, roll as required.

3.05 EQUIPMENT FOUNDATION AND SUPPORTS

- A. Shall be as required or as shown on plans or specified.
- B. Provide concrete house keeping bases 4" above finished floor, with leveling channels, where noted, for floor-mounted equipment. Coordinate requirements with Division 03 - Concrete.
- C. For equipment suspended from ceilings or walls, furnish and install all inserts, rods, structural steel frames, brackets and platforms required.

3.06 EQUIPMENT CONNECTIONS

- A. Make connections to equipment, motors, lighting fixtures, and other items included in the work in accordance with the approved shop drawings and rough-in measurements furnished by the manufacturers of the particular equipment furnished. All additional connections not shown on the drawings, but called out by the equipment manufacturer's shop drawings shall be provided.

3.07 ACCESS DOORS AND PANELS

- A. Refer to Division 08 - Openings; Provide access doors in locations as required per N.E.C. Coordinate locations with architectural trades.

3.08 CLEANING

- A. Refer to Division 01 - General Requirements; All equipment shall be cleaned as frequently as necessary through the construction process and again prior to project completion.
- B. Final cleanup shall include, but not be limited to, washing of fixture lenses or louvers, switchboards, substations, motor control centers, panels, etc. Fixture reflectors and lenses or louvers shall be left with no water marks or cleaning streaks.

3.09 DELIVERY, STORAGE AND PROTECTION OF EQUIPMENT AND MATERIALS

- A. Refer to Division 01 - General Requirements; All equipment and materials shall be delivered, stored and secured per manufacturer's recommendations.
- B. On-site storage shall be coordinated with Construction Manager and be performed in a manner as to avoid damage, deterioration and loss.

3.10 DRAWINGS AND MEASUREMENTS

- A. Electrical drawings are not intended to be scaled for rough-in measurements nor to serve as submittals. Field measurements necessary for ordering materials and fitting the installation to the building construction and arrangement shall be taken by the Contractor.

END OF SECTION

**SECTION 26 05 05
SELECTIVE DEMOLITION FOR ELECTRICAL**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Electrical demolition and extension of existing electrical work.

1.02 RELATED REQUIREMENTS

- A. Division 01 - General Requirements: Project administrative and procedural requirements
- B. Division 02 - Existing Conditions: Demolition, cleaning and disposal requirements.
- C. Section 26 0005 - Basic Electrical Requirements.

PART 2 PRODUCTS

2.01 MATERIALS AND EQUIPMENT

- A. Materials and equipment for patching and extending work: As specified in individual sections.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that abandoned wiring and equipment serve only abandoned facilities.
- B. Demolition drawings are based on casual field observation and existing record documents.
- C. Beginning of demolition means installer accepts existing conditions.

3.02 PREPARATION

- A. Disconnect electrical systems in walls, floors, and ceilings to be removed.
- B. Coordinate utility service outages with utility company.
- C. Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations.
- D. Existing Electrical Service: Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and connections. Minimize outage duration.
 - 1. Obtain permission from Owner at least 24 hours before partially or completely disabling system.
 - 2. Make temporary connections to maintain service in areas adjacent to work area.
- E. Existing Fire Alarm System: Maintain existing system in service until new system is accepted. Disable system only to make switchovers and connections. Minimize outage duration.
 - 1. Notify Owner before partially or completely disabling system.
 - 2. Notify local fire service.
 - 3. Make notifications at least 24 hours in advance.
 - 4. Make temporary connections to maintain service in areas adjacent to work area.

3.03 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

- A. Perform work for removal and disposal of equipment and materials containing toxic substances regulated under the Federal Toxic Substances Control Act (TSCA) in accordance with applicable federal, state, and local regulations. Applicable equipment and materials include, but are not limited to:
 - 1. PCB-containing electrical equipment, including transformers, capacitors, and switches.
 - 2. PCB- and DEHP-containing lighting ballasts.
 - 3. Mercury-containing lamps and tubes, including fluorescent lamps, high intensity discharge (HID), arc lamps, ultra-violet, high pressure sodium, mercury vapor, ignitron tubes, neon, and incandescent.
- B. Remove, relocate, and extend existing installations to accommodate new construction.

- C. Remove abandoned wiring to source of supply.
- D. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.
- E. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned outlets that are not removed.
- F. Disconnect and remove abandoned panelboards and distribution equipment.
- G. Disconnect and remove abandoned luminaires. Remove brackets, stems, hangers, and other accessories.
- H. Repair adjacent construction and finishes damaged during demolition and extension work.
- I. Maintain access to existing electrical installations that remain active. Modify installation or provide access panel as appropriate.

3.04 CLEANING AND REPAIR

- A. See Division 01 - General Requirements.
- B. Clean and repair existing materials and equipment that remain or that are to be reused.
- C. Panelboards: Clean exposed surfaces and check tightness of electrical connections. Replace damaged circuit breakers and provide closure plates for vacant positions. Provide typed circuit directory showing revised circuiting arrangement.
- D. Luminaires: Remove existing luminaires for cleaning. Use mild detergent to clean all exterior and interior surfaces; rinse with clean water and wipe dry. Replace lamps, ballasts and broken electrical parts.

END OF SECTION

**SECTION 26 05 19
VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Single conductor building wire.
- B. Metal-clad cable.
- C. Wiring connectors.
- D. Electrical tape.
- E. Heat shrink tubing.
- F. Oxide inhibiting compound.
- G. Wire pulling lubricant.
- H. Cable ties.
- I. Firestop sleeves.

1.02 RELATED REQUIREMENTS

- A. Division 01 - General Requirements: Project administrative and procedural requirements.
- B. Division 02 - Existing Conditions: Demolition, cleaning and disposal requirements, cutting and patching requirements, and repairs.
- C. Section 07 8400 - Firestopping.
- D. Section 26 0005 - Basic Electrical Requirements.
- E. Section 26 0505 - Selective Demolition for Electrical: Disconnection, removal, and/or extension of existing electrical conductors and cables.
- F. Section 26 0526 - Grounding and Bonding for Electrical Systems: Additional requirements for grounding conductors and grounding connectors.
- G. Section 26 0536 - Cable Trays for Electrical Systems: Additional installation requirements for cables installed in cable tray systems.
- H. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.
- I. Section 28 4600 - Fire Detection and Alarm: Fire alarm system conductors and cables.
- J. Division 31 - Earthwork: Excavating, bedding, and backfilling.

1.03 REFERENCE STANDARDS

- A. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire 2013 (Reapproved 2018).
- B. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft 2011 (Reapproved 2017).
- C. ASTM B33 - Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes 2010, with Editorial Revision (2020).
- D. ASTM B787/B787M - Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation 2004 (Reapproved 2020).
- E. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- F. NECA 120 - Standard for Installing Armored Cable (AC) and Metal-Clad Cable (MC) 2012.
- G. NEMA WC 70 - Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy 2009.
- H. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems 2017.

- I. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- J. UL 44 - Thermoset-Insulated Wires and Cables Current Edition, Including All Revisions.
- K. UL 83 - Thermoplastic-Insulated Wires and Cables Current Edition, Including All Revisions.
- L. UL 486A-486B - Wire Connectors Current Edition, Including All Revisions.
- M. UL 486C - Splicing Wire Connectors Current Edition, Including All Revisions.
- N. UL 486D - Sealed Wire Connector Systems Current Edition, Including All Revisions.
- O. UL 1569 - Metal-Clad Cables Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate sizes of raceways, boxes, and equipment enclosures installed under other sections with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
 - 2. Coordinate with electrical equipment installed under other sections to provide terminations suitable for use with the conductors to be installed.
 - 3. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

- A. Contractor shall provide submittals for equipment listed herein. Refer to Division 01 for submittal procedures.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 FIELD CONDITIONS

- A. Do not install or otherwise handle thermoplastic-insulated conductors at temperatures lower than 14 degrees F, unless otherwise permitted by manufacturer's instructions. When installation below this temperature is unavoidable, notify Architect and obtain direction before proceeding with work.

PART 2 PRODUCTS

2.01 CONDUCTOR AND CABLE APPLICATIONS

- A. Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.
- B. Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.
- C. Nonmetallic-sheathed cable is not permitted.
- D. Underground feeder and branch-circuit cable is not permitted.
- E. Service entrance cable is not permitted.
- F. Armored cable is not permitted.
- G. Metal-clad cable is permitted only as follows:
 - 1. Where not otherwise restricted, may be used:
 - a. Where concealed above accessible ceilings for final connections from junction boxes to luminaires.

- 1) Maximum Length: 6 feet.
- b. Where concealed in hollow stud walls, above accessible ceilings, and under raised floors for branch circuits up to 20 A.

H. Manufactured wiring systems are not permitted.

2.02 CONDUCTOR AND CABLE GENERAL REQUIREMENTS

- A. Provide products that comply with requirements of NFPA 70.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.
- D. Comply with NEMA WC 70.
- E. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.
- F. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.
- G. Conductor Material:
 1. Provide copper conductors only. Aluminum conductors are not acceptable for this project. Conductor sizes indicated are based on copper.
 2. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B787M unless otherwise indicated.
 3. Tinned Copper Conductors: Comply with ASTM B33.
- H. Minimum Conductor Size:
 1. Branch Circuits: 12 AWG.
 - a. Exceptions:
 - 1) 20 A, 120 V circuits longer than 75 feet: 10 AWG, for voltage drop.
 - 2) 20 A, 120 V circuits longer than 150 feet: 8 AWG, for voltage drop.
 - 3) 20 A, 277 V circuits longer than 150 feet: 10 AWG, for voltage drop.
- I. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
- J. Conductor Color Coding:
 1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.
 2. Color Coding Method: Integrally colored insulation.
 3. Color Code:
 - a. 480Y/277 V, 3 Phase, 4 Wire System:
 - 1) Phase A: Brown.
 - 2) Phase B: Orange.
 - 3) Phase C: Yellow.
 - 4) Neutral/Grounded: Gray.
 - b. 208Y/120 V, 3 Phase, 4 Wire System:
 - 1) Phase A: Black.
 - 2) Phase B: Red.
 - 3) Phase C: Blue.
 - 4) Neutral/Grounded: White.
 - c. Equipment Ground, All Systems: Green.
 - d. For modifications or additions to existing wiring systems, comply with existing color code when existing code complies with NFPA 70 and is approved by the authority having jurisdiction.

2.03 SINGLE CONDUCTOR BUILDING WIRE

- A. Manufacturers:
 1. Copper Building Wire:

- a. Cerro Wire LLC: www.cerrowire.com.
 - b. Encore Wire Corporation: www.encorewire.com.
 - c. General Cable Technologies Corporation: www.generalcable.com.
 - d. Southwire Company: www.southwire.com.
- B. Description: Single conductor insulated wire.
- C. Conductor Stranding:
- 1. Feeders and Branch Circuits:
 - a. Size 10 AWG and Smaller: Stranded.
 - b. Size 8 AWG and Larger: Stranded.
- D. Insulation Voltage Rating: 600 V.
- E. Insulation:
- 1. Copper Building Wire: Type THHN/THWN or THHN/THWN-2, except as indicated below.

2.04 METAL-CLAD CABLE

- A. Manufacturers:
- 1. AFC Cable Systems Inc: www.afcweb.com/#sle.
 - 2. Encore Wire Corporation: www.encorewire.com/#sle.
 - 3. Southwire Company: www.southwire.com/#sle.
- B. Description: NFPA 70, Type MC cable listed and labeled as complying with UL 1569, and listed for use in classified firestop systems to be used.
- C. Conductor Stranding:
- 1. Size 10 AWG and Smaller: Stranded.
 - 2. Size 8 AWG and Larger: Stranded.
- D. Insulation Voltage Rating: 600 V.
- E. Insulation: Type THHN, THHN/THWN, or THHN/THWN-2.
- F. Provide oversized neutral conductors where indicated or required.
- G. Grounding: Full-size integral equipment grounding conductor.
- H. Armor: Steel, interlocked tape.

2.05 WIRING CONNECTORS

- A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.
- B. Connectors for Grounding and Bonding: Comply with Section 26 0526.
- C. Wiring Connectors for Splices and Taps:
- 1. Copper Conductors Size 8 AWG and Smaller: Use twist-on insulated spring connectors.
 - 2. Copper Conductors Size 6 AWG and Larger: Use mechanical connectors or compression connectors.
- D. Wiring Connectors for Terminations:
- 1. Provide terminal lugs for connecting conductors to equipment furnished with terminations designed for terminal lugs.
 - 2. Provide compression adapters for connecting conductors to equipment furnished with mechanical lugs when only compression connectors are specified.
 - 3. Where over-sized conductors are larger than the equipment terminations can accommodate, provide connectors suitable for reducing to appropriate size, but not less than required for the rating of the overcurrent protective device.
 - 4. Copper Conductors Size 8 AWG and Larger: Use mechanical connectors or compression connectors where connectors are required.
- E. Do not use insulation-piercing or insulation-displacement connectors designed for use with conductors without stripping insulation.

- F. Do not use push-in wire connectors as a substitute for twist-on insulated spring connectors.
- G. Twist-on Insulated Spring Connectors: Rated 600 V, 221 degrees F for standard applications and 302 degrees F for high temperature applications; pre-filled with sealant and listed as complying with UL 486D for damp and wet locations.
- H. Mechanical Connectors: Provide bolted type or set-screw type.
- I. Compression Connectors: Provide circumferential type or hex type crimp configuration.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that interior of building has been protected from weather.
- B. Verify that work likely to damage wire and cable has been completed.
- C. Verify that raceways, boxes, and equipment enclosures are installed and are properly sized to accommodate conductors and cables in accordance with NFPA 70.
- D. Verify that field measurements are as indicated.
- E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

- A. Clean raceways thoroughly to remove foreign materials before installing conductors and cables.

3.03 INSTALLATION

- A. Circuiting Requirements:
 - 1. Unless dimensioned, circuit routing indicated is diagrammatic.
 - 2. When circuit destination is indicated without specific routing, determine exact routing required.
 - 3. Arrange circuiting to minimize splices.
 - 4. Include circuit lengths required to install connected devices within 10 ft of location indicated.
 - 5. Maintain separation of Class 1, Class 2, and Class 3 remote-control, signaling, and power-limited circuits in accordance with NFPA 70.
 - 6. Maintain separation of wiring for emergency systems in accordance with NFPA 70.
 - 7. Circuiting Adjustments: Unless otherwise indicated, when branch circuits are indicated as separate, combining them together in a single raceway is not permitted.
 - 8. Common Neutrals: Unless otherwise indicated, sharing of neutral/grounded conductors among up to three single phase branch circuits of different phases installed in the same raceway is not permitted. Provide dedicated neutral/grounded conductor for each individual branch circuit.
 - 9. Provide oversized neutral/grounded conductors where indicated and as specified below.
 - a. Provide 200 percent rated neutral for feeders fed from K-rated transformers.
 - b. Provide 200 percent rated neutral for feeders serving panelboards with 200 percent rated neutral bus.
- B. Install products in accordance with manufacturer's instructions.
- C. Perform work in accordance with NECA 1 (general workmanship).
- D. Install metal-clad cable (Type MC) in accordance with NECA 120.
- E. Installation in Raceway:
 - 1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.
 - 2. Pull all conductors and cables together into raceway at same time.
 - 3. Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.

4. Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by the manufacturer.
- F. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.
- G. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.
- H. Terminate cables using suitable fittings.
 1. Metal-Clad Cable (Type MC):
 - a. Use listed fittings.
 - b. Cut cable armor only using specialized tools to prevent damaging conductors or insulation. Do not use hacksaw or wire cutters to cut armor.
- I. Install conductors with a minimum of 12 inches of slack at each outlet.
- J. Where conductors are installed in enclosures for future termination by others, provide a minimum of 5 feet of slack.
- K. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.
- L. Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.
- M. Make wiring connections using specified wiring connectors.
 1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters.
 2. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors.
 3. Do not remove conductor strands to facilitate insertion into connector.
 4. Clean contact surfaces on conductors and connectors to suitable remove corrosion, oxides, and other contaminates. Do not use wire brush on plated connector surfaces.
 5. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
 6. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.
- N. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.
- O. Insulate ends of spare conductors using vinyl insulating electrical tape.
- P. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Division 07.
- Q. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.

3.04 FIELD QUALITY CONTROL

- A. Inspect and test in accordance with NETA ATS, except Section 4.
- B. Perform inspections and tests listed in NETA ATS, Section 7.3.2. The insulation resistance test is required for all conductors. The resistance test for parallel conductors listed as optional is not required.
 1. Disconnect surge protective devices (SPDs) prior to performing any high potential testing. Replace SPDs damaged by performing high potential testing with SPDs connected.
- C. Correct deficiencies and replace damaged or defective conductors and cables.

END OF SECTION

**SECTION 26 05 26
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Grounding and bonding requirements.
- B. Conductors for grounding and bonding.
- C. Connectors for grounding and bonding.
- D. Ground bars.
- E. Ground rod electrodes.

1.02 RELATED REQUIREMENTS

- A. Division 01 - General Requirements: Project administrative and procedural requirements
- B. Division 02 - Existing Conditions: Demolition, cleaning and disposal requirements, cutting and patching requirements, repairs.
- C. Section 26 0005 - Basic Electrical Requirements
- D. Section 26 0519 - Low-Voltage Electrical Power Conductors and Cables: Additional requirements for conductors for grounding and bonding, including conductor color coding.
- E. Section 26 0536 - Cable Trays for Electrical Systems: Additional grounding and bonding requirements for cable tray systems.
- F. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.
- G. Section 26 5600 - Exterior Lighting: Additional grounding and bonding requirements for pole-mounted luminaires.
- H. Division 31 - Earthwork: Excavating, trenching and fill.

1.03 REFERENCE STANDARDS

- A. IEEE 81 - IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Grounding System 2012.
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- C. NEMA GR 1 - Grounding Rod Electrodes and Grounding Rod Electrode Couplings 2017.
- D. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems 2017.
- E. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- F. UL 467 - Grounding and Bonding Equipment Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Verify exact locations of underground metal water service pipe entrances to building.
 - 2. Coordinate the work with other trades to provide steel reinforcement complying with specified requirements for concrete-encased electrode.
 - 3. Notify Strategic Energy Solutions, Inc. of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- B. Sequencing:
 - 1. Do not install ground rod electrodes until final backfill and compaction is complete.

1.05 SUBMITTALS

- A. Contractor shall provide submittals for equipment listed herein. Refer to Division 01 for submittal procedures.

- B. Project Record Documents: Record actual locations of grounding electrode system components and connections.

PART 2 PRODUCTS

2.01 GROUNDING AND BONDING REQUIREMENTS

- A. Existing Work: Where existing grounding and bonding system components are indicated to be reused, they may be reused only where they are free from corrosion, integrity and continuity are verified, and where acceptable to the authority having jurisdiction.
- B. Do not use products for applications other than as permitted by NFPA 70 and product listing.
- C. Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.
- D. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
- E. Grounding System Resistance:
 - 1. Achieve specified grounding system resistance under normally dry conditions unless otherwise approved by Architect. Precipitation within the previous 48 hours does not constitute normally dry conditions.
 - 2. Grounding Electrode System: Not greater than 5 ohms to ground, when tested according to IEEE 81 using "fall-of-potential" method.
 - 3. Between Grounding Electrode System and Major Electrical Equipment Frames, System Neutral, and Derived Neutral Points: Not greater than 0.5 ohms, when tested using "point-to-point" methods.
- F. Grounding Electrode System:
 - 1. Provide connection to required and supplemental grounding electrodes indicated to form grounding electrode system.
 - a. Provide continuous grounding electrode conductors without splice or joint.
 - b. Install grounding electrode conductors in raceway where exposed to physical damage. Bond grounding electrode conductor to metallic raceways at each end with bonding jumper.
 - 2. Metal Underground Water Pipe(s):
 - a. Provide connection to underground metal domestic and fire protection (where present) water service pipe(s) that are in direct contact with earth for at least 10 feet at an accessible location not more than 5 feet from the point of entrance to the building.
 - b. Provide bonding jumper(s) around insulating joints/pipes as required to make pipe electrically continuous.
 - c. Provide bonding jumper around water meter of sufficient length to permit removal of meter without disconnecting jumper.
 - 3. Concrete-Encased Electrode:
 - a. Provide connection to concrete-encased electrode consisting of not less than 20 feet of either steel reinforcing bars or bare copper conductor not smaller than 4 AWG embedded within concrete foundation or footing that is in direct contact with earth in accordance with NFPA 70.
 - 4. Ground Ring:
 - a. Provide a ground ring encircling the building or structure consisting of bare copper conductor not less than 2 AWG in direct contact with earth, installed at a depth of not less than 30 inches.
 - b. Where location is not indicated, locate ground ring conductor at least 24 inches outside building perimeter foundation.
 - c. Provide ground enhancement material around conductor.
 - d. Provide connection from ground ring conductor to:
 - 1) Perimeter columns of metal building frame.

- 2) Ground rod electrodes located as indicated.
5. Ground Rod Electrode(s):
 - a. Provide three electrodes in an equilateral triangle configuration unless otherwise indicated or required.
 - b. Space electrodes not less than 10 feet from each other and any other ground electrode.
 - c. Where location is not indicated, locate electrode(s) at least 5 feet outside building perimeter foundation as near as possible to electrical service entrance; where possible, locate in softscape (uncovered) area.
6. Provide additional ground electrode(s) as required to achieve specified grounding electrode system resistance.
7. Ground Bar: Provide ground bar, separate from service equipment enclosure, for common connection point of grounding electrode system bonding jumpers as permitted in NFPA 70. Connect grounding electrode conductor provided for service-supplied system grounding to this ground bar.
 - a. Ground Bar Size: 1/4 by 2 by 12 inches unless otherwise indicated or required.
 - b. Where ground bar location is not indicated, locate in accessible location as near as possible to service disconnect enclosure.
 - c. Ground Bar Mounting Height: 18 inches above finished floor unless otherwise indicated.
- G. Bonding and Equipment Grounding:
 1. Provide bonding for equipment grounding conductors, equipment ground busses, metallic equipment enclosures, metallic raceways and boxes, device grounding terminals, and other normally non-current-carrying conductive materials enclosing electrical conductors/equipment or likely to become energized as indicated and in accordance with NFPA 70.
 2. Provide insulated equipment grounding conductor in each feeder and branch circuit raceway. Do not use raceways as sole equipment grounding conductor.
 3. Where circuit conductor sizes are increased for voltage drop, increase size of equipment grounding conductor proportionally in accordance with NFPA 70.
 4. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
 5. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on neutral (grounded) or isolated/insulated ground bus.
 6. Provide bonding jumper across expansion or expansion/deflection fittings provided to accommodate conduit movement.
- H. Cable Tray Systems: Also comply with Section 26 0536.
- I. Pole-Mounted Luminaires: Also comply with Section 26 5600.

2.02 GROUNDING AND BONDING COMPONENTS

- A. General Requirements:
 1. Provide products listed, classified, and labeled as suitable for the purpose intended.
 2. Provide products listed and labeled as complying with UL 467 where applicable.
- B. Conductors for Grounding and Bonding, in Addition to Requirements of Section 26 0526:
 1. Use insulated copper conductors unless otherwise indicated.
 - a. Exceptions:
 - 1) Use bare copper conductors where installed underground in direct contact with earth.
 - 2) Use bare copper conductors where directly encased in concrete (not in raceway).
- C. Connectors for Grounding and Bonding:
 1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.

2. Unless otherwise indicated, use exothermic welded connections for underground, concealed and other inaccessible connections.
 3. Unless otherwise indicated, use mechanical connectors, compression connectors, or exothermic welded connections for accessible connections.
 4. Manufacturers - Mechanical and Compression Connectors:
 - a. Advanced Lightning Technology (ALT): www.altfab.com
 - b. Burndy LLC: www.burndy.com
 - c. Harger Lightning & Grounding: www.harger.com
 - d. Thomas & Betts Corporation: www.tnb.com
 5. Manufacturers - Exothermic Welded Connections:
 - a. Burndy LLC: www.burndy.com
 - b. Cadweld, a brand of Erico International Corporation: www.erico.com
 - c. thermOweld, subsidiary of Continental Industries; division of Burndy LLC: www.thermoweld.com
- D. Ground Bars:
1. Description: Copper rectangular ground bars with mounting brackets and insulators.
 2. Size: As indicated.
 3. Holes for Connections: As indicated or as required for connections to be made.
 4. Manufacturers:
 - a. Advanced Lightning Technology (ALT): www.altfab.com
 - b. Erico International Corporation: www.erico.com
 - c. Harger Lightning & Grounding: www.harger.com
 - d. thermOweld, subsidiary of Continental Industries; division of Burndy LLC: www.thermoweld.com
- E. Ground Rod Electrodes:
1. Comply with NEMA GR 1.
 2. Material: Copper-bonded (copper-clad) steel.
 3. Size: 3/4 inch diameter by 10 feet length, unless otherwise indicated.
 4. Where rod lengths of greater than 10 feet are indicated or otherwise required, sectionalized ground rods may be used.
 5. Manufacturers:
 - a. Advanced Lightning Technology (ALT): www.altfab.com/#sle.
 - b. Erico International Corporation: www.erico.com/#sle.
 - c. Galvan Industries, Inc: www.galvanelectrical.com/#sle.
 - d. Harger Lightning & Grounding: www.harger.com/#sle.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that work likely to damage grounding and bonding system components has been completed.
- B. Verify that field measurements are as indicated.
- C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Ground Rod Electrodes: Unless otherwise indicated, install ground rod electrodes vertically. Where encountered rock prohibits vertical installation, install at 45 degree angle or bury horizontally in trench at least 30 inches (750 mm) deep in accordance with NFPA 70 or provide ground plates.
- D. Make grounding and bonding connections using specified connectors.

1. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.
2. Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.
3. Exothermic Welds: Make connections using molds and weld material suitable for the items to be connected in accordance with manufacturer's recommendations.
4. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
5. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

E. Identify grounding and bonding system components in accordance with Section 26 0553.

3.03 FIELD QUALITY CONTROL

- A. Inspect and test in accordance with NETA ATS except Section 4.
- B. Perform inspections and tests listed in NETA ATS, Section 7.13.
- C. Perform ground electrode resistance tests under normally dry conditions. Precipitation within the previous 48 hours does not constitute normally dry conditions.
- D. Investigate and correct deficiencies where measured ground resistances do not comply with specified requirements.

END OF SECTION

**SECTION 26 05 29
HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Support and attachment requirements and components for equipment, conduit, cable, boxes, and other electrical work.

1.02 RELATED REQUIREMENTS

- A. Division 01 - General Requirements: Project administrative and procedural requirements
- B. Division 02 - Existing Conditions: Demolition, cleaning and disposal requirements, and cutting and patching requirements.
- C. Division 03 - Concrete: Concrete equipment pads.
- D. Section 03 3000 - Cast-in-Place Concrete: Concrete equipment pads.
- E. Section 26 0005 - Basic Electrical Requirements
- F. Section 26 0533.13 - Conduit for Electrical Systems: Additional support and attachment requirements for conduits.
- G. Section 26 0536 - Cable Trays for Electrical Systems: Additional support and attachment requirements for cable tray.
- H. Section 26 0533.16 - Boxes for Electrical Systems: Additional support and attachment requirements for boxes.
- I. Section 26 5100 - Interior Lighting: Additional support and attachment requirements for interior luminaires.
- J. Section 26 5600 - Exterior Lighting: Additional support and attachment requirements for exterior luminaires.

1.03 REFERENCE STANDARDS

- A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products 2017.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware 2016a.
- C. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel 2019.
- D. MFMA-4 - Metal Framing Standards Publication 2004.
- E. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- F. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- G. UL 5B - Strut-Type Channel Raceways and Fittings Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate sizes and arrangement of supports and bases with the actual equipment and components to be installed.
 - 2. Coordinate the work with other trades to provide additional framing and materials required for installation.
 - 3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
 - 4. Coordinate the arrangement of supports with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
 - 5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:

1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured in accordance with Division 03.

1.05 QUALITY ASSURANCE

A. Comply with NFPA 70.

B. Comply with applicable building code.

PART 2 PRODUCTS

2.01 SUPPORT AND ATTACHMENT COMPONENTS

A. General Requirements:

1. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of electrical work.
2. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.
3. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported. Include consideration for vibration, equipment operation, and shock loads where applicable.
4. Do not use products for applications other than as permitted by NFPA 70 and product listing.
5. Steel Components: Use corrosion resistant materials suitable for the environment where installed.
 - a. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
 - b. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.

B. Conduit and Cable Supports: Straps, clamps, etc. suitable for the conduit or cable to be supported.

1. Conduit Straps: One-hole or two-hole type; steel or malleable iron.
2. Conduit Clamps: Bolted type unless otherwise indicated.
3. Manufacturers:
 - a. Cooper Crouse-Hinds, a division of Eaton Corporation: www.cooperindustries.com
 - b. Erico International Corporation: www.erico.com
 - c. HoldRite, a brand of Reliance Worldwide Corporation: www.holdrite.com
 - d. O-Z/Gedney, a brand of Emerson Electric Co: www.emerson.com
 - e. Thomas & Betts Corporation: www.tnb.com

C. Outlet Box Supports: Hangers, brackets, etc. suitable for the boxes to be supported.

1. Manufacturers:
 - a. Cooper Crouse-Hinds, a division of Eaton Corporation: www.cooperindustries.com/#sle.
 - b. Erico International Corporation: www.erico.com/#sle.
 - c. HoldRite, a brand of Reliance Worldwide Corporation: www.holdrite.com/#sle.
 - d. O-Z/Gedney, a brand of Emerson Electric Co: www.emerson.com/#sle.
 - e. Thomas & Betts Corporation: www.tnb.com/#sle.

D. Metal Channel (Strut) Framing Systems: Factory-fabricated continuous-slot metal channel (strut) and associated fittings, accessories, and hardware required for field-assembly of supports.

1. Comply with MFMA-4.
2. Channel (Strut) Used as Raceway (only where specifically indicated): Listed and labeled as complying with UL 5B.
3. Manufacturers:
 - a. Cooper B-Line, a division of Eaton Corporation: www.cooperindustries.com
 - b. Thomas & Betts Corporation: www.tnb.com

- c. Unistrut, a brand of Atkore International Inc: www.unistrut.com
- E. Hanger Rods: Threaded zinc-plated steel unless otherwise indicated.
 1. Minimum Size, Unless Otherwise Indicated or Required:
 - a. Equipment Supports: 1/2 inch diameter.
 - b. Single Conduit up to 1 inch (27 mm) trade size: 1/4 inch diameter.
 - c. Single Conduit larger than 1 inch (27 mm) trade size: 3/8 inch diameter.
 - d. Trapeze Support for Multiple Conduits: 3/8 inch diameter.
 - e. Outlet Boxes: 1/4 inch diameter.
 - f. Luminaires: 1/4 inch diameter.
 - F. Non-Penetrating Rooftop Supports for Low-Slope Roofs: Steel pedestals with thermoplastic or rubber bases that rest on top of roofing membrane, not requiring any attachment to the roof structure and not penetrating the roofing assembly, with support fixtures as specified.
 1. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
 2. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports.
 3. Mounting Height: Provide minimum clearance of 6 inches under supported component to top of roofing.
 4. Manufacturers:
 - a. Cooper B-Line, a division of Eaton Corporation: www.cooperindustries.com
 - b. Erico International Corporation: www.erico.com
 - c. PHP Systems/Design: www.phpsd.com
 - d. Unistrut, a brand of Atkore International Inc: www.unistrut.com
 - G. Anchors and Fasteners:
 1. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
- D. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.
- E. Unless specifically indicated or approved by Architect, do not provide support from roof deck.
- F. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.
- G. Equipment Support and Attachment:
 1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
 2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
 3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
 4. Unless otherwise indicated, mount floor-mounted equipment on properly sized 4 inch high concrete pad constructed in accordance with Division 03.
 5. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.
- H. Conduit Support and Attachment: Also comply with Section 26 0533.13.
- I. Cable Tray Support and Attachment: Also comply with Section 26 0536.

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- J. Box Support and Attachment: Also comply with Section 26 0533.16.
- K. Secure fasteners according to manufacturer's recommended torque settings.
- L. Remove temporary supports.

3.02 FIELD QUALITY CONTROL

- A. See Division 01 - General Requirements for additional requirements.
- B. Inspect support and attachment components for damage and defects.
- C. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
- D. Correct deficiencies and replace damaged or defective support and attachment components.

END OF SECTION

**SECTION 26 05 33.13
CONDUIT FOR ELECTRICAL SYSTEMS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Galvanized steel rigid metal conduit (RMC).
- B. Aluminum rigid metal conduit (RMC).
- C. Flexible metal conduit (FMC).
- D. Electrical metallic tubing (EMT).
- E. Rigid polyvinyl chloride (PVC) conduit.
- F. Conduit fittings.
- G. Accessories.

1.02 RELATED REQUIREMENTS

- A. Division 01 - General Requirements: Project administrative and procedural requirements.
- B. Division 02 - Existing Conditions: Demolition, cleaning and disposal requirements, cutting and patching requirements, and repairs.
- C. Division 07 - Thermal and Moisture Protection: Firestopping.
- D. Section 07 8400 - Firestopping.
- E. Section 26 0005 - Basic Electrical Requirements
- F. Section 26 0519 - Low-Voltage Electrical Power Conductors and Cables.
- G. Section 26 0526 - Grounding and Bonding for Electrical Systems.
- H. Section 26 0529 - Hangers and Supports for Electrical Systems.
- I. Section 26 0533.16 - Boxes for Electrical Systems.
- J. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.
- K. Section 28 4600 - Fire Detection and Alarm: Fire alarm wiring in conduit.
- L. Division 31 - Earthwork: Excavating, trenching and fill.
- M. Section 31 2316.13 - Trenching: Excavating, bedding, and backfilling.

1.03 REFERENCE STANDARDS

- A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC) 2015.
- B. ANSI C80.3 - American National Standard for Electrical Metallic Tubing -- Steel (EMT-S) 2015.
- C. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- D. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT) 2013.
- E. NECA 102 - Standard for Installing Aluminum Rigid Metal Conduit 2004.
- F. NECA 111 - Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC) 2017.
- G. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable 2014.
- H. NEMA RN 1 - Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit 2018.
- I. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit 2020.
- J. NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing 2016.
- K. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

- L. UL 1 - Flexible Metal Conduit Current Edition, Including All Revisions.
- M. UL 6 - Electrical Rigid Metal Conduit-Steel Current Edition, Including All Revisions.
- N. UL 514B - Conduit, Tubing, and Cable Fittings Current Edition, Including All Revisions.
- O. UL 651 - Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings Current Edition, Including All Revisions.
- P. UL 797 - Electrical Metallic Tubing-Steel Current Edition, Including All Revisions.

PART 2 PRODUCTS

2.01 CONDUIT APPLICATIONS

- A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70 and product listing.
- B. Unless otherwise indicated and where not otherwise restricted, use the conduit types indicated for the specified applications. Where more than one listed application applies, comply with the most restrictive requirements. Where conduit type for a particular application is not specified, use galvanized steel rigid metal conduit.
- C. Underground:
 - 1. Under Slab on Grade: Use galvanized steel rigid metal conduit or rigid PVC conduit.
 - 2. Exterior, Direct-Buried: Use galvanized steel rigid metal conduit or rigid PVC conduit.
 - 3. Exterior, Embedded Within Concrete: Use galvanized steel rigid metal conduit or rigid PVC conduit.
 - 4. Where rigid polyvinyl (PVC) conduit is provided, transition to galvanized steel rigid metal conduit where emerging from underground.
 - 5. Where rigid polyvinyl (PVC) conduit larger than 2 inch (53 mm) trade size is provided, use galvanized steel rigid metal conduit elbows for bends.
- D. Embedded Within Concrete:
 - 1. Within Slab on Grade (within structural slabs only where approved by Structural Engineer): Use galvanized steel rigid metal conduit or rigid PVC conduit.
 - 2. Within Slab Above Ground (within structural slabs only where approved by Structural Engineer): Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), PVC-coated galvanized steel rigid metal conduit, or rigid PVC conduit.
- E. Concealed Within Masonry Walls: Use galvanized steel rigid metal conduit or electrical metallic tubing (EMT).
- F. Concealed Within Hollow Stud Walls: Use galvanized steel rigid metal conduit or electrical metallic tubing (EMT).
- G. Concealed Above Accessible Ceilings: Use galvanized steel rigid metal conduit or electrical metallic tubing (EMT).
- H. Interior, Damp or Wet Locations: Use galvanized steel rigid metal conduit.
- I. Exposed, Interior, Not Subject to Physical Damage: Use galvanized steel rigid metal conduit or electrical metallic tubing (EMT).
- J. Exposed, Interior, Subject to Physical Damage: Use galvanized steel rigid metal conduit or intermediate metal conduit (IMC).
- K. Exposed, Exterior: Use galvanized steel rigid metal conduit or PVC-coated galvanized steel rigid metal conduit.
- L. Concealed, Exterior, Not Embedded in Concrete or in Contact With Earth: Use galvanized steel rigid metal conduit.
- M. Connections to Luminaires Above Accessible Ceilings: Use flexible metal conduit.
 - 1. Maximum Length: 6 feet.
- N. Connections to Vibrating Equipment:
 - 1. Dry Locations: Use flexible metal conduit.

2. Damp, Wet, or Corrosive Locations: Use liquidtight flexible metal conduit.
3. Vibrating equipment includes, but is not limited to:
 - a. Transformers.
 - b. Motors.

O. Fished in Existing Walls, Where Necessary: Use flexible metal conduit.

2.02 CONDUIT REQUIREMENTS

- A. Existing Work: Where existing conduits are indicated to be reused, they may be reused only where they comply with specified requirements, are free from corrosion, and integrity is verified by pulling a mandrel through them.
- B. Provide all conduit, fittings, supports, and accessories required for a complete raceway system.
- C. Provide products listed, classified, and labeled as suitable for the purpose intended.
- D. Minimum Conduit Size, Unless Otherwise Indicated:
 1. Branch Circuits: 3/4 inch (21 mm) trade size.
 2. Flexible Connections to Luminaires: 3/8 inch (12 mm) trade size.
 3. Underground, Interior: 1 inch (27 mm) trade size.
 4. Underground, Exterior: 1 inch (27 mm) trade size.
- E. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

2.03 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

- A. Manufacturers:
 1. Allied Tube & Conduit: www.alliedeg.com
 2. Republic Conduit: www.republic-conduit.com
 3. Wheatland Tube, a Division of Zekelman Industries: www.wheatland.com
- B. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.
- C. Fittings:
 1. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 2. Material: Use steel or malleable iron.
 3. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

2.04 FLEXIBLE METAL CONDUIT (FMC)

- A. Manufacturers:
 1. AFC Cable Systems, Inc: www.afcweb.com
 2. Electri-Flex Company: www.electriflex.com
 3. International Metal Hose: www.metalhose.com
- B. Description: NFPA 70, Type FMC standard wall steel flexible metal conduit listed and labeled as complying with UL 1, and listed for use in classified firestop systems to be used.
- C. Fittings:
 1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 2. Material: Use steel or malleable iron.

2.05 ELECTRICAL METALLIC TUBING (EMT)

- A. Manufacturers:
 1. Allied Tube & Conduit: www.alliedeg.com
 2. Republic Conduit: www.republic-conduit.com
 3. Wheatland Tube, a Division of Zekelman Industries: www.wheatland.com

- B. Description: NFPA 70, Type EMT steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.
- C. Fittings:
 - 1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 - 2. Material: Use steel or malleable iron.
 - 3. Connectors and Couplings: Use compression (gland) or set-screw type.
 - a. Do not use indenter type connectors and couplings.
 - 4. Damp or Wet Locations (where permitted): Use fittings listed for use in wet locations.
 - 5. Embedded Within Concrete (where permitted): Use fittings listed as concrete-tight. Fittings that require taping to be concrete-tight are acceptable.

2.06 RIGID POLYVINYL CHLORIDE (PVC) CONDUIT

- A. Manufacturers:
 - 1. Cantex Inc: www.cantexinc.com
 - 2. Carlon, a brand of Thomas & Betts Corporation: www.carlon.com
 - 3. JM Eagle: www.jmeagle.com
- B. Description: NFPA 70, Type PVC rigid polyvinyl chloride conduit complying with NEMA TC 2 and listed and labeled as complying with UL 651; Schedule 40 unless otherwise indicated, Schedule 80 where subject to physical damage; rated for use with conductors rated 90 degrees C.
- C. Fittings:
 - 1. Manufacturer: Same as manufacturer of conduit to be connected.
 - 2. Description: Fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; material to match conduit.

2.07 ACCESSORIES

- A. Conduit Joint Compound: Corrosion-resistant, electrically conductive; suitable for use with the conduit to be installed.
- B. Solvent Cement for PVC Conduit and Fittings: As recommended by manufacturer of conduit and fittings to be installed.
- C. Pull Strings: Use nylon cord with average breaking strength of not less than 200 pound-force.
- D. Sealing Compound for Sealing Fittings: Listed for use with the particular fittings to be installed.
- E. Modular Seals for Conduit Penetrations: Rated for minimum of 40 psig; Suitable for the conduits to be installed.
- F. Sealing Systems for Roof Penetrations: Premanufactured components and accessories as required to preserve integrity of roofing system and maintain roof warranty; suitable for conduits and roofing system to be installed; designed to accommodate existing penetrations where applicable.
- G. Firestop Sleeves: Listed; provide as required to preserve fire resistance rating of building elements.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that mounting surfaces are ready to receive conduits.
- C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).

- C. Install galvanized steel rigid metal conduit (RMC) in accordance with NECA 101.
- D. Install rigid polyvinyl chloride (PVC) conduit in accordance with NECA 111.
- E. Conduit Routing:
 - 1. Unless dimensioned, conduit routing indicated is diagrammatic.
 - 2. When conduit destination is indicated without specific routing, determine exact routing required.
 - 3. Conceal all conduits unless specifically indicated to be exposed.
 - 4. Conduits in the following areas may be exposed, unless otherwise indicated:
 - a. Electrical rooms.
 - b. Mechanical equipment rooms.
 - 5. Unless otherwise approved, do not route conduits exposed:
 - a. Across floors.
 - b. Across roofs.
 - c. Across top of parapet walls.
 - d. Across building exterior surfaces.
 - 6. Conduits installed underground or embedded in concrete may be routed in the shortest possible manner unless otherwise indicated. Route all other conduits parallel or perpendicular to building structure and surfaces, following surface contours where practical.
 - 7. Arrange conduit to maintain adequate headroom, clearances, and access.
 - 8. Arrange conduit to provide no more than the equivalent of four 90 degree bends between pull points.
 - 9. Arrange conduit to prevent moisture traps. Provide drain fittings at low points and at sealing fittings where moisture may collect.
 - 10. Group parallel conduits in the same area together on a common rack.
- F. Conduit Support:
 - 1. Secure and support conduits in accordance with NFPA 70 and Section 26 0529 using suitable supports and methods approved by the authority having jurisdiction.
 - 2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
 - 3. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conduits to lay on ceiling tiles.
 - 4. Use conduit strap to support single surface-mounted conduit.
 - a. Use clamp back spacer with conduit strap for damp and wet locations to provide space between conduit and mounting surface.
 - 5. Use metal channel (strut) with accessory conduit clamps to support multiple parallel surface-mounted conduits.
 - 6. Use trapeze hangers assembled from threaded rods and metal channel (strut) with accessory conduit clamps to support multiple parallel suspended conduits.
 - 7. Use of wire for support of conduits is not permitted.
- G. Connections and Terminations:
 - 1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.
 - 2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.
 - 3. Use suitable adapters where required to transition from one type of conduit to another.
 - 4. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.
 - 5. Provide insulating bushings or insulated throats at all conduit terminations to protect conductors.
 - 6. Secure joints and connections to provide maximum mechanical strength and electrical continuity.

- H. Penetrations:
 - 1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.
 - 2. Make penetrations perpendicular to surfaces unless otherwise indicated.
 - 3. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.
 - 4. Conceal bends for conduit risers emerging above ground.
 - 5. Seal interior of conduits entering the building from underground at first accessible point to prevent entry of moisture and gases.
 - 6. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.
 - 7. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as indicated or as required to preserve integrity of roofing system and maintain roof warranty. Include proposed locations of penetrations and methods for sealing with submittals.
 - 8. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Division 07.
- I. Underground Installation:
 - 1. Provide trenching and backfilling in accordance with Division 31.
- J. Embedment Within Structural Concrete Slabs (only where approved by Structural Engineer):
 - 1. Secure conduits to prevent floating or movement during pouring of concrete.
- K. Concrete Encasement: Where conduits not otherwise embedded within concrete are indicated to be concrete-encased, provide concrete in accordance with Division 03 with minimum concrete cover of 2 inches on all sides unless otherwise indicated.
- L. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed conductors or connected equipment. This includes, but is not limited to:
 - 1. Where conduits cross structural joints intended for expansion, contraction, or deflection.
 - 2. Where calculated in accordance with NFPA 70 for rigid polyvinyl chloride (PVC) conduit installed above ground to compensate for thermal expansion and contraction.
 - 3. Where conduits are subject to earth movement by settlement or frost.
- M. Condensation Prevention: Where conduits cross barriers between areas of potential substantial temperature differential, provide sealing fitting or approved sealing compound at an accessible point near the penetration to prevent condensation. This includes, but is not limited to:
 - 1. Where conduits pass from outdoors into conditioned interior spaces.
 - 2. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.
- N. Provide grounding and bonding in accordance with Section 26 0526.
- O. Identify conduits in accordance with Section 26 0553.

3.03 PROTECTION

- A. Immediately after installation of conduit, use suitable manufactured plugs to provide protection from entry of moisture and foreign material and do not remove until ready for installation of conductors.

END OF SECTION

**SECTION 26 05 33.16
BOXES FOR ELECTRICAL SYSTEMS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Outlet and device boxes up to 100 cubic inches, including those used as junction and pull boxes.
- B. Cabinets and enclosures, including junction and pull boxes larger than 100 cubic inches.

1.02 RELATED REQUIREMENTS

- A. Division 01 - General Requirements: Project administrative and procedural requirements.
- B. Division 03 - Concrete: Concrete.
- C. Division 07 - Thermal and Moisture Protection: Firestopping.
- D. Division 08 - Openings: Access Doors.
- E. Section 08 3100 - Access Doors and Panels: Panels for maintaining access to concealed boxes.
- F. Section 26 0005 - Basic Electrical Requirements.
- G. Section 26 0526 - Grounding and Bonding for Electrical Systems.
- H. Section 26 0529 - Hangers and Supports for Electrical Systems.
- I. Section 26 0533.13 - Conduit for Electrical Systems:
 - 1. Conduit bodies and other fittings.
 - 2. Additional requirements for locating boxes to limit conduit length and/or number of bends between pulling points.
- J. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.
- K. Section 26 2726 - Wiring Devices:
 - 1. Wall plates.
- L. Section 26 2813 - Fuses: Spare fuse cabinets.

1.03 REFERENCE STANDARDS

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- B. NECA 130 - Standard for Installing and Maintaining Wiring Devices 2010.
- C. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable 2014.
- D. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports 2013.
- E. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum) 2020.
- F. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- G. SCTE 77 - Specification for Underground Enclosure Integrity 2017.
- H. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations Current Edition, Including All Revisions.
- I. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations Current Edition, Including All Revisions.
- J. UL 508A - UL Standard for Safety Industrial Control Panels 2018.
- K. UL 514A - Metallic Outlet Boxes Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:

1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
3. Coordinate minimum sizes of boxes with the actual installed arrangement of conductors, clamps, support fittings, and devices, calculated according to NFPA 70.
4. Coordinate minimum sizes of pull boxes with the actual installed arrangement of connected conduits, calculated according to NFPA 70.
5. Coordinate the placement of boxes with millwork, furniture, devices, equipment, etc. installed under other sections or by others.
6. Coordinate the work with other trades to preserve insulation integrity.
7. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted boxes where indicated.
8. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

- A. Contractor shall provide submittals for equipment listed herein. Refer to Division 01 for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for cabinets and enclosures, boxes for hazardous (classified) locations, floor boxes, and underground boxes/enclosures.
 1. Underground Boxes/Enclosures: Include reports for load testing in accordance with SCTE 77 certified by a professional engineer or an independent testing agency upon request.
- C. Project Record Documents: Record actual locations for outlet and device boxes, pull boxes, cabinets and enclosures, floor boxes, and underground boxes/enclosures.
- D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 1. See Section 01 6000 - Product Requirements, for additional provisions.
 2. Keys for Lockable Enclosures: Two of each different key.

PART 2 PRODUCTS

2.01 BOXES

- A. General Requirements:
 1. Do not use boxes and associated accessories for applications other than as permitted by NFPA 70 and product listing.
 2. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.
 3. Provide products listed, classified, and labeled as suitable for the purpose intended.
 4. Where box size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
 5. Provide grounding terminals within boxes where equipment grounding conductors terminate.
- B. Outlet and Device Boxes Up to 100 cubic inches, Including Those Used as Junction and Pull Boxes:
 1. Use sheet-steel boxes for dry locations unless otherwise indicated or required.
 2. Use cast iron boxes or cast aluminum boxes for damp or wet locations unless otherwise indicated or required; furnish with compatible weatherproof gasketed covers.
 3. Use suitable concrete type boxes where flush-mounted in concrete.
 4. Use suitable masonry type boxes where flush-mounted in masonry walls.
 5. Use raised covers suitable for the type of wall construction and device configuration where required.
 6. Use shallow boxes where required by the type of wall construction.
 7. Do not use "through-wall" boxes designed for access from both sides of wall.

8. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.
 9. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.
 10. Boxes for Supporting Luminaires and Ceiling Fans: Listed as suitable for the type and weight of load to be supported; furnished with fixture stud to accommodate mounting of luminaire where required.
 11. Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes unless specifically indicated or permitted.
 12. Wall Plates: Comply with Section 26 2726.
 13. Manufacturers:
 - a. Cooper Crouse-Hinds, a division of Eaton Corporation: www.cooperindustries.com
 - b. Hubbell Incorporated; Bell Products: www.hubbell-rtb.com
 - c. Hubbell Incorporated; RACO Products: www.hubbell-rtb.com
 - d. O-Z/Gedney, a brand of Emerson Electric Co: www.emerson.com
 - e. Thomas & Betts Corporation: www.tnb.com
- C. Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches:
1. Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E, or UL 508A.
 2. NEMA 250 Environment Type, Unless Otherwise Indicated:
 3. Junction and Pull Boxes Larger Than 100 cubic inches:
 - a. Provide screw-cover or hinged-cover enclosures unless otherwise indicated.
 - b. Boxes 6 square feet and Larger: Provide sectionalized screw-cover or hinged-cover enclosures.
 4. Cabinets and Hinged-Cover Enclosures, Other Than Junction and Pull Boxes:
 - a. Provide lockable hinged covers, all locks keyed alike unless otherwise indicated.
 - b. Back Panels: Painted steel, removable.
 - c. Terminal Blocks: Provide voltage/current ratings and terminal quantity suitable for purpose indicated, with 25 percent spare terminal capacity.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that mounting surfaces are ready to receive boxes.
- C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install boxes in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards where mounting heights are not indicated.
- C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- D. Provide separate boxes for emergency power and normal power systems.
- E. Unless otherwise indicated, provide separate boxes for line voltage and low voltage systems.
- F. Flush-mount boxes in finished areas unless specifically indicated to be surface-mounted.
- G. Unless otherwise indicated, boxes may be surface-mounted where exposed conduits are indicated or permitted.
- H. Box Locations:
 1. Locate boxes to be accessible. Provide access panels in accordance with Division 08 as required where approved by the Architect.

2. Unless dimensioned, box locations indicated are approximate.
 3. Locate boxes as required for devices installed under other sections or by others.
 4. Locate boxes so that wall plates do not span different building finishes.
 5. Locate boxes so that wall plates do not cross masonry joints.
 6. Do not install flush-mounted boxes on opposite sides of walls back-to-back. Provide minimum 6 inches horizontal separation unless otherwise indicated.
 7. Fire Resistance Rated Walls: Install flush-mounted boxes such that the required fire resistance will not be reduced.
 - a. Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches separation where wall is constructed with individual noncommunicating stud cavities or protect both boxes with listed putty pads.
 8. Locate junction and pull boxes as indicated, as required to facilitate installation of conductors, and to limit conduit length and/or number of bends between pulling points in accordance with Section 26 0533.13.
- I. Box Supports:
1. Secure and support boxes in accordance with NFPA 70 and Section 26 0529 using suitable supports and methods approved by the authority having jurisdiction.
 2. Provide independent support from building structure except for cast metal boxes (other than boxes used for fixture support) supported by threaded conduit connections in accordance with NFPA 70. Do not provide support from piping, ductwork, or other systems.
- J. Install boxes plumb and level.
- K. Flush-Mounted Boxes:
1. Install boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that front edge of box or associated raised cover is not set back from finished surface more than 1/4 inch or does not project beyond finished surface.
 2. Install boxes in combustible materials such as wood so that front edge of box or associated raised cover is flush with finished surface.
 3. Repair rough openings around boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that there are no gaps or open spaces greater than 1/8 inch at the edge of the box.
- L. Install boxes as required to preserve insulation integrity.
- M. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.
- N. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 8400.
- O. Close unused box openings.
- P. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.
- Q. Provide grounding and bonding in accordance with Section 26 0526.

3.03 PROTECTION

- A. Immediately after installation, protect boxes from entry of moisture and foreign material until ready for installation of conductors.

END OF SECTION

**SECTION 26 05 53
IDENTIFICATION FOR ELECTRICAL SYSTEMS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Electrical identification requirements.
- B. Identification nameplates and labels.
- C. Wire and cable markers.
- D. Warning signs and labels.

1.02 RELATED REQUIREMENTS

- A. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables: Color coding for power conductors and cables 600 V and less; vinyl color coding electrical tape.

1.03 REFERENCE STANDARDS

- A. ANSI Z535.2 - American National Standard for Environmental and Facility Safety Signs 2011 (Reaffirmed 2017).
- B. ANSI Z535.4 - American National Standard for Product Safety Signs and Labels 2011 (Reaffirmed 2017).
- C. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- D. NFPA 70E - Standard for Electrical Safety in the Workplace 2024.
- E. UL 969 - Marking and Labeling Systems Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Verify final designations for equipment, systems, and components to be identified prior to fabrication of identification products.
- B. Sequencing:
 - 1. Do not conceal items to be identified, in locations such as above suspended ceilings, until identification products have been installed.
 - 2. Do not install identification products until final surface finishes and painting are complete.

1.05 SUBMITTALS

- A. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation and installation of product.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.

1.07 FIELD CONDITIONS

- A. Do not install adhesive products when ambient temperature is lower than recommended by manufacturer.

PART 2 PRODUCTS

2.01 IDENTIFICATION REQUIREMENTS

- A. Existing Work: Unless specifically excluded, identify existing elements to remain that are not already identified in accordance with specified requirements.
- B. Identification for Equipment:
 - 1. Use identification nameplate to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.
 - a. Switchboards:

MACOMB COUNTY JAIL
LAUNDRY HOT WATER STORAGE TANKS
AND BOILER REPLACEMENT

231997

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- 1) Identify ampere rating.
- 2) Identify voltage and phase.
- 3) Identify power source and circuit number. Include location when not within sight of equipment.
- 4) Use identification nameplate to identify main overcurrent protective device.
- 5) Use identification nameplate to identify load(s) served for each branch device. Do not identify spares and spaces.
- b. Panelboards:
 - 1) Identify ampere rating.
 - 2) Identify voltage and phase.
 - 3) Identify power source and circuit number. Include location when not within sight of equipment.
 - 4) Identify main overcurrent protective device. Use identification label for panelboards with a door. For power distribution panelboards without a door, use identification nameplate.
 - 5) Use typewritten circuit directory to identify load(s) served for panelboards with a door. Identify spares and spaces using pencil.
 - 6) For power panelboards without a door, use identification nameplate to identify load(s) served for each branch device. Do not identify spares and spaces.
- c. Transformers:
 - 1) Identify kVA rating.
 - 2) Identify voltage and phase for primary and secondary.
 - 3) Identify power source and circuit number. Include location when not within sight of equipment.
 - 4) Identify load(s) served. Include location when not within sight of equipment.
- d. Enclosed switches, circuit breakers, and motor controllers:
 - 1) Identify voltage and phase.
 - 2) Identify power source and circuit number. Include location when not within sight of equipment.
 - 3) Identify load(s) served. Include location when not within sight of equipment.
- e. Enclosed Contactors:
 - 1) Identify ampere rating.
 - 2) Identify voltage and phase.
 - 3) Identify configuration, e.g., E.O.E.H. (electrically operated, electrically held) or E.O.M.H. (electrically operated, mechanically held).
 - 4) Identify coil voltage.
 - 5) Identify load(s) and associated circuits controlled. Include location.
2. Use identification nameplate to identify switchboards and panelboards utilizing a high leg delta system in accordance with NFPA 70.
3. Use identification nameplate to identify disconnect location for equipment with remote disconnecting means.
4. Use identification label or handwritten text using indelible marker on inside of door at each fused switch to identify required NEMA fuse class and size.
5. Use identification label or handwritten text using indelible marker on inside of door at each motor controller to identify nameplate horsepower, full load amperes, code letter, service factor, voltage, and phase of motor(s) controlled.
6. Arc Flash Hazard Warning Labels: Use warning labels to identify arc flash hazards for electrical equipment, such as switchboards, panelboards, industrial control panels, meter socket enclosures, and motor control centers that are likely to require examination, adjustment, servicing, or maintenance while energized.
 - a. Minimum Size: 3.5 by 5 inches (89 mm by 127 mm).
 - b. Legend: Include orange header that reads "WARNING", followed by the word message "Arc Flash and Shock Hazard; Appropriate PPE Required; Do not operate controls or open covers without appropriate personal protection equipment; Failure to

comply may result in injury or death; Refer to NFPA 70E for minimum PPE requirements" or approved equivalent.

- C. Identification for Conductors and Cables:
 - 1. Color Coding for Power Conductors 600 V and Less: Comply with Section 26 05 19.
 - 2. Use wire and cable markers to identify circuit number or other designation indicated for power, control, and instrumentation conductors and cables at the following locations:
 - a. At each source and load connection.
 - b. Within boxes when more than one circuit is present.
 - c. Within equipment enclosures when conductors and cables enter or leave the enclosure.
- D. Identification for Boxes:
 - 1. Use identification labels or handwritten text using indelible marker to identify circuits enclosed.

2.02 IDENTIFICATION NAMEPLATES AND LABELS

- A. Identification Nameplates:
 - 1. Manufacturers:
 - a. Brimar Industries, Inc: www.brimar.com/#sle.
 - b. Kolbi Pipe Marker Co: www.kolbipipemarkers.com/#sle.
 - c. Seton Identification Products: www.seton.com/#sle.
 - 2. Materials:
 - a. Indoor Clean, Dry Locations: Use plastic nameplates.
 - b. Outdoor Locations: Use plastic, stainless steel, or aluminum nameplates suitable for exterior use.
 - 3. Plastic Nameplates: Two-layer or three-layer laminated acrylic or electrically non-conductive phenolic with beveled edges; minimum thickness of 1/16 inch (1.6 mm); engraved text.
 - 4. Stainless Steel Nameplates: Minimum thickness of 1/32 inch (0.8 mm); engraved or laser-etched text.
 - 5. Aluminum Nameplates: Anodized; minimum thickness of 1/32 inch (0.8 mm); engraved or laser-etched text.
 - 6. Mounting Holes for Mechanical Fasteners: Two, centered on sides for sizes up to 1 inch (25 mm) high; Four, located at corners for larger sizes.
- B. Identification Labels:
 - 1. Manufacturers:
 - a. Brady Corporation: www.bradyid.com/#sle.
 - b. Brother International Corporation: www.brother-usa.com/#sle.
 - c. Panduit Corp: www.panduit.com/#sle.
 - 2. Materials: Use self-adhesive laminated plastic labels; UV, chemical, water, heat, and abrasion resistant.
 - a. Use only for indoor locations.
 - 3. Text: Use factory pre-printed or machine-printed text. Do not use handwritten text unless otherwise indicated.
- C. Format for Equipment Identification:
 - 1. Minimum Size: 1 inch (25 mm) by 2.5 inches (64 mm).
 - 2. Legend:
 - a. Equipment designation or other approved description.
 - 3. Text: All capitalized unless otherwise indicated.
 - 4. Minimum Text Height:
 - a. Equipment Designation: 1/2 inch (13 mm).
 - 5. Color:
 - a. Normal Power System: White text on black background.

2.03 WIRE AND CABLE MARKERS

- A. Manufacturers:
 - 1. Brady Corporation: www.bradyid.com/#sle.
 - 2. HellermannTyton: www.hellermanntyton.com/#sle.
 - 3. Panduit Corp: www.panduit.com/#sle.
- B. Markers for Conductors and Cables: Use wrap-around self-adhesive vinyl cloth, wrap-around self-adhesive vinyl self-laminating, heat-shrink sleeve, plastic sleeve, plastic clip-on, or vinyl split sleeve type markers suitable for the conductor or cable to be identified.
- C. Markers for Conductor and Cable Bundles: Use plastic marker tags secured by nylon cable ties.
- D. Legend: Power source and circuit number or other designation indicated.
- E. Text: Use factory pre-printed or machine-printed text, all capitalized unless otherwise indicated.
- F. Minimum Text Height: 1/8 inch (3 mm).
- G. Color: Black text on white background unless otherwise indicated.

2.04 WARNING SIGNS AND LABELS

- A. Manufacturers:
 - 1. Brimar Industries, Inc: www.brimar.com/#sle.
 - 2. Clarion Safety Systems, LLC: www.clarionsafety.com/#sle.
 - 3. Seton Identification Products: www.seton.com/#sle.
- B. Comply with ANSI Z535.2 or ANSI Z535.4 as applicable.
- C. Warning Signs:
 - 1. Materials:
 - a. Indoor Dry, Clean Locations: Use factory pre-printed rigid plastic or self-adhesive vinyl signs.
 - b. Outdoor Locations: Use factory pre-printed rigid aluminum signs.
 - 2. Rigid Signs: Provide four mounting holes at corners for mechanical fasteners.
 - 3. Minimum Size: 7 by 10 inches (178 by 254 mm) unless otherwise indicated.
- D. Warning Labels:
 - 1. Materials: Use factory pre-printed or machine-printed self-adhesive polyester or self-adhesive vinyl labels; UV, chemical, water, heat, and abrasion resistant; produced using materials recognized to UL 969.
 - a. Do not use labels designed to be completed using handwritten text.
 - 2. Machine-Printed Labels: Use thermal transfer process printing machines and accessories recommended by label manufacturer.
 - 3. Minimum Size: 2 by 4 inches (51 mm by 102 mm) unless otherwise indicated.

PART 3 EXECUTION

3.01 PREPARATION

- A. Clean surfaces to receive adhesive products according to manufacturer's instructions.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install identification products to be plainly visible for examination, adjustment, servicing, and maintenance. Unless otherwise indicated, locate products as follows:
 - 1. Surface-Mounted Equipment: Enclosure front.
 - 2. Flush-Mounted Equipment: Inside of equipment door.
 - 3. Free-Standing Equipment: Enclosure front; also enclosure rear for equipment with rear access.
 - 4. Elevated Equipment: Legible from the floor or working platform.
 - 5. Branch Devices: Adjacent to device.
 - 6. Interior Components: Legible from the point of access.

7. Boxes: Outside face of cover.
8. Conductors and Cables: Legible from the point of access.
- C. Install identification products centered, level, and parallel with lines of item being identified.
- D. Secure nameplates to exterior surfaces of enclosures using stainless steel screws and to interior surfaces using self-adhesive backing or epoxy cement.
- E. Install self-adhesive labels and markers to achieve maximum adhesion, with no bubbles or wrinkles and edges properly sealed.
- F. Secure rigid signs using stainless steel screws.
- G. Mark all handwritten text, where permitted, to be neat and legible.

3.03 FIELD QUALITY CONTROL

- A. Replace self-adhesive labels and markers that exhibit bubbles, wrinkles, curling or other signs of improper adhesion.

END OF SECTION

**SECTION 26 05 83
WIRING CONNECTIONS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Electrical connections to equipment.

1.02 RELATED REQUIREMENTS

- A. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables.
- B. Section 26 05 33.13 - Conduit for Electrical Systems.
- C. Section 26 05 33.16 - Boxes for Electrical Systems.
- D. Section 26 28 16.16 - Enclosed Switches.
- E. Section 26 29 13 - Enclosed Controllers.

1.03 REFERENCE STANDARDS

- A. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Obtain and review shop drawings, product data, manufacturer's wiring diagrams, and manufacturer's instructions for equipment furnished under other sections.
 - 2. Determine connection locations and requirements.
- B. Sequencing:
 - 1. Install rough-in of electrical connections before installation of equipment is required.
 - 2. Make electrical connections before required start-up of equipment.

1.05 SUBMITTALS

- A. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Products: Listed, classified, and labeled as suitable for the purpose intended.
- C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Disconnect Switches: As specified in Section 26 28 16.16 and in individual equipment sections.
- B. Flexible Conduit: As specified in Section 26 05 33.13.
- C. Wire and Cable: As specified in Section 26 05 19.
- D. Boxes: As specified in Section 26 05 33.16.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that equipment is ready for electrical connection, wiring, and energization.

3.02 ELECTRICAL CONNECTIONS

- A. Make electrical connections in accordance with equipment manufacturer's instructions.

- B. Make conduit connections to equipment using flexible conduit. Use liquidtight flexible conduit with watertight connectors in damp or wet locations.
- C. Connect heat producing equipment using wire and cable with insulation suitable for temperatures encountered.
- D. Provide receptacle outlet to accommodate connection with attachment plug.
- E. Install suitable strain-relief clamps and fittings for cord connections at outlet boxes and equipment connection boxes.
- F. Install disconnect switches, controllers, control stations, and control devices to complete equipment wiring requirements.
- G. Install terminal block jumpers to complete equipment wiring requirements.
- H. Install interconnecting conduit and wiring between devices and equipment to complete equipment wiring requirements.

END OF SECTION

**SECTION 26 29 13
ENCLOSED CONTROLLERS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Enclosed NEMA controllers for low-voltage (600 V and less) applications:
 - 1. Magnetic motor starters.
- B. Overcurrent protective devices for motor controllers, including overload relays.
- C. Control accessories:
 - 1. Auxiliary contacts.
 - 2. Pilot devices.
 - 3. Control and timing relays.

1.02 RELATED REQUIREMENTS

- A. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
- B. Section 26 05 29 - Hangers and Supports for Electrical Systems.
- C. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.
- D. Section 26 28 13 - Fuses: Fuses for fusible switches.

1.03 REFERENCE STANDARDS

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum) 2020.
- C. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts 2008 (Reaffirmed 2020).
- D. NEMA ICS 5 - Industrial Control and Systems: Control Circuit and Pilot Devices 2017.
- E. NEMA ICS 6 - Industrial Control and Systems: Enclosures 1993 (Reaffirmed 2016).
- F. NEMA KS 1 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum) 2013.
- G. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems 2021.
- H. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- I. UL 98 - Enclosed and Dead-Front Switches Current Edition, Including All Revisions.
- J. UL 60947-1 - Low-Voltage Switchgear and Controlgear - Part 1: General Rules Current Edition, Including All Revisions.
- K. UL 60947-4-1 - Low-Voltage Switchgear and Controlgear - Part 4-1: Contactors and Motor-starters - Electromechanical Contactors and Motor-starters Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances required by NFPA 70.
 - 2. Coordinate the work to provide motor controllers and associated overload relays suitable for use with the actual motors to be installed.
 - 3. Coordinate the work to provide controllers and associated wiring suitable for interface with control devices to be installed.
 - 4. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.

5. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
6. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

- A. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- B. Field Quality Control Test Reports.
- C. Project Record Documents: Record actual installed locations of controllers and final equipment settings.
 1. Include nameplate data of actual installed motors and associated overload relay selections and settings.
 2. Motor Circuit Protectors: Include magnetic instantaneous trip settings.
- D. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.
- E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 1. See Section 01 60 00 - Product Requirements, for additional provisions.
 2. Indicating Lights: Two of each different type.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

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 carefully in accordance with manufacturer's written instructions to avoid damage to internal components, enclosure, and finish.

1.08 FIELD CONDITIONS

- A. Maintain field conditions within required service conditions during and after installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Schneider Electric; Square D Products: www.schneider-electric.us/#sle.
- B. Source Limitations: Furnish enclosed motor controllers and associated components produced by a single manufacturer and obtained from a single supplier.

2.02 ENCLOSED CONTROLLERS

- A. Provide enclosed controller assemblies consisting of all required components, control power transformers, instrumentation and control wiring, accessories, etc. as necessary for a complete operating system.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Description: Enclosed controllers complying with NEMA ICS 2, and listed and labeled as complying with UL 60947-1 and UL 60947-4-1; ratings, configurations and features as indicated on the drawings.
- D. Service Conditions:

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1. Provide controllers and associated components suitable for operation under the following service conditions without derating:
 - a. Altitude:
 - 1) Class 1 Km Equipment (devices utilizing power semiconductors, e.g. variable frequency controllers): Less than 3,300 feet (1,000 m).
 - 2) Class 2 Km Equipment (electromagnetic and manual devices): Less than 6,600 feet (2,000 m).
 - b. Ambient Temperature: Between 32 degrees F (0 degrees C) and 104 degrees F (40 degrees C).
 2. Provide controllers and associated components suitable for operation at indicated ratings under the service conditions at the installed location.
- E. Conductor Terminations: Suitable for use with the conductors to be installed.
- F. Enclosures:
1. Comply with NEMA ICS 6.
 2. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
 - a. Indoor Clean, Dry Locations: Type 1 or Type 12.
 3. Finish: Manufacturer's standard unless otherwise indicated.
- G. Magnetic Motor Starters: Combination type unless otherwise indicated.
1. Combination Magnetic Motor Starters: NEMA ICS 2, Class A combination motor controllers with magnetic contactor(s), externally operable disconnect and overload relay(s).
 2. Configuration: Full-voltage non-reversing unless otherwise indicated.
 3. Minimum Starter Size: NEMA Size 0.
 4. Use of non-standard starter sizes smaller than specified standard NEMA sizes is not permitted.
 5. Disconnects: Disconnect switch type.
 - a. Disconnect Switches: Fusible type unless otherwise indicated.
 - b. Provide externally operable handle with means for locking in the OFF position. Provide safety interlock to prevent opening the cover with the disconnect in the ON position with capability of overriding interlock for testing purposes.
 - c. Provide auxiliary interlock for disconnection of external control power sources where applicable.
 6. Overload Relays: Solid-state type unless otherwise indicated.
 7. Pilot Devices Required:
 - a. Furnish local pilot devices for each unit as specified below unless otherwise indicated on drawings.
 - b. Single-Speed, Non-Reversing Starters:
 - 1) Pushbuttons: START-STOP.
 - 2) Selector Switches: HAND/OFF/AUTO.
 - 3) Indicating Lights: Red ON, Green OFF.

2.03 OVERCURRENT PROTECTIVE DEVICES

- A. Overload Relays:
1. Provide overload relays and, where applicable, associated current elements/heaters, selected according to actual installed motor nameplate data, in accordance with manufacturer's recommendations and NFPA 70; include consideration for motor service factor and ambient temperature correction, where applicable.
 2. Inverse-Time Trip Class Rating: Class 20 unless otherwise indicated or required.
 3. Trip-free operation.
 4. Visible trip indication.
 5. Resettable.
 - a. Employ manual reset unless otherwise indicated.
 - b. Do not employ automatic reset with two-wire control.

6. Solid-State Overload Relays:
 - a. Selectable inverse-time trip class rating; available ratings of Class 10, 20, and 30, minimum.
 - b. Adjustable full load current.
 - c. Phase loss protection.
 - d. Phase imbalance protection.
 - e. Ground fault protection.
 - f. Ambient temperature insensitive.
 - g. Thermal memory.
 - h. Trip test function.
 - i. Provide isolated alarm contact.
- B. Fusible Disconnect Switches:
 1. Description: Quick-make, quick-break, dead-front fusible switch units complying with NEMA KS 1, and listed and labeled as complying with UL 98; ratings, configurations, and features as indicated on the drawings.
 2. Fuse Clips: As required to accept indicated fuses.
 - a. Where NEMA Class R fuses are installed, provide rejection feature to prevent installation of fuses other than Class R.
 3. Provide externally operable handle with means for locking in the OFF position. Provide means for locking switch cover in the closed position. Provide safety interlock to prevent opening the cover with the switch in the ON position with capability of overriding interlock for testing purposes.

2.04 CONTROL ACCESSORIES

- A. Auxiliary Contacts:
 1. Comply with NEMA ICS 5.
 2. Provide number and type of contacts indicated or required to perform necessary functions, including holding (seal-in) circuit and interlocking, plus one normally open (NO) and one normally closed (NC) spare contact for each magnetic motor starter, minimum.
- B. Pilot Devices:
 1. Comply with NEMA ICS 5; heavy-duty type.
 2. Pushbuttons: Unless otherwise indicated, provide momentary, non-illuminated type with flush button operator; normally open or normally closed as indicated or as required.
 3. Selector Switches: Unless otherwise indicated, provide maintained, non-illuminated type with knob operator; number of switch positions as indicated or as required.
 4. Indicating Lights: Push-to-test type unless otherwise indicated.
 5. Provide LED lamp source for indicating lights and illuminated devices.
- C. Control and Timing Relays:
 1. Comply with NEMA ICS 5.
 2. Provide number and type of relays indicated or required to perform necessary functions.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that ratings of enclosed controllers are consistent with the indicated requirements.
- C. Verify that mounting surfaces are ready to receive enclosed controllers.
- D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install controllers in accordance with NECA 1 (general workmanship).

- C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- D. Provide required support and attachment in accordance with Section 26 05 29.
- E. Install enclosed controllers plumb and level.
- F. Provide grounding and bonding in accordance with Section 26 05 26.
- G. Install all field-installed devices, components, and accessories.
- H. Provide fuses complying with Section 26 28 13 for fusible switches as indicated.
- I. Where accessories are not self-powered, provide control power source as indicated or as required to complete installation.
- J. Set field-adjustable controllers and associated components according to installed motor requirements, in accordance with manufacturer's recommendations and NFPA 70.
- K. Identify enclosed controllers in accordance with Section 26 05 53.

3.03 FIELD QUALITY CONTROL

- A. Inspect and test in accordance with NETA ATS, except Section 4.
- B. Motor Starters: Perform inspections and tests listed in NETA ATS, Section 7.16.1.1. Tests listed as optional are not required.
 - 1. Verify motor-running protection.
 - 2. Perform insulation-resistance tests on all control wiring with respect to ground.
- C. Fusible Switches: Perform inspections and tests listed in NETA ATS, Section 7.5.1.1.
- D. Correct deficiencies and replace damaged or defective enclosed controllers or associated components.
- E. Submit detailed reports indicating inspection and testing results and corrective actions taken.

3.04 ADJUSTING

- A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

3.05 CLEANING

- A. Clean dirt and debris from controller enclosures and components according to manufacturer's instructions.
- B. Repair scratched or marred exterior surfaces to match original factory finish.

3.06 CLOSEOUT ACTIVITIES

- A. Demonstration: Demonstrate proper operation of controllers to Owner, and correct deficiencies or make adjustments as directed.
- B. Training: Train Owner's personnel on operation, adjustment, and maintenance of enclosed controllers and associated devices.
 - 1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.

3.07 PROTECTION

- A. Protect installed enclosed controllers from subsequent construction operations.

END OF SECTION

**SECTION 26 32 13
ENGINE GENERATORS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Packaged engine generator system and associated components and accessories:
 - 1. Engine and engine accessory equipment.
 - 2. Alternator (generator).
 - 3. Generator set control system.
 - 4. Generator set enclosure.

1.02 RELATED REQUIREMENTS

- A. Division 01 - General Requirements: Project administrative and procedural requirements.
- B. Division 03 - Concrete: Concrete equipment pads.
- C. Division 23 - Heating, Ventilation and Air-Conditioning (HVAC): Fuel piping.
- D. Section 23 5100 - Breechings, Chimneys, and Stacks: Engine exhaust piping.
 - 1. Includes installation of exhaust silencer specified in this section.
- E. Section 26 0005 - Basic Electrical Requirements.
- F. Section 26 0526 - Grounding and Bonding for Electrical Systems.
- G. Section 26 0529 - Hangers and Supports for Electrical Systems.
- H. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.
- I. Section 26 3600 - Transfer Switches.

1.03 REFERENCE STANDARDS

- A. MDEQ - Natural Resources and Environmental Protection Act Current Edition, Including all revisions.
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- C. NECA/EGSA 404 - Standard for Installing Generator Sets 2014.
- D. NEMA MG 1 - Motors and Generators 2018.
- E. NFPA 30 - Flammable and Combustible Liquids Code 2018.
- F. NFPA 37 - Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines 2018.
- G. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- H. NFPA 99 - Health Care Facilities Code 2018.
- I. NFPA 110 - Standard for Emergency and Standby Power Systems 2019.
- J. NFPA 20 - Standard for the Installation of Stationary Pumps for Fire Protection 2018.
- K. UL 1236 - Battery Chargers for Charging Engine-Starter Batteries Current Edition, Including All Revisions.
- L. UL 2085 - Protected Aboveground Tanks for Flammable and Combustible Liquids Current Edition, Including All Revisions.
- M. UL 2200 - Stationary Engine Generator Assemblies Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate compatibility of generator sets to be installed with work provided under other sections or by others.

- a. Transfer Switches: See Section 26 3600.
 2. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment or other potential obstructions within the spaces dedicated for engine generator system.
 3. Coordinate arrangement of equipment with the dimensions and clearance requirements of the actual equipment to be installed.
 4. Coordinate the work to provide electrical circuits suitable for the power requirements of the actual auxiliary equipment and accessories to be installed.
 5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- B. Preinstallation Meeting: Convene one week before starting work of this section; require attendance of all affected installers.

1.05 SUBMITTALS

- A. Contractor shall provide submittals for equipment listed herein. Refer to Division 01 for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product, including ratings, configurations, dimensions, finishes, weights, service condition requirements, and installed features. Include alternator starting capabilities, engine fuel consumption rates, and cooling, combustion air, and exhaust requirements.
 1. Include generator set sound level test data.
 2. Include characteristic trip curves for overcurrent protective devices upon request.
 3. Include alternator thermal damage curve upon request.
- C. Shop Drawings: Include dimensioned plan views and sections indicating locations of system components, required clearances, and field connection locations. Include system interconnection schematic diagrams showing all factory and field connections.
- D. Derating Calculations: Indicate ratings adjusted for applicable service conditions.
- E. Fuel Storage Tank Calculations: Indicate maximum running time for generator set configuration provided.
- F. Manufacturer's factory emissions certification.
- G. Manufacturer's certification that products meet or exceed specified requirements.
- H. Provide NFPA 110 required documentation from manufacturer, including but not limited to:
 1. Certified prototype tests.
 2. Torsional vibration compatibility certification.
 3. NFPA 110 compliance certification.
 4. Certified rated load test at rated power factor.
- I. Manufacturer's detailed field testing procedures.
- J. Operation and Maintenance Data: Include detailed information on system operation, equipment programming and setup, replacement parts, and recommended maintenance procedures and intervals.
 1. Include contact information for entity that will be providing contract maintenance and trouble call-back service.
- K. Executed Warranty: Submit documentation of final executed warranty completed in Owner's name and registered with manufacturer.
- L. Maintenance contracts.
- M. Project Record Documents: Record actual locations of system components, installed circuiting arrangements and routing, and final equipment settings.

1.06 QUALITY ASSURANCE

- A. Comply with the following:
 1. NFPA 70 (National Electrical Code).

2. NFPA 110 (Standard for Emergency and Standby Power Systems); meet requirements for Level 1 system.
 3. NFPA 30 (Flammable and Combustible Liquids Code).
 4. UL Certified.
 5. EPA Certified.
 6. Michigan Department of Environmental Quality (MDEQ).
- B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 WARRANTY

- A. Refer to Division 01 - General Requirements for additional warranty requirements.
- B. Provide minimum two year manufacturer warranty covering repair or replacement due to defective materials or workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Packaged Engine Generator Set:
 1. Cummins Power Generation Inc: www.cumminspower.com
 2. Kohler Co: www.kohlerpower.com
- B. Products other than basis of design are subject to compliance with specified requirements and prior approval of Engineer. By using products other than basis of design, Contractor accepts responsibility for costs associated with any necessary modifications to related work, including any design fees.

2.02 PACKAGED ENGINE GENERATOR SYSTEM

- A. Provide new engine generator system consisting of all required equipment, sensors, conduit, boxes, wiring, piping, supports, accessories, system programming, etc. as necessary for a complete operating system that provides the functional intent indicated.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. System Description:
 1. Application: Emergency/standby.
 2. Configuration: Single packaged engine generator set operated independently (not in parallel).
- D. Packaged Engine Generator Set:
 1. Type: Gaseous (spark ignition).
 2. Power Rating: As indicated on drawings, standby.
 3. Voltage: As indicated on drawings.
- E. Generator Set General Requirements:
 1. Prototype tested in accordance with NFPA 110 for Level 1 systems.
 2. Factory-assembled, with components mounted on suitable base.
 3. List and label engine generator assembly as complying with UL 2200.
 4. Power Factor: Unless otherwise indicated, specified power ratings are at 0.8 power factor for three phase voltages and 1.0 power factor for single phase voltages.
 5. Provide suitable guards to protect personnel from accidental contact with rotating parts, hot piping, and other potential sources of injury.
- F. Service Conditions: Provide engine generator system and associated components suitable for operation under the service conditions at the installed location.
- G. Starting and Load Acceptance Requirements:
 1. Cranking Method: Cycle cranking complying with NFPA 110 (15 second crank period, followed by 15 second rest period, with cranking limiter time-out after 3 cycles), unless otherwise required.

2. Cranking Limiter Time-Out: If generator set fails to start after specified cranking period, indicate overcrank alarm condition and lock-out generator set from further cranking until manually reset.
 3. Start Time: Capable of starting and achieving conditions necessary for load acceptance within 10 seconds (NFPA 110, Type 10).
 4. Maximum Load Step: Refer to "Generator Performance Requirements" schedule in Electrical drawings.
 5. Motor Starting Capability: Supports starting of motor load indicated with a maximum voltage dip as indicated under "Maximum Load Step" above.
- H. Exhaust Emissions Requirements:
1. Comply with federal (EPA), state, and local regulations applicable at the time of commissioning; include factory emissions certification with submittals.
 2. Do not make modifications affecting generator set factory emissions certification without approval of manufacturer and Engineer. Where such modifications are made, provide field emissions testing as necessary for certification.
- I. Sound Level Requirements:
1. Do not exceed 72 dBA when measured at 23 feet from generator set in free field (no sound barriers) while operating at full load; include manufacturer's sound data with submittals.
 2. Comply with applicable noise level regulations.
- J. Interface with building automation system.

2.03 ENGINE AND ENGINE ACCESSORY EQUIPMENT

- A. Provide engine with adequate horsepower to achieve specified power output at rated speed, accounting for alternator efficiency and parasitic loads.
- B. Engine Fuel System - Natural Gas:
1. Fuel Source: Natural Gas.
 2. Engine Fuel Connections: Provide suitable, approved flexible fuel lines for coupling engine to fuel source.
 3. Provide components/features indicated and as necessary for operation and/or required by applicable codes, including but not limited to:
 - a. Carburetor.
 - b. Gas pressure regulators.
 - c. Fuel shutoff control valves.
- C. Engine Starting System:
1. System Type: Electric, with DC solenoid-activated starting motor(s).
 2. Battery(s):
 - a. Battery Type: Lead-acid.
 - b. Battery Capacity: Size according to manufacturer's recommendations for achieving starting and load acceptance requirements under worst case ambient temperature; capable of providing cranking through two complete periods of cranking limiter time-outs without recharging.
 - c. Provide battery rack, cables, and connectors suitable for the supplied battery(s); size battery cables according to manufacturer's recommendations for cable length to be installed.
 3. Battery-Charging Alternator: Engine-driven, with integral solid-state voltage regulation.
 4. Battery Charger:
 - a. Provide dual rate battery charger with automatic float and equalize charging modes and minimum rating of 10 amps; suitable for maintaining the supplied battery(s) at full charge without manual intervention.
 - b. Capable of returning supplied battery(s) from fully discharged to fully charged condition within 24 hours, as required by NFPA 110 for Level 1 applications while carrying normal loads.

- c. Recognized as complying with UL 1236.
 - d. Furnished with integral overcurrent protection; current limited to protect charger during engine cranking; reverse polarity protection.
 - e. Provide integral DC output ammeter and voltmeter with five percent accuracy.
 - f. Provide alarm output contacts as necessary for alarm indications.
- D. Engine Speed Control System (Governor):
1. Single Engine Generator Sets (Not Operated in Parallel): Provide electronic isochronous governor for controlling engine speed/alternator frequency.
 2. Frequency Regulation, Electronic Isochronous Governors: No change in frequency from no load to full load; plus/minus 0.25 percent at steady state.
- E. Engine Lubrication System:
1. System Type: Full pressure, with engine-driven, positive displacement lubrication oil pump, replaceable full-flow oil filter(s), and dip-stick for oil level indication. Provide oil cooler where recommended by manufacturer.
 2. Oil Heater: Provide thermostatically controlled oil heater to improve starting under cold ambient conditions.
- F. Engine Cooling System:
1. System Type: Closed-loop, liquid-cooled, with unit-mounted radiator/fan and engine-driven coolant pump; suitable for providing adequate cooling while operating at full load under worst case ambient temperature.
 2. Fan Guard: Provide suitable guard to protect personnel from accidental contact with fan.
 3. Coolant Heater: Provide thermostatically controlled coolant heater to improve starting under cold ambient conditions; size according to manufacturer's recommendations for achieving starting and load acceptance requirements under worst case ambient temperature.
- G. Engine Air Intake and Exhaust System:
1. Air Intake Filtration: Provide engine-mounted, replaceable, dry element filter.
 2. Engine Exhaust Connection: Provide suitable, approved flexible connector for coupling engine to exhaust system.

2.04 ALTERNATOR (GENERATOR)

- A. Alternator: 4-pole, 1800 rpm (60 Hz output) revolving field, synchronous generator complying with NEMA MG 1; connected to engine with flexible coupling; voltage output configuration as indicated, with reconnectable leads for 3 phase alternators.
- B. Exciter:
1. Exciter Type: Brushless; provide permanent magnet generator (PMG) excitation system; self-excited (shunt) systems are not permitted.
 2. PMG Excitation Short-Circuit Current Support: Capable of sustaining 300 percent of rated output current for 10 seconds.
 3. Voltage Regulation (with PMG excitation): Plus/minus 0.5 percent for any constant load from no load to full load.
- C. Temperature Rise: Comply with UL 2200.
- D. Insulation System: NEMA MG 1, Class H; suitable for alternator temperature rise.
- E. Enclosure: NEMA MG 1, drip-proof.
- F. Total Harmonic Distortion: Not greater than five percent.

2.05 GENERATOR SET CONTROL SYSTEM

- A. Provide microprocessor-based control system for automatic control, monitoring, and protection of generator set. Include sensors, wiring, and connections necessary for functions/indications specified.
- B. Control Panel:
1. Control Panel Mounting: Unit-mounted unless otherwise indicated; vibration isolated.

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2. Generator Set Control Functions:
 - a. Automatic Mode: Initiates generator set start/shutdown upon receiving corresponding signal from remote device (e.g. automatic transfer switch).
 - b. Manual Mode: Initiates generator set start/shutdown upon direction from operator.
 - c. Reset Mode: Clears all faults, allowing generator set restart after a shutdown.
 - d. Emergency Stop: Immediately shuts down generator set (without time delay) and prevents automatic restarting until manually reset. Coordinate final location with AHJ.
 - e. Cycle Cranking: Programmable crank time, rest time, and number of cycles.
 - f. Time Delay: Programmable for shutdown (engine cooldown) and start (engine warmup).
 - g. Voltage Adjustment: Adjustable through range of plus/minus 5 percent.
3. Generator Set Status Indications:
 - a. Voltage (Volts AC): Line-to-line, line-to-neutral for each phase.
 - b. Current (Amps): For each phase.
 - c. Frequency (Hz).
 - d. Real power (W/kW).
 - e. Reactive power (VAR/kVAR).
 - f. Apparent power (VA/kVA).
 - g. Power factor.
 - h. Duty Level: Actual load as percentage of rated power.
 - i. Engine speed (RPM).
 - j. Battery voltage (Volts DC).
 - k. Engine oil pressure.
 - l. Engine coolant temperature.
 - m. Engine run time.
 - n. Generator powering load (position signal from transfer switch).
4. Generator Set Protection and Warning/Shutdown Indications:
 - a. Comply with NFPA 110; configurable for NFPA 110 Level 1 or Level 2, or NFPA 99 systems including but not limited to the following protections/indications:
 - 1) Overcrank (shutdown).
 - 2) Low coolant temperature (warning).
 - 3) High coolant temperature (warning).
 - 4) High coolant temperature (shutdown).
 - 5) Low oil pressure (shutdown).
 - 6) Overspeed (shutdown).
 - 7) Low fuel level (warning).
 - 8) Low coolant level (warning/shutdown).
 - 9) Generator control not in automatic mode (warning).
 - 10) High battery voltage (warning).
 - 11) Low cranking voltage (warning).
 - 12) Low battery voltage (warning).
 - 13) Battery charger failure (warning).
 - b. In addition to NFPA 110 requirements, provide the following protections/indications:
 - 1) High AC voltage (shutdown).
 - 2) Low AC voltage (shutdown).
 - 3) High frequency (shutdown).
 - 4) Low frequency (shutdown).
 - 5) Overcurrent (shutdown).
 - c. Provide contacts for local and remote common alarm.
 - d. Provide lamp test function that illuminates all indicator lamps.
5. Other Control Panel Features:
 - a. Event log.

- b. Communications Capability: Compatible with system indicated. Provide all accessories necessary for proper interface.
- c. Remote monitoring capability.
- C. Remote Annunciator:
 - 1. Remote Annunciator Mounting: Wall-mounted; Provide flush-mounted annunciator for finished areas and surface-mounted annunciator for non-finished areas unless otherwise indicated.
 - 2. Generator Set Status Indications:
 - a. Generator powering load (via position signal from transfer switch).
 - b. Communication functional.
 - 3. Generator Set Warning/Shutdown Indications:
 - a. Comply with NFPA 110; configurable for NFPA 110 Level 1 or Level 2, or NFPA 99 systems including but not limited to the following indications:
 - 1) Overcrank (shutdown).
 - 2) Low coolant temperature (warning).
 - 3) High coolant temperature (warning).
 - 4) High coolant temperature (shutdown).
 - 5) Low oil pressure (shutdown).
 - 6) Overspeed (shutdown).
 - 7) Low fuel level (warning).
 - 8) Low coolant level (warning/shutdown).
 - 9) Generator control not in automatic mode (warning).
 - 10) High battery voltage (warning).
 - 11) Low cranking voltage (warning).
 - 12) Low battery voltage (warning).
 - 13) Battery charger failure (warning).
 - b. Provide audible alarm with silence function.
 - c. Provide lamp test function that illuminates all indicator lamps.
- D. Remote Emergency Stop: Provide approved red, mushroom style remote emergency stop button where indicated or required by authorities having jurisdiction.

2.06 GENERATOR SET ENCLOSURE

- A. Enclosure Type: Sound attenuating, weather protective, level 1
- B. Enclosure Material: aluminum.
- C. Hardware Material: Stainless steel.
- D. Color: Manufacturer's standard.
- E. Access Doors: Lockable, with all locks keyed alike.
- F. Openings: Designed to prevent bird/rodent entry.
- G. External Drains: Extend oil and coolant drain lines to exterior of enclosure for maintenance service.
- H. Sound Attenuating Enclosures: Line enclosure with non-hygroscopic, self-extinguishing sound-attenuating material.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that the ratings and configurations of generator sets and auxiliary equipment are consistent with the indicated requirements.
- C. Verify that rough-ins for field connections are in the proper locations.
- D. Verify that mounting surfaces are ready to receive equipment.

- E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Perform work in accordance with NECA 1 (general workmanship).
- B. Install products in accordance with manufacturer's instructions.
- C. Install generator sets and associated accessories in accordance with NECA/EGSA 404.
- D. Arrange equipment to provide minimum clearances and required maintenance access.
- E. Unless otherwise indicated, mount generator set on properly sized, minimum 4 inch high concrete pad constructed in accordance with Section 26 0005 and Division 03 - Concrete. Provide suitable vibration isolators, where no factory installed.
- F. Provide required support and attachment in accordance with Section 26 0529.
- G. Use manufacturer's recommended oil and coolant, suitable for the worst case ambient temperatures.
- H. Provide engine exhaust piping in accordance with Section 23 5100, where not factory installed.
 - 1. Include piping expansion joints, piping insulation, thimble, condensation trap/drain, rain cap, hangers/supports, etc. as indicated or as required.
 - 2. Do not exceed manufacturer's maximum back pressure requirements.
- I. Install exhaust silencer in accordance with Section 23 5100, where not factory installed.
- J. Provide grounding and bonding in accordance with Section 26 0526.
- K. Identify system wiring and components in accordance with Section 26 0553.

3.03 FIELD QUALITY CONTROL

- A. See Division 01 - General Requirements for additional requirements.
- B. Provide services of a manufacturer's authorized representative to prepare and start systems and perform inspection and testing. Include manufacturer's detailed testing procedures and field reports with submittals.
- C. Notify Owner and Architect at least two weeks prior to scheduled inspections and tests.
- D. Notify authorities having jurisdiction and comply with their requirements for scheduling inspections and tests and for observation by their personnel.
- E. Provide all equipment, tools, and supplies required to accomplish inspection and testing, including load bank and fuel.
- F. Preliminary inspection and testing to include, at a minimum:
 - 1. Inspect each system component for damage and defects.
 - 2. Verify tightness of mechanical and electrical connections are according to manufacturer's recommended torque settings.
 - 3. Check for proper oil and coolant levels.
- G. Prepare and start system in accordance with manufacturer's instructions.
- H. Perform acceptance test in accordance with NFPA 110.
- I. Provide field emissions testing where necessary for certification.
- J. Sound Level Tests: Measure sound levels for compliance with specified requirements. Identify and report ambient noise conditions.
- K. Correct defective work, adjust for proper operation, and retest until entire system complies with Contract Documents.

3.04 CLOSEOUT ACTIVITIES

- A. See Division 01 - General Requirements for closeout submittals.
- B. Demonstration: Demonstrate proper operation of system to Owner, and correct deficiencies or make adjustments as directed.

- C. Training: Train Owner's personnel on operation, adjustment, and maintenance of system.
 - 1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
 - 2. Provide minimum of four hours of training.
 - 3. Instructor: Manufacturer's authorized representative.
 - 4. Location: At project site.

3.05 MAINTENANCE

- A. Provide to Owner a proposal as an alternate to the base bid, a separate maintenance contract for the service and maintenance of engine generator system for two years from date of Substantial Completion; Include a complete description of preventive maintenance, systematic examination, adjustment, inspection, and testing, with a detailed schedule.

END OF SECTION

**SECTION 26 36 00
TRANSFER SWITCHES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Transfer switches for low-voltage (600 V and less) applications and associated accessories:
 - 1. Automatic transfer switches.
 - 2. Remote annunciators.

1.02 RELATED REQUIREMENTS

- A. Division 01 - General Requirements: Project administrative and procedural requirements.
- B. Division 03 - Concrete: Concrete equipment pads for floor mounted units.
- C. Division 14 - Conveying Equipment: For interface with transfer switch.
- D. Section 26 0005 - Basic Electrical Requirements.
- E. Section 26 0526 - Grounding and Bonding for Electrical Systems.
- F. Section 26 0529 - Hangers and Supports for Electrical Systems.
- G. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.
- H. Section 26 0573 - Power System Studies: Additional criteria for the selection of equipment specified in this section.
- I. Section 26 2816.16 - Enclosed Switches: Safety switches not listed for use as transfer switch equipment.
- J. Section 26 3213 - Engine Generators: For interface with transfer switches.
 - 1. Includes code requirements applicable to work of this section.

1.03 REFERENCE STANDARDS

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum) 2020.
- C. NEMA ICS 10 Part 1 - Industrial Control and Systems Part 1: Electromechanical AC Transfer Switch Equipment 2020.
- D. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems 2017.
- E. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- F. NFPA 110 - Standard for Emergency and Standby Power Systems 2019.
- G. UL 1008 - Transfer Switch Equipment Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate compatibility of transfer switches to be installed with work provided under other sections or by others.
 - a. Engine Generators: See Section 26 3213.
 - 2. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances required by NFPA 70.
 - 3. Coordinate arrangement of equipment with the dimensions and clearance requirements of the actual equipment to be installed.
 - 4. Coordinate the work with placement of supports, anchors, etc. required for mounting.
 - 5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

- A. Contractor shall provide submittals for equipment listed herein. Refer to Division 01 for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product, including ratings, configurations, dimensions, finishes, weights, service condition requirements, and installed features.
 - 1. Where applicable, include characteristic trip curves for overcurrent protective devices upon request.
- C. Shop Drawings: Include dimensioned plan views and sections indicating locations of system components, required clearances, and field connection locations. Include system interconnection schematic diagrams showing all factory and field connections.
- D. Maintenance contracts.
- E. Project Record Documents: Record actual locations of system components, installed circuiting arrangements and routing, and final equipment settings.

1.06 QUALITY ASSURANCE

- A. Comply with the following:
 - 1. NFPA 70 (National Electrical Code).
 - 2. NFPA 110 (Standard for Emergency and Standby Power Systems); meet requirements for system Level specified in Section 26 3213.
- B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Transfer Switches:
 - 1. Same as manufacturer of engine generator(s) used for this project.
- B. Products other than basis of design are subject to compliance with specified requirements and prior approval of Engineer. By using products other than basis of design, Contractor accepts responsibility for costs associated with any necessary modifications to related work, including any design fees.
- C. Source Limitations: Furnish transfer switches and accessories produced by a single manufacturer and obtained from a single supplier.

2.02 TRANSFER SWITCHES

- A. Provide complete power transfer system consisting of all required equipment, conduit, boxes, wiring, supports, accessories, system programming, etc. as necessary for a complete operating system that provides the functional intent indicated.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Applications:
- D. Construction Type: Either "contactor type" (open contact) or "breaker type" (enclosed contact) transfer switches complying with specified requirements are acceptable.
- E. Automatic Transfer Switch:
 - 1. Transfer Switch Type: As indicated on the drawings.
 - 2. Transition Configuration: As indicated on the drawings.
 - 3. Voltage: As indicated on the drawings.
 - 4. Ampere Rating: As indicated on the drawings.
 - 5. Neutral Configuration: Solid neutral (unswitched), except as indicated.
 - 6. Features:
 - a. Provide signal connection to elevator programming hub.

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- F. Comply with NEMA ICS 10 Part 1, and list and label as complying with UL 1008 for the classification of the intended application (e.g. emergency, optional standby).
- G. Do not use double throw safety switches or other equipment not specifically designed for power transfer applications and listed as transfer switch equipment.
- H. Load Classification: Classified for total system load (any combination of motor, electric discharge lamp, resistive, and tungsten lamp loads with tungsten lamp loads not exceeding 30 percent of the continuous current rating) unless otherwise indicated or required.
- I. Switching Methods:
 - 1. Open Transition:
 - a. Provide break-before-make transfer without a neutral position that is not connected to either source, and with interlocks to prevent simultaneous connection of the load to both sources.
 - 2. Obtain control power for transfer operation from line side of source to which the load is to be transferred.
- J. Service Conditions: Provide transfer switches suitable for continuous operation at indicated ratings under the service conditions at the installed location.
- K. Enclosures:
 - 1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
 - 2. Finish: Manufacturer's standard unless otherwise indicated.
- L. Short Circuit Current Rating:
 - 1. Withstand and Closing Rating: Provide transfer switches, when protected by the supply side overcurrent protective devices to be installed, with listed withstand and closing rating not less than the available fault current at the installed location as indicated on the drawings.
- M. Automatic Transfer Switches:
 - 1. Description: Transfer switches with automatically initiated transfer between sources; electrically operated and mechanically held.
 - 2. Control Functions:
 - a. Automatic mode.
 - b. Test Mode: Simulates failure of primary/normal source.
 - c. Voltage and Frequency Sensing:
 - 1) Undervoltage sensing for each phase of primary/normal source; adjustable dropout/pickup settings.
 - 2) Undervoltage sensing for alternate/emergency source; adjustable dropout/pickup settings.
 - 3) Underfrequency sensing for alternate/emergency source; adjustable dropout/pickup settings.
 - d. Outputs:
 - 1) Contacts for engine start/shutdown (except where direct generator communication interface is provided).
 - 2) Auxiliary contacts; one set(s) for each switch position.
 - e. Adjustable Time Delays:
 - 1) Engine generator start time delay; delays engine start signal to override momentary primary/normal source failures.
 - 2) Transfer to alternate/emergency source time delay.
 - 3) Retransfer to primary/normal source time delay.
 - 4) Engine generator cooldown time delay; delays engine shutdown following retransfer to primary/normal source to permit generator to run unloaded for cooldown period.
 - f. In-Phase Monitor (Open Transition Transfer Switches): Monitors phase angle difference between sources for initiating in-phase transfer.

- g. Engine Exerciser: Provides programmable scheduled exercising of engine generator selectable with or without transfer to load; provides memory retention during power outage.
- 3. Status Indications:
 - a. Connected to alternate/emergency source.
 - b. Connected to primary/normal source.
 - c. Alternate/emergency source available.
- 4. Automatic Sequence of Operations:
 - a. Upon failure of primary/normal source for a programmable time period (engine generator start time delay), initiate starting of engine generator where applicable.
 - b. When alternate/emergency source is available, transfer load to alternate/emergency source after programmable time delay.
 - c. When primary/normal source has been restored, retransfer to primary/normal source after a programmable time delay. Bypass time delay if alternate/emergency source fails and primary/normal source is available.
 - d. Where applicable, initiate shutdown of engine generator after programmable engine cooldown time delay.
- N. Interface with Other Work:
 - 1. Interface with engine generators as specified in Section 26 3213.
 - 2. Interface with elevators as specified in Division 14.
 - 3. Interface with building automation system.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that the ratings and configurations of transfer switches are consistent with the indicated requirements.
- C. Verify that rough-ins for field connections are in the proper locations.
- D. Verify that mounting surfaces are ready to receive transfer switches.
- E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Perform work in accordance with NECA 1 (general workmanship).
- B. Install products in accordance with manufacturer's instructions.
- C. Arrange equipment to provide minimum clearances and required maintenance access.
- D. Provide required support and attachment in accordance with Section 26 0529.
- E. Install transfer switches plumb and level.
- F. Unless otherwise indicated, mount floor-mounted transfer switches on properly sized 3 inch high concrete pad constructed in accordance with Section 03 3000.
- G. Provide grounding and bonding in accordance with Section 26 0526.
- H. Identify transfer switches and associated system wiring in accordance with Section 26 0553.

3.03 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Prepare and start system in accordance with manufacturer's instructions.
- C. Automatic Transfer Switches:
 - 1. Inspect and test in accordance with NETA ATS, except Section 4.
 - 2. Perform inspections and tests listed in NETA ATS, Section 7.22.3. The insulation-resistance tests listed as optional are not required.

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- D. Correct defective work, adjust for proper operation, and retest until entire system complies with Contract Documents.

3.04 MAINTENANCE

- A. Provide to Owner at no extra cost, a separate maintenance contract for the service and maintenance of transfer switches for two years from date of Substantial Completion; Include a complete description of preventive maintenance, systematic examination, adjustment, inspection, and testing, with a detailed schedule.

END OF SECTION

MACOMB COUNTY EXECUTIVE MACOMB COUNTY JAIL JAIL LAUNDRY HW STORAGE TANK AND BOILER REPLACEMENT

ISSUED FOR: BIDS AND CONSTRUCTION DOCUMENTS
 DATE: OCTOBER 25, 2023
 PROJECT NO.: 231997

ARCHITECT:

WAKELY ASSOCIATES, INC./ ARCHITECTS
 30500 VAN DYKE AVE, SUITE 209, WARREN, MI 48093, 586-573-4100

MECHANICAL/ ELECTRICAL ENGINEERS:

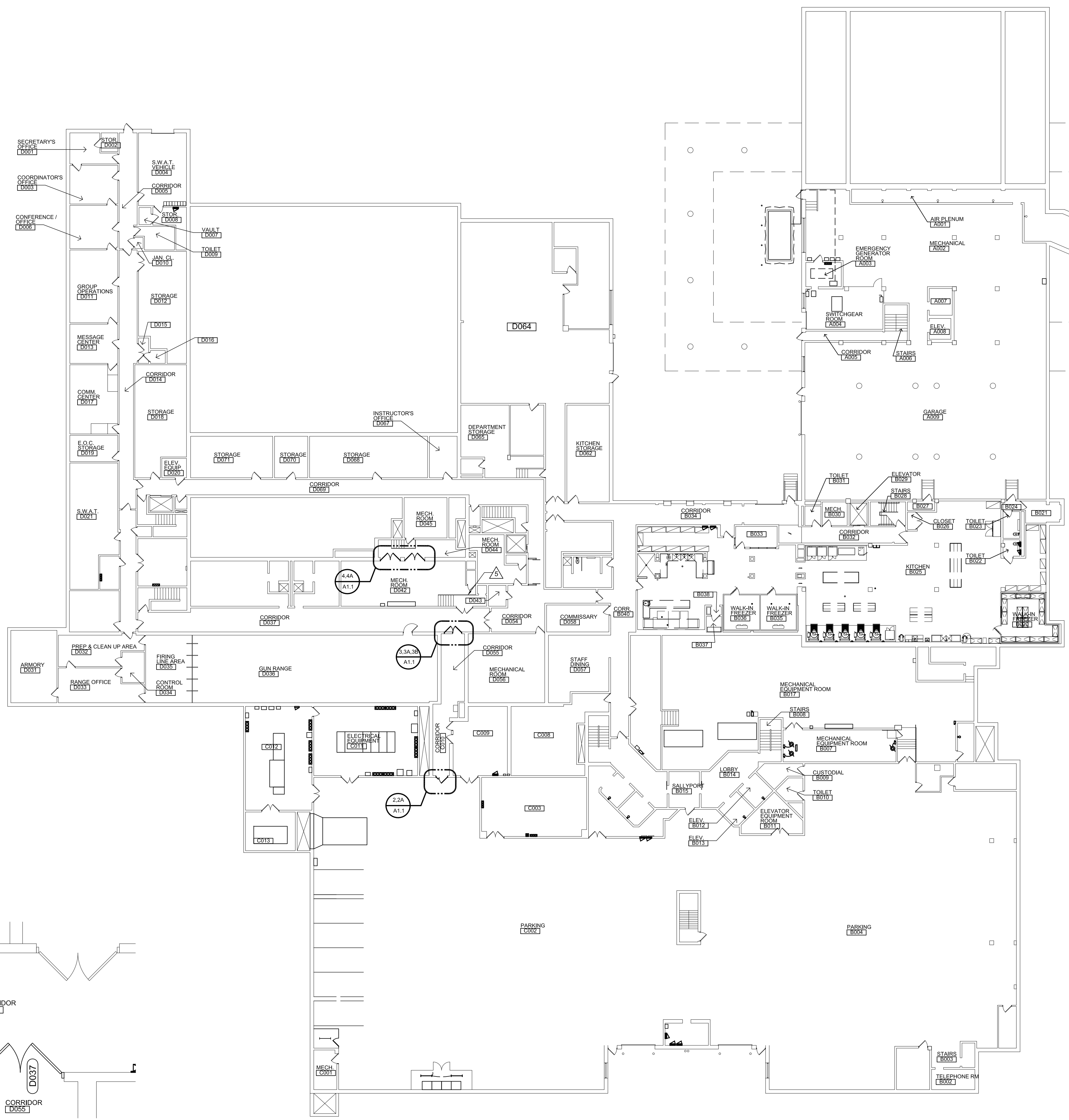
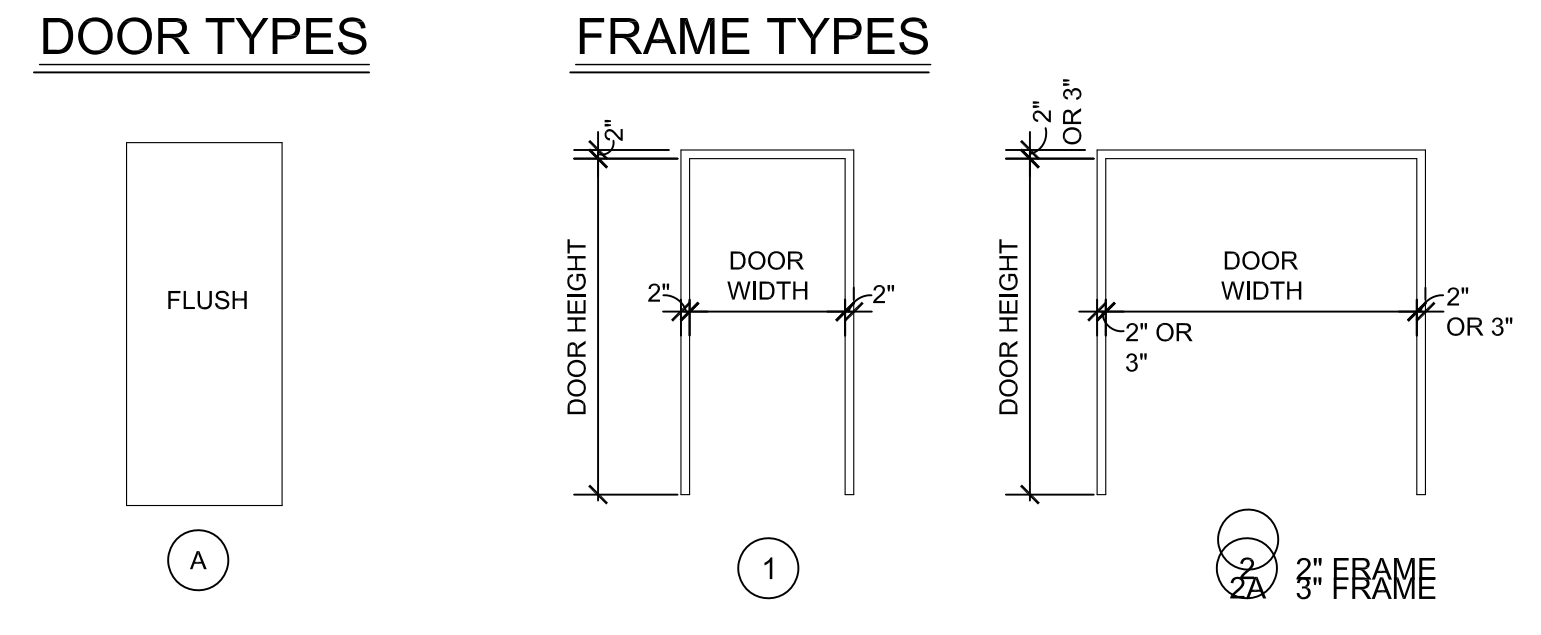
 UNIFIED BUILDING SYSTEMS ENGINEERING, LLC
 75 N. MAIN ST. SUITE 221, MT. CLEMENS, MI 48043, 248.804.1741

Index of Drawings	
ARCHITECTURAL DRAWINGS:	
G0.0	COVER SHEET
A1.1	COMPOSITE AND ENLARGED FLOOR PLAN - FIRST FLOOR
MECHANICAL DRAWINGS:	
M0.00	MECHANICAL GENERAL INFORMATION
M1.01	MECHANICAL DEMOLITION AND NEW WORK PLANS
M4.01	ENLARGED MECHANICAL AND ELECTRICAL DEMOLITION AND NEW WORK PLANS
M6.00	MECHANICAL SCHEDULES, DETAILS AND TEMPERATURE CONTROLS
M7.00	PIPING DIAGRAMS

ENGINEER SEAL:	ARCHITECT SEAL:
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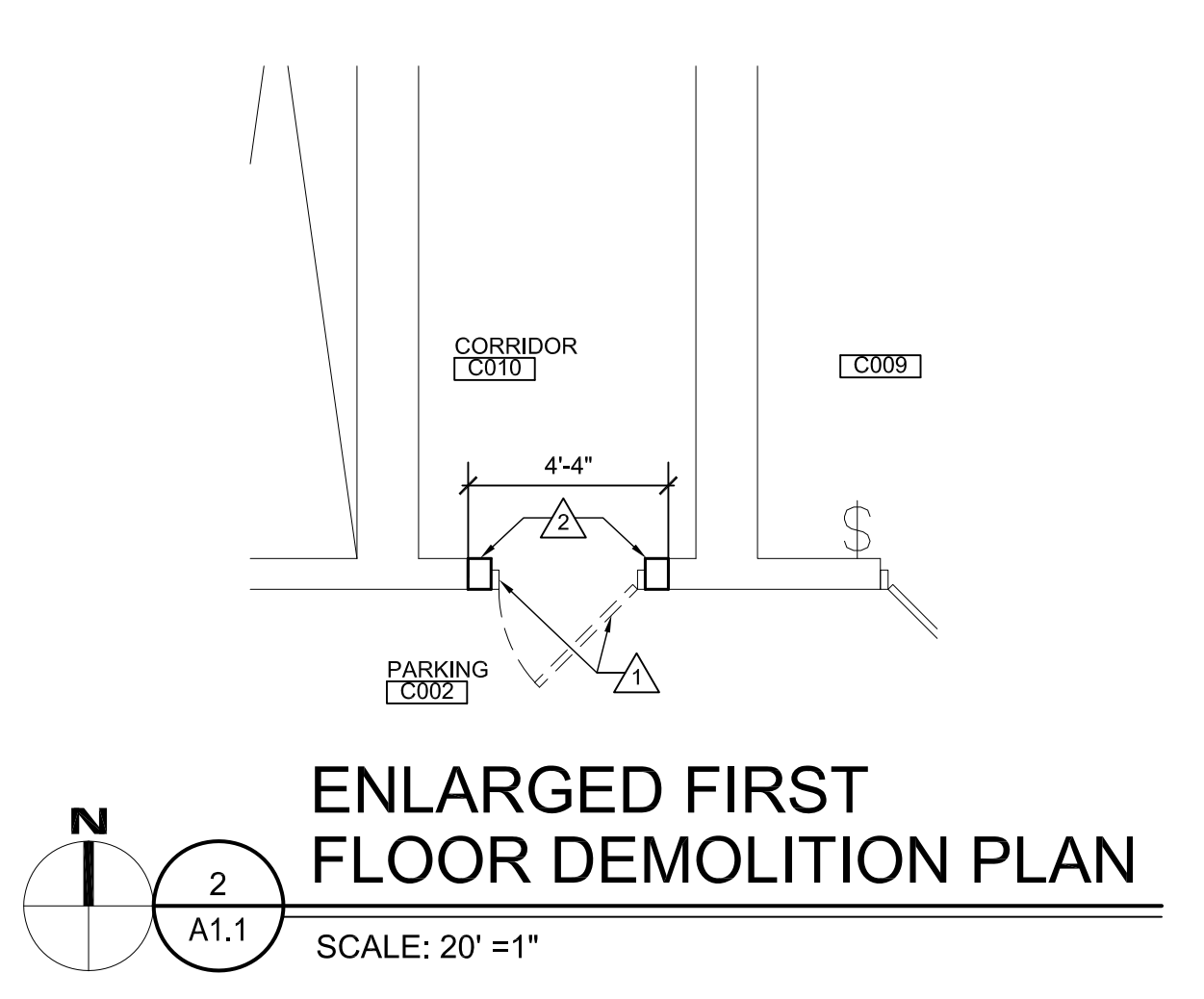
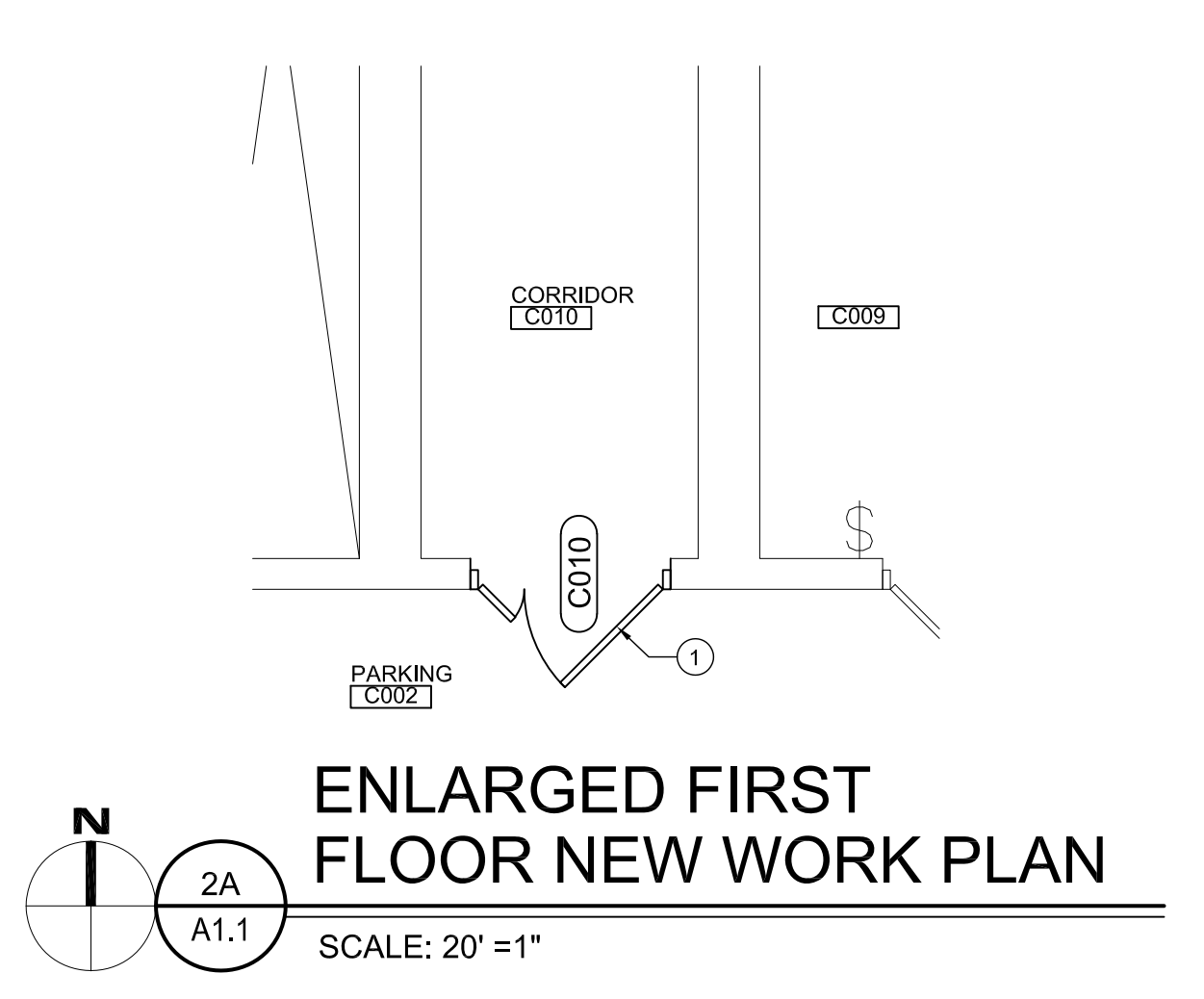
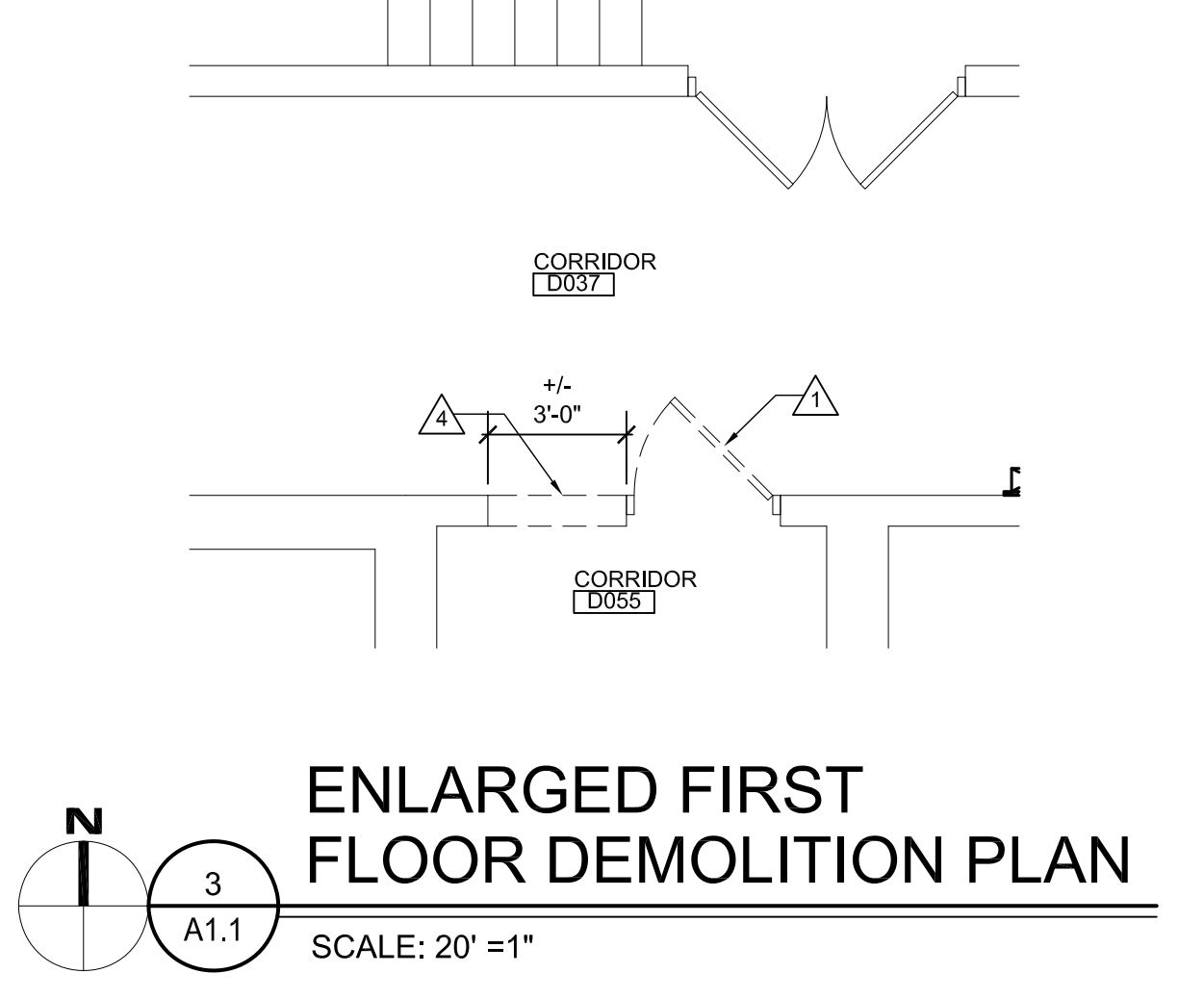
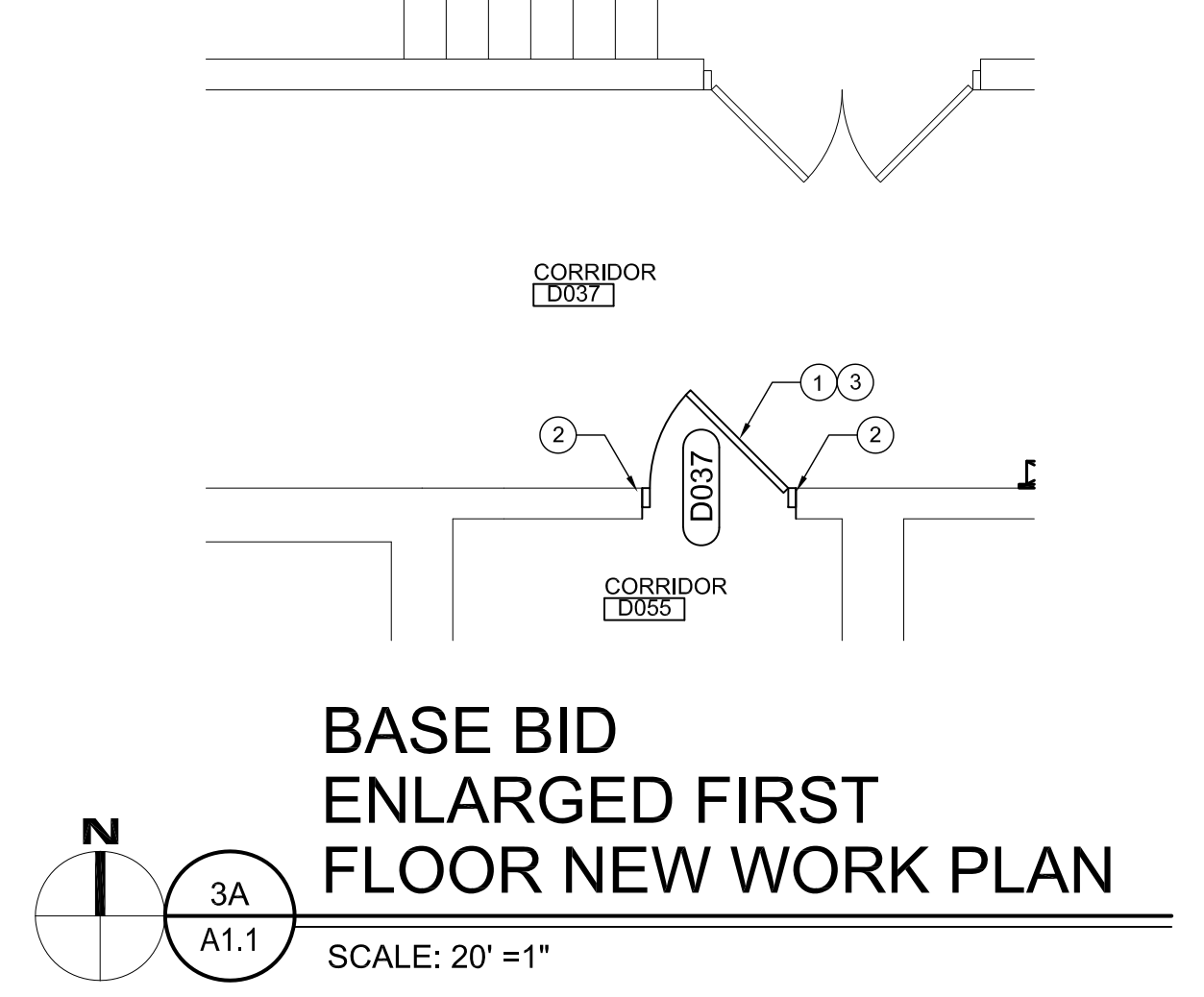
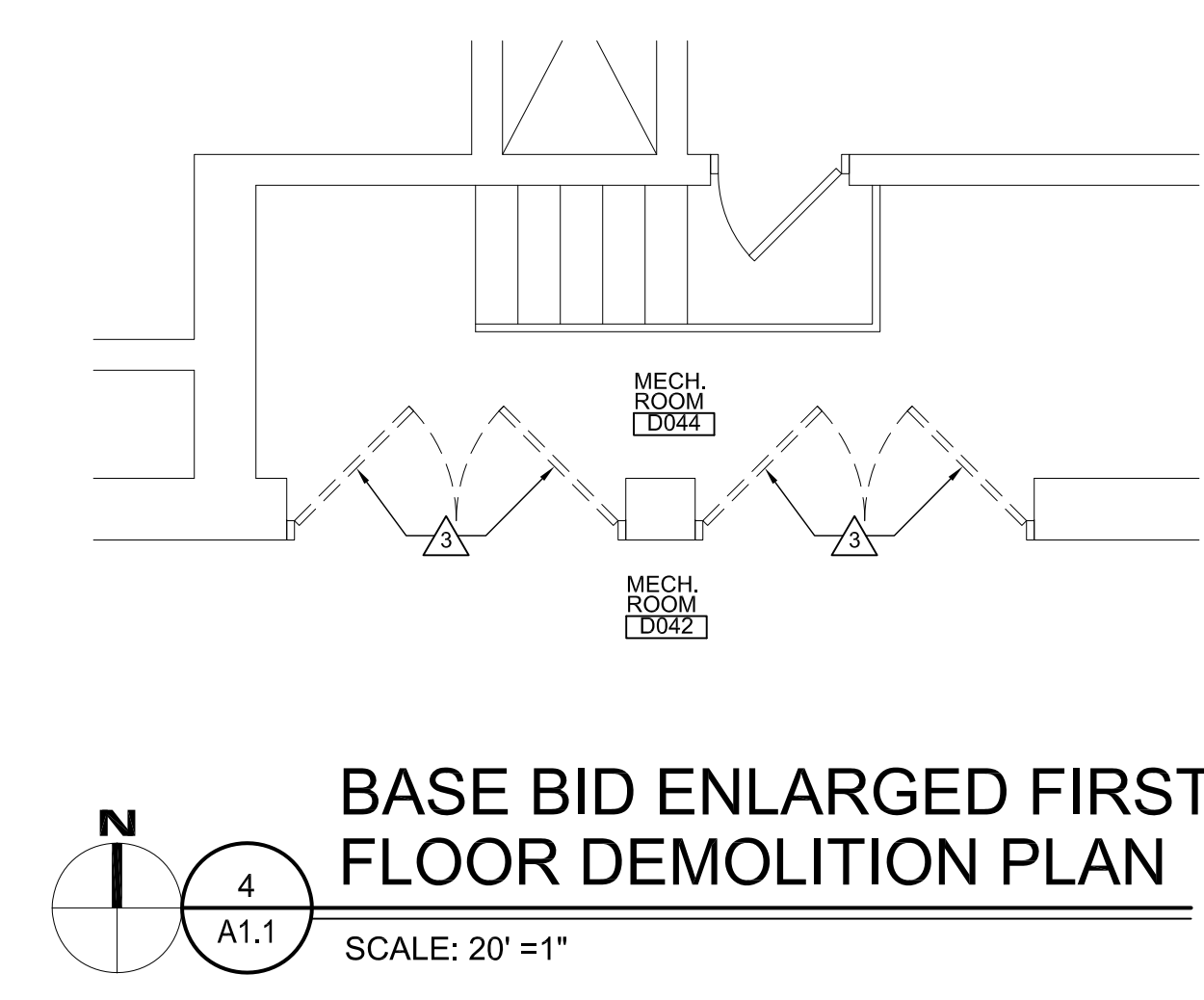
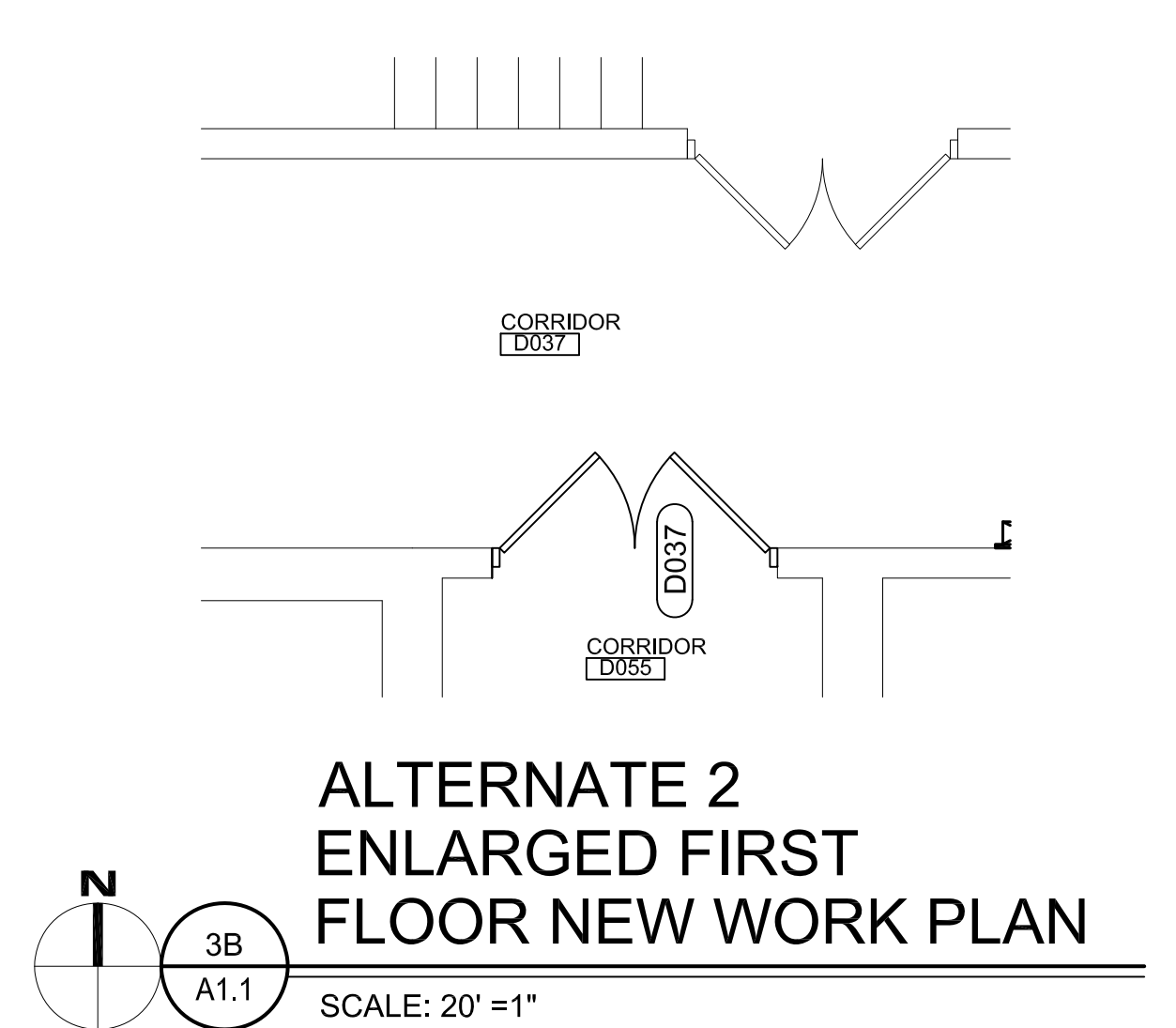
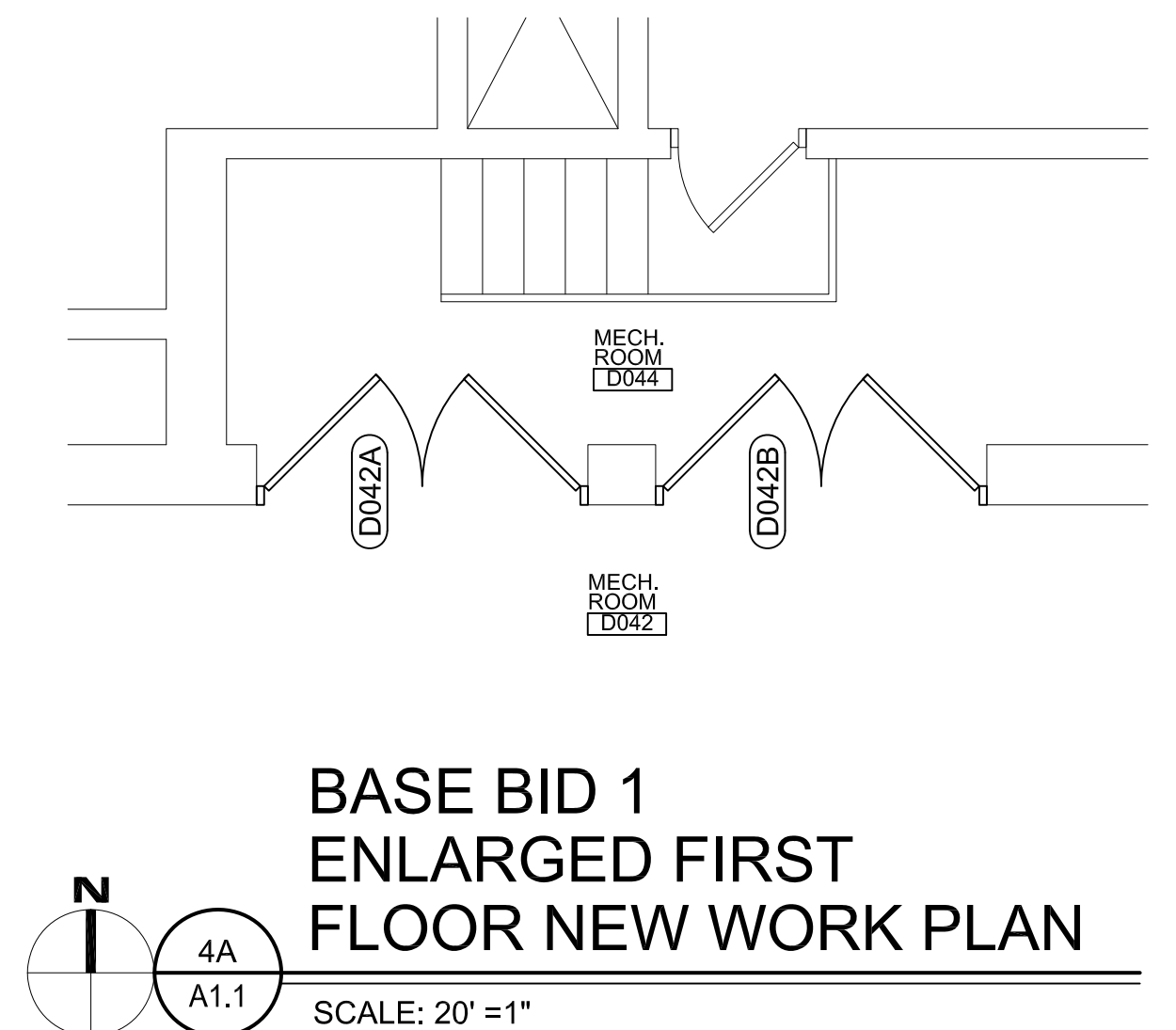
DOOR SCHEDULE													
DOOR OPENING			DOOR		FRAME		DETAILS			THRESHOLD	U.L. LABEL	HARDWARE SET	REMARKS
NO.	WIDTH	HEIGHT	TYPE	MATERIAL	FINISH	TYPE	MATERIAL	FINISH	HEAD				
BASEMENT - BASE BID													
C010	3'-0"	1'-0" UNEVEN LEAF	7'-0"	A	HM	PT	1	HM	PT	H1	J1	-	01 1
D037	3'-0"		7'-0"	A	HM	PT	1	HM	PT	H1	J1	-	02 1,4
D042A	(2)3'-6"		9'-0"	A	HM	PT	2A	HM	PT	H1	J1	-	04 1,2
D042B	(2)3'-6"		9'-0"	A	HM	PT	2A	HM	PT	H1	J1	-	04 1,2
BASEMENT - ALTERNATES													
D037	(2)3'-0"		7'-0"	A	HM	PT	2	HM	PT	H1	J1	-	03 1,3
D042A	(2)3'-6"		9'-0"	A	FRP	PFN	2A	AL	PFN	H2	J2	-	1,2
D042B	(2)3'-6"		9'-0"	A	FRP	PFN	2A	AL	PFN	H2	J2	-	1,2

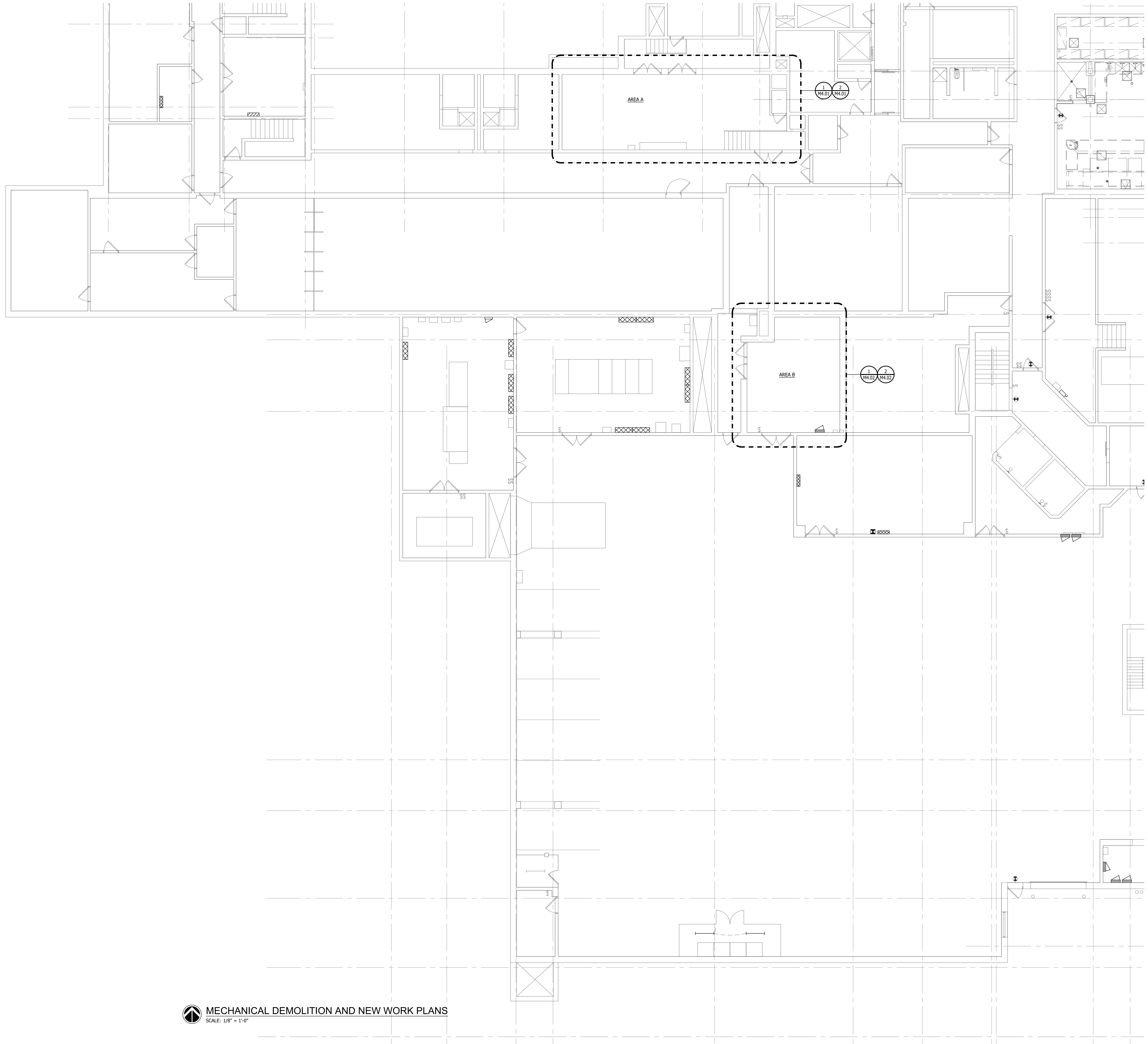
REMARKS - DOOR SCHEDULE	
1	ALL EXISTING CONDITIONS TO BE VERIFIED IN FIELD
2	ALTERNATE 1 - NEW DOOR, FRAME AND HARDWARE
3	ALTERNATE 2 - NEW DOOR, FRAME AND HARDWARE
4	DOOR TO HAVE CARD READER.



- TYPICAL CONSTRUCTION NOTES:**
- ALL WORK SHALL COMPLY WITH NATIONAL, STATE AND LOCAL CODES, ORDINANCES AND REGULATIONS.
 - ALL MATERIALS SHALL BE INSTALLED/APPLIED IN STRICT ACCORDANCE WITH MANUFACTURER'S REGULATIONS.
 - CONTRACTOR SHALL BE HELD RESPONSIBLE FOR VISITING THE JOB SITE AND FAMILIARIZING THEMSELVES WITH EXISTING CONDITIONS PRIOR TO START OF WORK. ALL DIMENSIONS AND FIELD CONDITIONS SHALL BE VERIFIED AND ARCHITECT NOTIFIED OF ANY DISCREPANCIES PRIOR TO THE RECEIPT OF BIDS. FAILURE OF THE CONTRACTOR TO VERIFY ALL CONDITIONS PRIOR TO THE AWARD OF BID WILL NOT BE CONSIDERED AS GROUNDS FOR AN EXTRA.
 - THE CONTRACTOR SHALL BE HELD RESPONSIBLE FOR INITIATING, MAINTAINING, AND SUPERVISING ALL SAFETY PRECAUTIONS AND PROGRAMS IN CONNECTION WITH THE PERFORMANCE OF THE CONTRACT. PROVIDE ALL NECESSARY TEMPORARY PROTECTION TO ENSURE THE SAFETY OF THE GENERAL PUBLIC DURING CONSTRUCTION.
 - ALL ITEMS SHALL BE AS SPECIFIED BY ARCHITECT.
 - SUBMIT SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES TO THE ARCHITECT FOR REVIEW PRIOR TO INSTALLATION/APPLICATION.
 - ALL DEBRIS SHALL BE LEGALLY DISPOSED OF OFF THE SITE BY THE CONTRACTOR.
 - ALL PRECAUTIONS SHALL BE TAKEN TO AVOID DAMAGE TO EXISTING MATERIALS AND CONSTRUCTION TO REMAIN.
 - CONTRACTOR SHALL CUT AND PATCH EXISTING WALLS, FLOORS, CEILING, ETC., SNUG-TIGHT AS REQUIRED TO COMPLETE THE WORK.
 - CONTRACTOR SHALL KEEP NOISE, DUST, ETC., TO A MINIMUM STANDARD AS SET FORTH BY THE OWNER.
 - CONTRACTOR SHALL COORDINATE INSTALLATION AND PHASING OF WORK WITH THE ARCHITECT AND OWNER'S REPRESENTATIVE PRIOR TO THE START OF WORK.

- FLOOR PLAN KEY NOTES:**
- NEW DOOR, FRAME AND HARDWARE. REFER TO DOOR SCHEDULE.
 - TOOTH-IN NEW CMU WITH BULLNOSE (VERTICAL EDGE) AT JAMBS. PAINT TO MATCH EXISTING WALL.
 - PROVIDE NEW MASONRY L INTEL FOR NEW DOOR OPENING.
- DEMOLITION NOTES:**
- REMOVE EXISTING HOLLOW METAL FRAME, DOOR AND HARDWARE COMPLETE.
 - REMOVE PORTION OF EXISTING CMU WALL AND EXISTING INTEL FOR NEW DOOR. REFER TO NEW WORK PLAN.
 - ALTERNATE NO. 1 - REMOVE EXISTING HOLLOW METAL DOOR, FRAME (POURED IN PLACE) AND HARDWARE.
 - ALTERNATE NO. 2 - REMOVE PORTION OF EXISTING CMU WALL AND EXISTING INTEL FOR NEW DOOR. REFER TO NEW WORK PLAN.
 - EXISTING REMOVABLE HANDRAIL. REMOVE AND REINSTALL AS REQUIRED FOR NEW HVAC EQUIPMENT.





 MECHANICAL DEMOLITION AND NEW WORK PLANS
SCALE: 1/8" = 1'-0"



WAKELY ASSOCIATES, INC.
ARCHITECTS

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MACOMB COUNTY EXECUTIVE
JAIL LAUNDRY HW STOR. TANK AND BOILER REPLACEMENT
MACOMB COUNTY JAIL, MT. CLEMENS, MI

MECHANICAL DEMOLITION
AND NEW WORK PLANS

- PRELIMINARY
- DESIGN DEVELOPMENT
- CONSTRUCTION
- FINAL RECORD

DRAWN BY: D.J.L.

CHECKED BY: D.J.L.

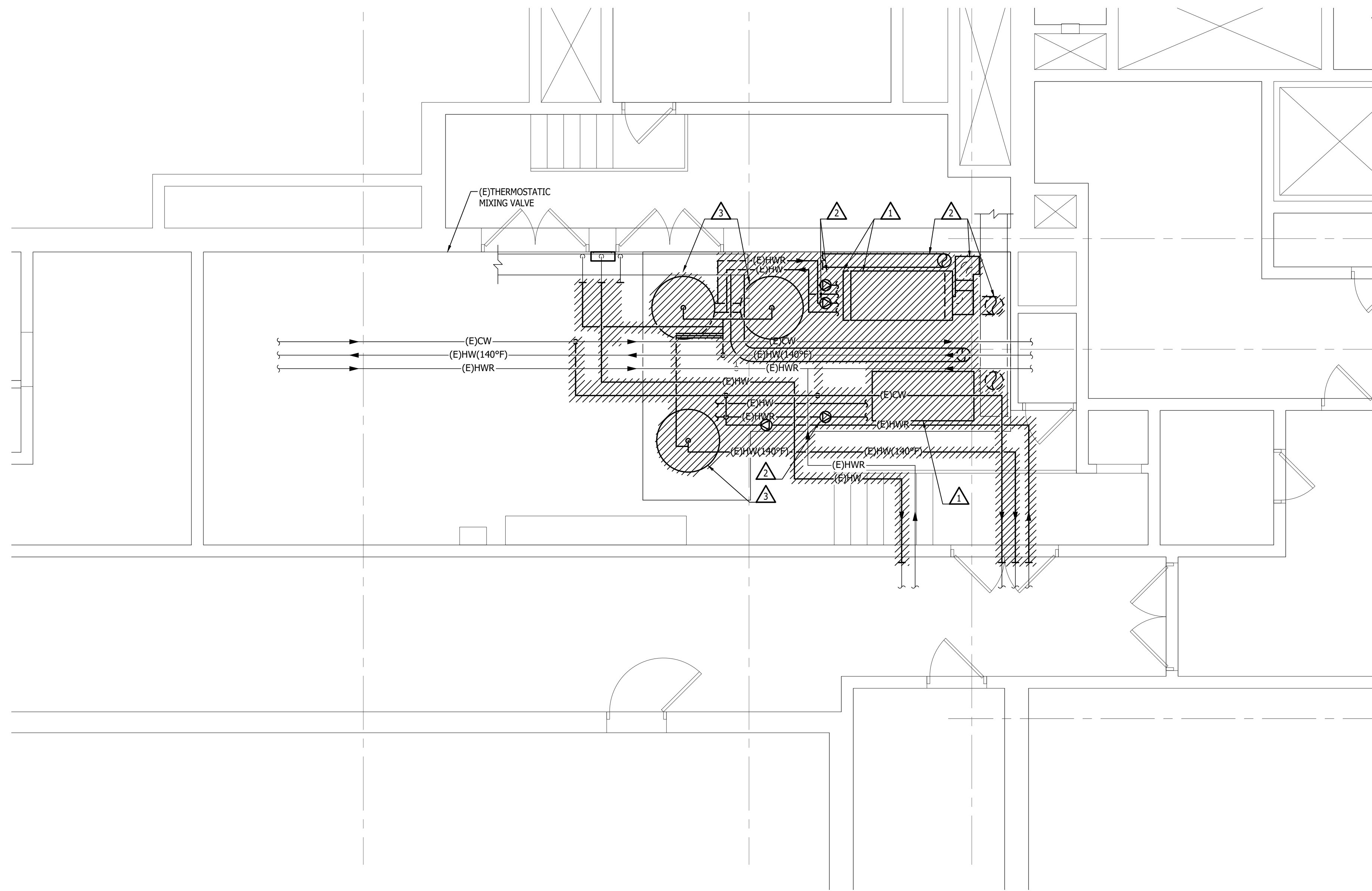
REVISIONS

DATE: OCTOBER 25, 2023

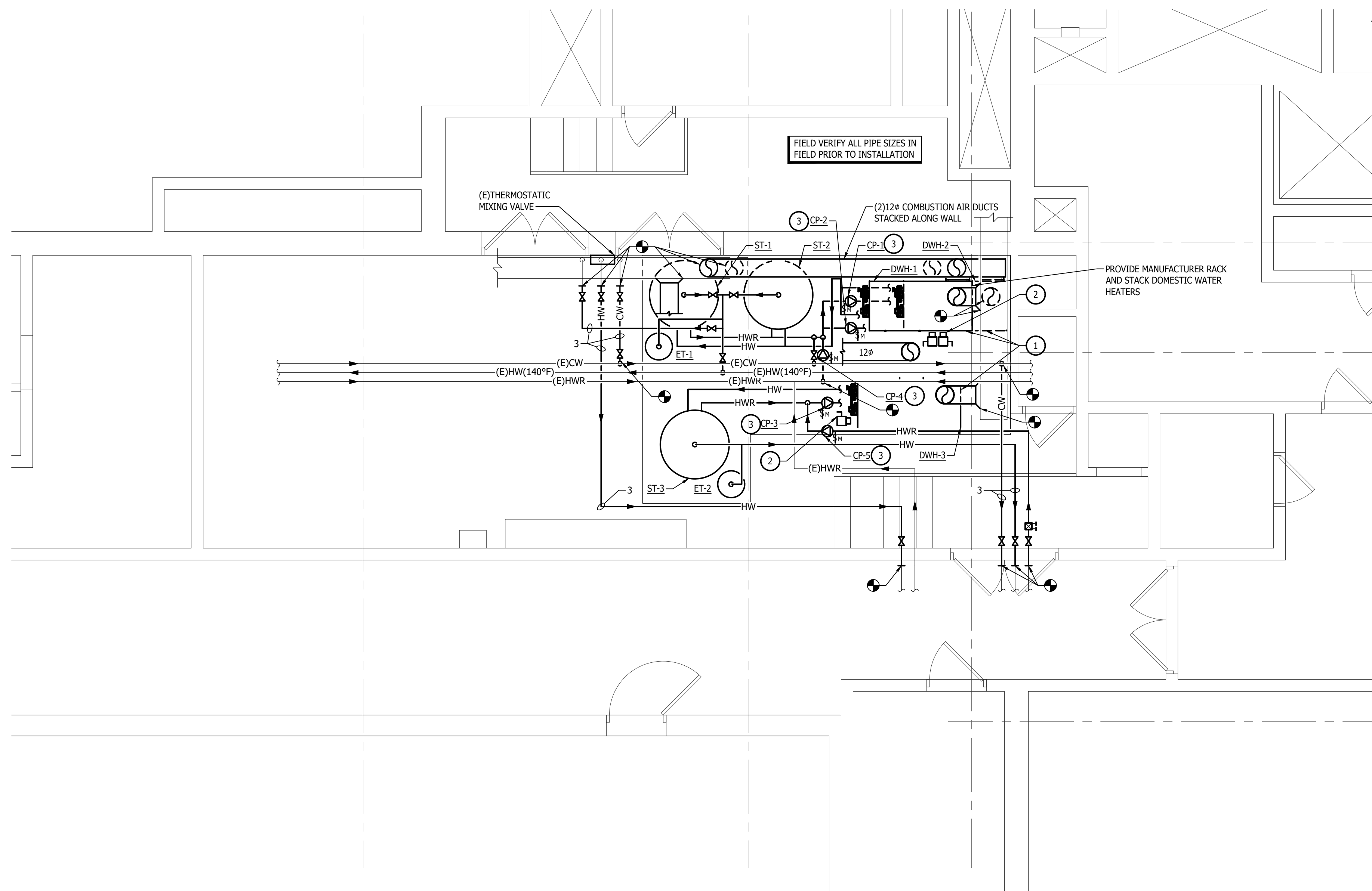
SHEET NO.

M1.01

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1 ENLARGED MECHANICAL DEMOLITION PLAN
SCALE: 1/4" = 1'-0"



2 ENLARGED MECHANICAL NEW WORK PLAN
SCALE: 1/4" = 1'-0"

GENERAL DEMOLITION NOTES	
A	THESE DRAWINGS ARE DIAGRAMMATIC AND INDICATE THE GENERAL EXTENT OF WORK TO BE PERFORMED. PROVIDE AND EXECUTE ALL HVAC SYSTEMS PER ENGINEER'S SPECIFICATION, AND LOCAL APPLICABLE CODES INCLUDING AMENDMENTS, BULLETINS, ETC. AS WELL AS THE STANDARDS OF INSTALLATION AND EQUIPMENT ESTABLISHED FOR THE BUILDINGS, AND REQUIREMENTS OF THE OWNER.
B	EXCEPT FOR CHANGES AS MAY BE SPECIFICALLY APPROVED BY THE ENGINEER OF RECORD, IN ACCORDANCE WITH ALTERNATES OF OPTIONS AS STATED HEREINAFTER, ALL WORK MUST BE IN FULL ACCORDANCE WITH THE INTENT OF THE PLANS AND SPECIFICATIONS. SYSTEMS ARE TO BE COMPLETE, EFFICIENT, AND SATISFACTORY OPERATION WHEN PROJECT IS DELIVERED TO THE OWNER.
C	CONTRACTOR SHALL OBTAIN ALL NECESSARY PERMITS AND APPROVAL FROM GOVERNING AUTHORITIES AND FILE NECESSARY FORMS, PAY ALL INSPECTION FEES.
D	CONTRACTOR SHALL OBTAIN ALL NECESSARY PERMITS AND APPROVAL FROM GOVERNING AUTHORITIES AND FILE NECESSARY FORMS, PAY ALL INSPECTION FEES.
E	CONTRACTOR TO EXAMINE ALL ADJOINING WORK BEFORE COMMENCEMENT OF HIS/HER SCOPE OF WORK. REPORT ANY DISCREPANCIES TO THE CONSTRUCTION MANAGER FOR REVIEW AND APPROVAL. COORDINATE ALL WORK WITH OTHER TRADES TO ENSURE THAT INSTALLATION IS MADE IN ACCORDANCE WITH THE CONTRACT DOCUMENTS.
F	PROVIDE REQUIRED CLEARANCE IN FRONT OF ELECTRICAL EQUIPMENT, DUCTWORK/PIPING SHALL NOT INTERFERE WITH ELECTRICAL EQUIPMENT CLEARANCE.
G	CONNECTION TO EQUIPMENT SHALL BE VERIFIED WITH MANUFACTURER'S CERTIFIED DRAWINGS. ALL PIPING CONNECTIONS SHALL BE MINIMUM 3/4" UNLESS NOTED OTHERWISE.
H	FURNISH ADEQUATE LIABILITY INSURANCE AND BONDING DOCUMENTS AS REQUIRED BY THE OWNER.

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H	FURNISH ADEQUATE LIABILITY INSURANCE AND BONDING DOCUMENTS AS REQUIRED BY THE OWNER.

DEMOLITION KEYED NOTES	
1	ALTERNATE #1 - DISCONNECT, MAKE SAFE, AND REMOVE EXISTING DOMESTIC WATER HEATING BOILER AND ALL ASSOCIATED COMPONENTS COMPLETE. EXISTING ELECTRICAL TO BE RE-USED. PRE-PARE CONDUIT AND WIRING FOR EXTENSION AS REQUIRED. BASE BID: DOMESTIC WATER HEATING BOILERS TO REMAIN. CIRCULATION PUMPS TO BE REMOVED AND RE-INSTALLED.
2	REMOVE CIRCULATION PUMP AND ALL ASSOCIATED PIPING BETWEEN BOILER AND STORAGE TANK COMPLETE. BASE BID PUMPS ARE TO REMAIN. PROVIDE ALTERNATE PRICING TO REMOVE AND PROVIDE NEW PUMPS. IF REMOVING, TURN OVER PUMPS TO OWNER. REMOVE ALL FLUE AND COMBUSTION AIR DUCT TO MAIN. PREPARE MAIN FOR FUTURE CONNECTION.
3	REMOVE DOMESTIC WATER STORAGE TANK AND ALL ASSOCIATED COMPONENTS COMPLETE.
4	DISCONNECT, MAKE SAFE AND REMOVE EXISTING DOMESTIC WATER HEATING BOILERS AND ASSOCIATED PUMPS COMPLETE. REMOVE FLUE AND COMBUSTION AIR AS REQUIRED FOR INSTALLATION OF NEW BOILERS. REFER TO NEW WORK PLANS FOR FURTHER INFORMATION.

HVAC GENERAL NOTES	
A	THESE DRAWINGS ARE DIAGRAMMATIC AND REPRESENT THE GENERAL EXTENT OF THE WORK TO BE PERFORMED. PROVIDE AND EXECUTE ALL HVAC SYSTEMS PER ENGINEER'S SPECIFICATION, AND LOCAL APPLICABLE CODES INCLUDING AMENDMENTS, BULLETINS, ETC. AS WELL AS THE STANDARDS OF INSTALLATION AND EQUIPMENT ESTABLISHED FOR THE BUILDINGS, AND REQUIREMENTS OF THE OWNER.
B	EXCEPT FOR CHANGES AS MAY BE SPECIFICALLY APPROVED BY THE ENGINEER OF RECORD, IN ACCORDANCE WITH ALTERNATES OF OPTIONS AS STATED HEREINAFTER, ALL WORK MUST BE IN FULL ACCORDANCE WITH THE INTENT OF THE PLANS AND SPECIFICATIONS. SYSTEMS ARE TO BE COMPLETE, EFFICIENT, AND SATISFACTORY OPERATION WHEN PROJECT IS DELIVERED TO THE OWNER.
C	CONTRACTOR SHALL OBTAIN ALL NECESSARY PERMITS AND APPROVAL FROM GOVERNING AUTHORITIES AND FILE NECESSARY FORMS, PAY ALL INSPECTION FEES.
D	CONTRACTOR SHALL OBTAIN ALL NECESSARY PERMITS AND APPROVAL FROM GOVERNING AUTHORITIES AND FILE NECESSARY FORMS, PAY ALL INSPECTION FEES.
E	CONTRACTOR TO EXAMINE ALL ADJOINING WORK BEFORE COMMENCEMENT OF HIS/HER SCOPE OF WORK. REPORT ANY DISCREPANCIES TO THE CONSTRUCTION MANAGER FOR REVIEW AND APPROVAL. COORDINATE ALL WORK WITH OTHER TRADES TO ENSURE THAT INSTALLATION IS MADE IN ACCORDANCE WITH THE CONTRACT DOCUMENTS.
F	PROVIDE REQUIRED CLEARANCE IN FRONT OF ELECTRICAL EQUIPMENT, DUCTWORK/PIPING SHALL NOT INTERFERE WITH ELECTRICAL EQUIPMENT CLEARANCE.
G	CONNECTION TO EQUIPMENT SHALL BE VERIFIED WITH MANUFACTURER'S CERTIFIED DRAWINGS. ALL PIPING CONNECTIONS SHALL BE MINIMUM 3/4" UNLESS NOTED OTHERWISE.
H	FURNISH ADEQUATE LIABILITY INSURANCE AND BONDING DOCUMENTS AS REQUIRED BY THE OWNER.
J	SUPPORT ALL ANCHORS SECURED TO THE BOTTOM OF FLOOR SLABS SHALL BE DROP-IN OR SLEEVE ANCHOR TYPE. ALL SUPPORTING STEEL SHALL BE PROVIDED BY THE CONTRACTOR.
K	DUCTWORK/PIPING SHALL NOT BE INSTALLED IN A LOCATION THAT RESTRICTS THE ACCESS TO MECHANICAL DEVICES REQUIRING ACCESS.
L	THE CONTRACTOR SHALL PROVIDE ALL MISCELLANEOUS SUPPORTING STEEL FOR THE PROPER INSTALLATION OF MECHANICAL SYSTEMS.
M	BRANCH DUCTWORK TO GRILLES, REGISTERS, AND DIFFUSERS SHALL BE THE SAME SIZE AS THE TERMINAL DEVICE NECK SIZE WHERE NO DUCT SIZE IS INDICATED.

POWER GENERAL NOTES	
A	THESE DRAWINGS ARE DIAGRAMMATIC AND REPRESENT THE GENERAL EXTENT OF THE WORK TO BE PERFORMED. PROVIDE AND EXECUTE ALL HVAC SYSTEMS PER ENGINEER'S SPECIFICATION, AND LOCAL APPLICABLE CODES INCLUDING AMENDMENTS, BULLETINS, ETC. AS WELL AS THE STANDARDS OF INSTALLATION AND EQUIPMENT ESTABLISHED FOR THE BUILDINGS, AND REQUIREMENTS OF THE OWNER.
B	EXCEPT FOR CHANGES AS MAY BE SPECIFICALLY APPROVED BY THE ENGINEER OF RECORD, IN ACCORDANCE WITH ALTERNATES OF OPTIONS AS STATED HEREINAFTER, ALL WORK MUST BE IN FULL ACCORDANCE WITH THE INTENT OF THE PLANS AND SPECIFICATIONS. SYSTEMS ARE TO BE COMPLETE, EFFICIENT, AND SATISFACTORY OPERATION WHEN PROJECT IS DELIVERED TO THE OWNER.
D	CONTRACTOR SHALL OBTAIN ALL NECESSARY PERMITS AND APPROVAL FROM GOVERNING AUTHORITIES AND FILE NECESSARY FORMS, PAY ALL INSPECTION FEES.
E	ELECTRICAL CONTRACTOR SHALL COMPLY WITH THE LATEST NATIONAL ELECTRICAL CODE, LIFE SAFETY CODE AND APPLICABLE STATE AND LOCAL CODES AND ORDINANCES.
F	ELECTRICAL EQUIPMENT AND WIRING SHALL BE NEW AND SHALL BE FURNISHED AND INSTALLED BY ELECTRICAL CONTRACTOR, UNLESS OTHERWISE NOTED.
G	WIRING SHALL BE IN CONDUIT. CONDUIT SHALL BE 3/4" CONDUIT MINIMUM. CONDUITS IN FINISHED AREAS SHALL BE CONCEALED.
H	NEW WIRES SHALL BE TYPE THHN. MINIMUM SIZE SHALL BE #12 AWG, UNLESS OTHERWISE NOTED. FINAL CONNECTIONS TO EQUIPMENT, FURNISHED AND INSTALLED BY OTHERS, SHALL BE PROVIDED BY THIS CONTRACTOR.

NEW WORK KEYED NOTES	
1	ALTERNATE #1 - INSTALL DOMESTIC HOT WATER HEATING BOILERS AND EXISTING CIRCULATING PUMPS AS INDICATED. EXTEND AND CONNECT 12" FLUE AND COMBUSTION AIR TO EXISTING COMBINED SYSTEM AS INDICATED. FIELD VERIFY ALL EXACT SIZES AND LOCATIONS PRIOR TO INSTALLATION. FLUE SHALL BE STAINLESS STEEL. EXTEND GAS PIPING TO NEW LOCATION AS REQUIRED. REPLACE ISOLATION VALVE AND REGULATOR AS REQUIRED. BASE BID - EXISTING DOMESTIC WATER HEATING BOILER SHALL REMAIN. ALL PIPING SHALL BE REPLACED AND CIRCULATING PUMPS SHALL BE REMOVED AND RE-INSTALLED.
2	ALTERNATE #1 - CONTRACTOR SHALL PROVIDE AND INSTALL A NEW UNISTRUT SUPPORT STAND AND 120V (ON-OFF) SWITCH AS REQUIRED FOR NEW WATER HEATERS BEING INSTALLED. COORDINATE EXACT PLACEMENT OF THE UTILITY STAND, AND SWITCH IN THE FIELD WITH THE MECHANICAL CONTRACTOR. EXTEND THE EXISTING CONDUIT AND WIRING AS REQUIRED TO RE-FEED THE NEW WATER HEATERS FROM EXISTING CIRCUIT. CONTRACTOR SHALL PROVIDE AND INSTALL A TOGGLE SWITCH HANDLE LOCKING GUARD WITH PADLOCK PROVISION FOR THE (ON-OFF) SWITCH TO SECURE CONTROL OF THE SWITCH IN THE "OFF" POSITION FOR SERVICE OR MAINTENANCE.
3	PROVIDE NEW MOTOR RATED SINGLE POLE DISCONNECT SWITCH FOR CP-1, CP-2, CP-3, CP-4, CP-5, CP-6, CP-7. EXTEND EXISTING CONDUIT AND WIRING AS REQUIRED TO NEW LOCATION. COORDINATE EXACT PLACEMENT WITH MECHANICAL CONTRACTOR PRIOR TO INSTALLATION. FIELD VERIFY EXISTING VOLTAGE AND PHASE PRIOR TO ORDER. IF VARIES FROM DRAWING, PLEASE NOTIFY ENGINEER. ELECTRICAL CONTRACTOR TO FIELD VERIFY OVER CURRENT PROTECTION DEVICES AND PROVIDE NEW AS REQUIRED.
4	RE-PIPE ALL EQUIPMENT FROM EXISTING BOILER AS INDICATED. REFER TO PIPING DIAGRAMS FOR FURTHER INFORMATION. PIPE SIZES SHALL MATCH THAT OF EXISTING. PLUMBING CONTRACTOR SHALL FIELD VERIFY ALL PIPE SIZES PRIOR TO ORDER. COORDINATE EXACT LOCATION OF NEW ISOLATION VALVES WITH OWNER PRIOR TO INSTALLATION. ALL PIPING SHALL BE INSULATED AND JACKETED AND PROVIDED WITH PIPE LABELS.
5	CONTRACTOR SHALL PROVIDE AND INSTALL A NEW UNISTRUT SUPPORT STAND AND 120V (ON-OFF) SWITCH AS REQUIRED FOR NEW WATER HEATERS BEING INSTALLED.
6	INSTALL NEW BOILER IN APPROXIMATE LOCATION OF EXISTING. EXTEND GAS PIPING TO NEW LOCATION AS REQUIRED. PROVIDE NEW ISOLATION VALVES AND PRESSURE REGULATING VALVES AS REQUIRED. EXTEND 7" FLUE AND COMBUSTION AIR DUCT TO EXISTING AND CONNECT. FLUE SHALL BE STAINLESS STEEL AND MATCH EXISTING. FIELD VERIFY EXACT LOCATION IN FIELD PRIOR TO INSTALLATION.



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STORAGE TANK SCHEDULE								
UNIT ID	SYSTEM SERVED	TANK VOLUME (GAL)	DIA. (IN)	HEIGHT (IN)	INSULATION TYPE	JACKET TYPE	MANUFACTURER/ MODEL NO.	REMARKS
ST-1	DOMESTIC HOT WATER	432	46	80	2" POLYURETHANE	GALVANIZED STEEL	LOCHINVAR / RGA432	
ST-2	DOMESTIC HOT WATER	432	46	80	2" POLYURETHANE	GALVANIZED STEEL	LOCHINVAR / RGA432	
ST-3	DOMESTIC HOT WATER	432	46	80	2" POLYURETHANE	GALVANIZED STEEL	LOCHINVAR / RGA432	
ST-4	DOMESTIC HOT WATER	432	46	80	2" POLYURETHANE	GALVANIZED STEEL	LOCHINVAR / RGA432	

NOTES:

EXPANSION TANK SCHEDULE												
UNIT ID	SYSTEM SERVED	TYPE	MIN PSIG	MAX PSIG	MIN (°F)	MAX (°F)	TANK VOLUME (GAL)	ACCEPTANCE VOLUME (GAL)	DIA (IN)	HEIGHT (IN)	MANUFACTURER/ MODEL NO.	REMARKS
ET-1	DOMESTIC HOT WATER	DIAPHRAM	12	150	45	140	90	60	24	53	BELL AND GOSSETT / PTA-210V	
ET-2	DOMESTIC HOT WATER	DIAPHRAM	12	150	45	140	90	60	24	53	BELL AND GOSSETT / PTA-210V	

NOTES:

1. PERFORMANCE BASED ON WATER.

PUMP SCHEDULE												
UNIT ID	SERVICE	TYPE	GPM	HEAD (FT)	MIN % EFF	WATTS	HP	RPM	VOLTS	PHASE	MODEL NO.	REMARKS
CP-1	DWH-1	INLINE	61	25	48.6	-	0.5	1750	120	1		BY UNIT MANUFACTURER
CP-2	DWH-2	INLINE	61	25	48.6	-	0.5	1750	120	1		BY UNIT MANUFACTURER
CP-3	DWH-3	INLINE	61	25	48.6	-	0.5	1750	120	1		BY UNIT MANUFACTURER
CP-4	HOT WATER RE-CIRC	INLINE	5.0	30.0	14.1	270	-	4600	120	1	NBF-45	
CP-5	HOT WATER RE-CIRC	INLINE	5.0	30.0	14.1	270	-	4600	120	1	NBF-45	
CP-6	DWH-4	INLINE	90	25	-	-	3/4	1750	120	1		BY UNIT MANUFACTURER
CP-7	DWH-5	INLINE	90	25	-	-	3/4	1750	120	1		BY UNIT MANUFACTURER

NOTES:

1. MODEL NUMBERS ARE BELL & GOSSETT UNLESS NOTED OTHERWISE.

2. PERFORMANCE BASED ON WATER, UNLESS OTHERWISE INDICATED.

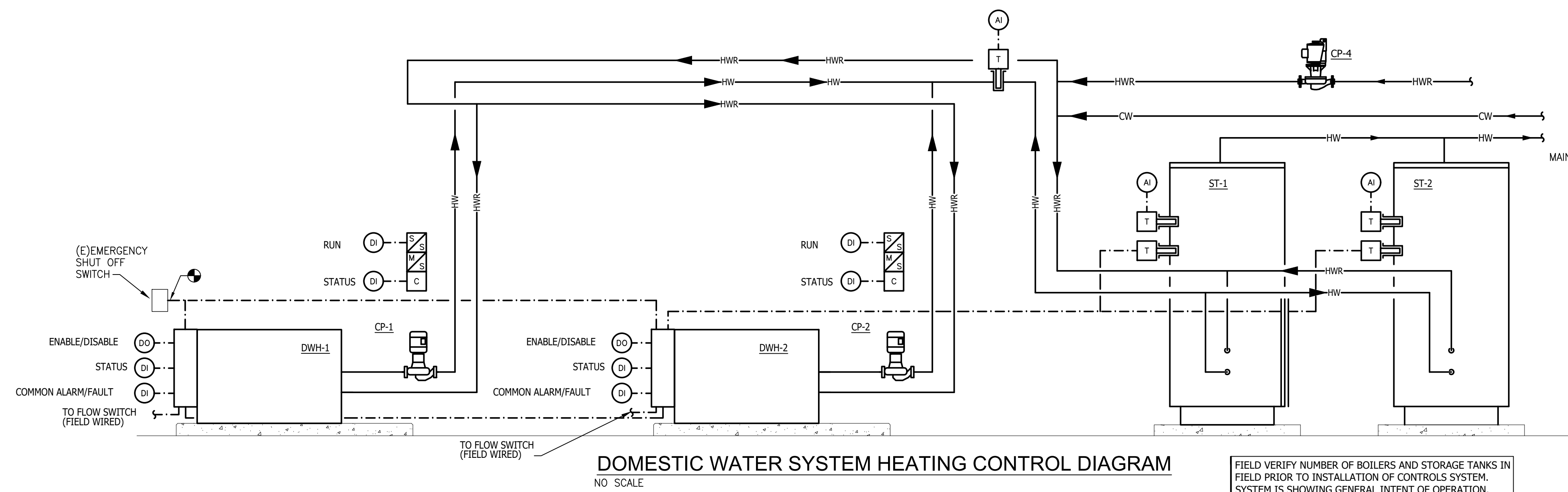
3. PUMPS SHALL BE NON-OVERLOADING.

4. LEAD FREE

DOMESTIC WATER HEATER SCHEDULE (BOILER TYPE)

UNIT ID	FUEL TYPE	GAS PRESS MIN - MAX (IN WG)	INPUT (MBH)	THERMAL EFFICIENCY	MODULATION TURNDOWN RATIO	VENTING		PRIMARY PUMP PROVIDED WITH HEATER		ELECTRICAL				DISCONNECT			MANUFACTURER/ MODEL NO.	REMARKS
						SIZE (IN)	MATERIAL	PUMP ID	MOC	MCA	VOLTS	PHASE	FURN. BY	INST. BY	TYPE			
DWH-1	NAT GAS	4-14.5	1440	85	4:1	12	SS	CP-1	20	14	120	1	EC	EC	SWITCH	LOCHINVAR / CH-1442		
DWH-2	NAT GAS	4-14.5	1440	85	4:1	12	SS	CP-2	20	14	120	1	EC	EC	SWITCH	LOCHINVAR / CH-1442		
DWH-3	NAT GAS	4-14.5	1440	85	4:1	12	SS	CP-3	20	14	120	1	EC	EC	SWITCH	LOCHINVAR / CH-1442		
DWH-4	NAT GAS	4-14.5		85	5:1	7	SS	CP-4	15	<15	120	1	EC	EC	SWITCH	LOCHINVAR / PEN1701	CATEGORY IV	
DWH-5	NAT GAS	4-14.5		85	5:1	7	SS	CP-5	15	<15	120	1	EC	EC	SWITCH	LOCHINVAR / PEN1701	CATEGORY IV	

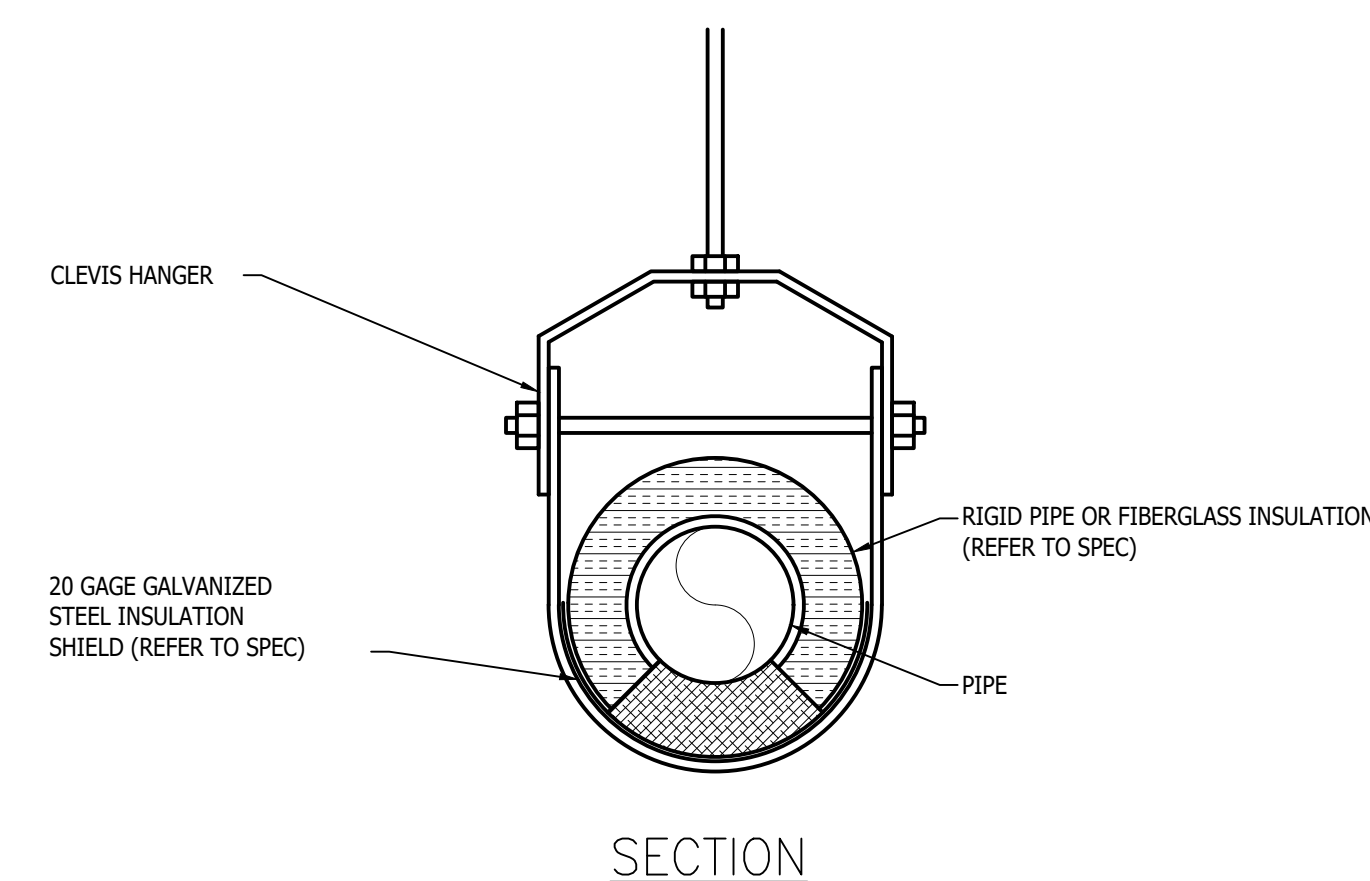
NOTES:



DOMESTIC HOT WATER SYSTEM SEQUENCE OF OPERATIONS:

NOTE: ALL SETPOINTS AND TIME INTERVALS SHALL BE ADJUSTABLE BY THE SYSTEM OPERATOR. METRO CONTROLS IS THE ONLY ALLOWED CONTROLS CONTRACTOR.

1. THE BOILER CONTROL PANEL SHALL ALTERNATE BOILER OPERATION BASED ON RUN TIME HOURS. IF A BOILER FAILS, AN ALARM WILL BE SENT TO THE DDC SYSTEM AND THE STANDBY BOILER WILL BE ACTIVATED.
2. THE BOILER CONTROL PANEL SHALL STAGE BOILERS TO MAINTAIN THE RETURN WATER TEMPERATURE (FROM TANKS TO BOILERS). UPON A CALL FOR HEATING, THE BOILER PRIMARY PUMP SHALL BE ENERGIZED AND RUN WHENEVER THE BOILER IS FIRING. AFTER FLOW IS PROVEN BY THE PUMPS CURRENT SWITCH, THE BOILER SHALL MODULATE FIRING RATE TO MAINTAIN THE SYSTEM RETURN WATER TEMPERATURE.
3. IF THE PRIMARY BOILER CANNOT MAINTAIN SYSTEM SETPOINT, THE SECOND BOILER SHALL BE ENERGIZED. IF THE SECOND BOILER CANNOT MAINTAIN SYSTEM SETPOINT, THE THIRD BOILER SHALL BE ENERGIZED.
4. WHEN THE EMERGENCY SHUT OFF SWITCH IS ACTIVATED, THE BOILERS AND PUMPS SHALL IMMEDIATELY BE DE-ENERGIZED.
5. THE BUILDING DDC SYSTEM SHALL MONITOR AND GRAPHICALLY SHOW THE FOLLOWING POINTS: ALL TEMPERATURE POINTS INDICATED, BOILER STATUS, BOILER ALARM, PUMP ALARM, AND STORAGE TANK TEMPERATURES.

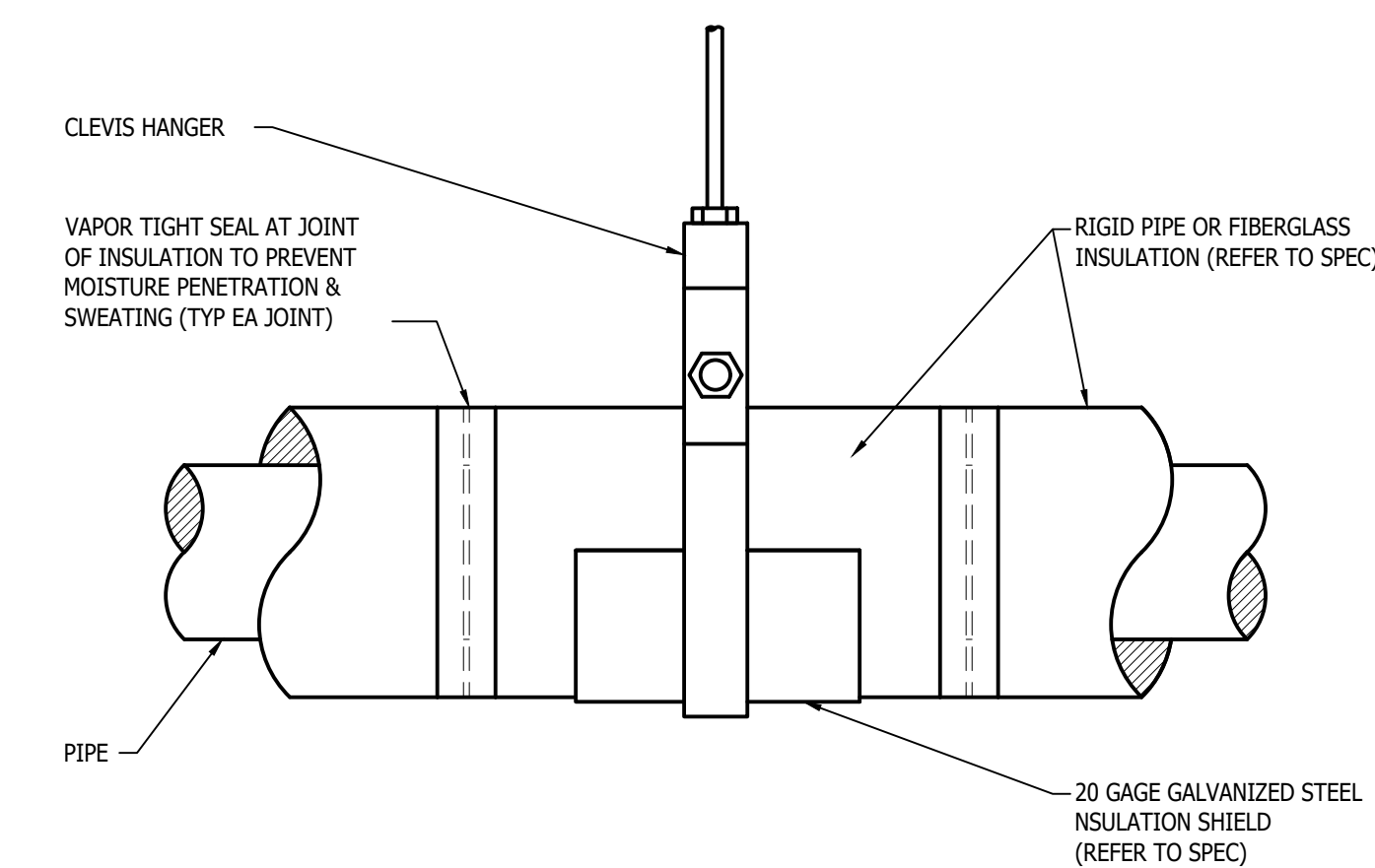


NOTES:

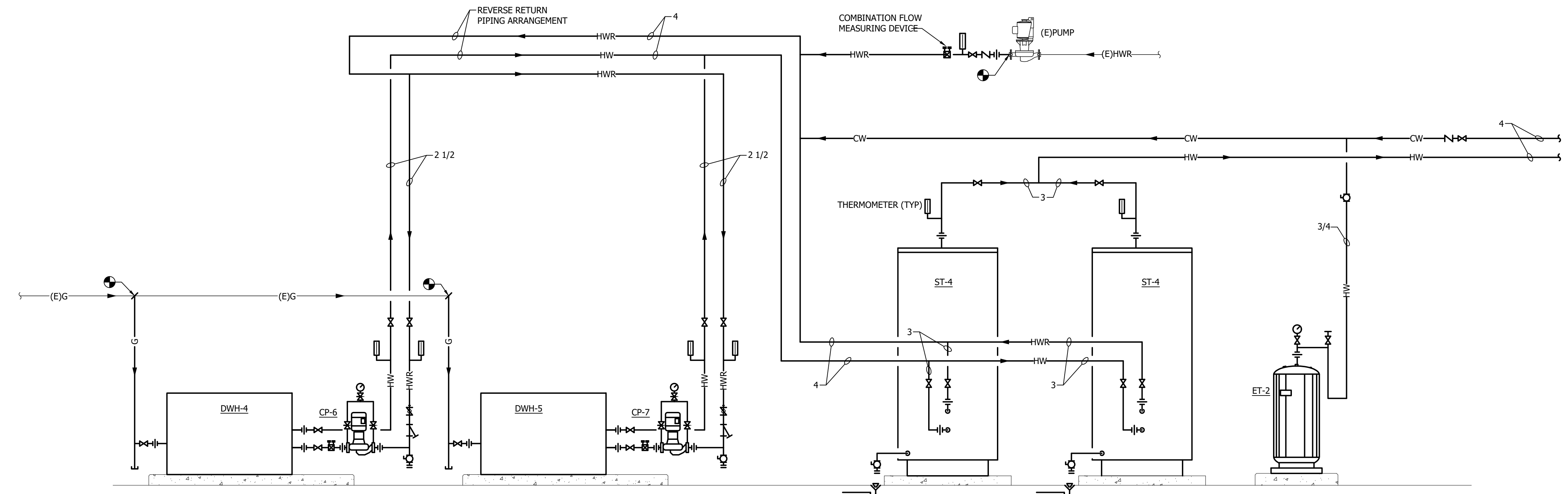
PRE-INSULATED PIPE SUPPORTS SHALL BE USED TO ALLOW PROPER ALIGNMENT OF PIPING DURING INSTALLATION. PRE-INSULATED HANGERS SHALL BE PIPE SHIELDS INCORPORATED OR APPROVED EQUAL. REFER TO SPECIFICATIONS.

INSULATED PIPE HANGER DETAIL

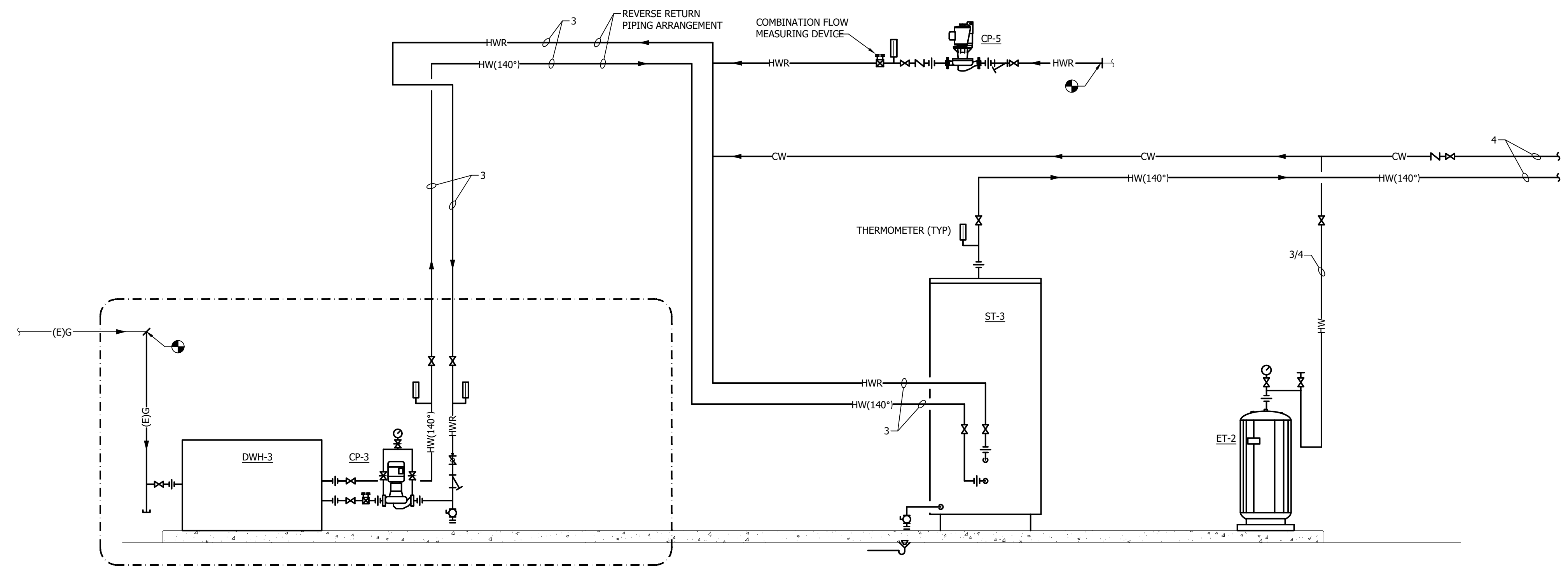
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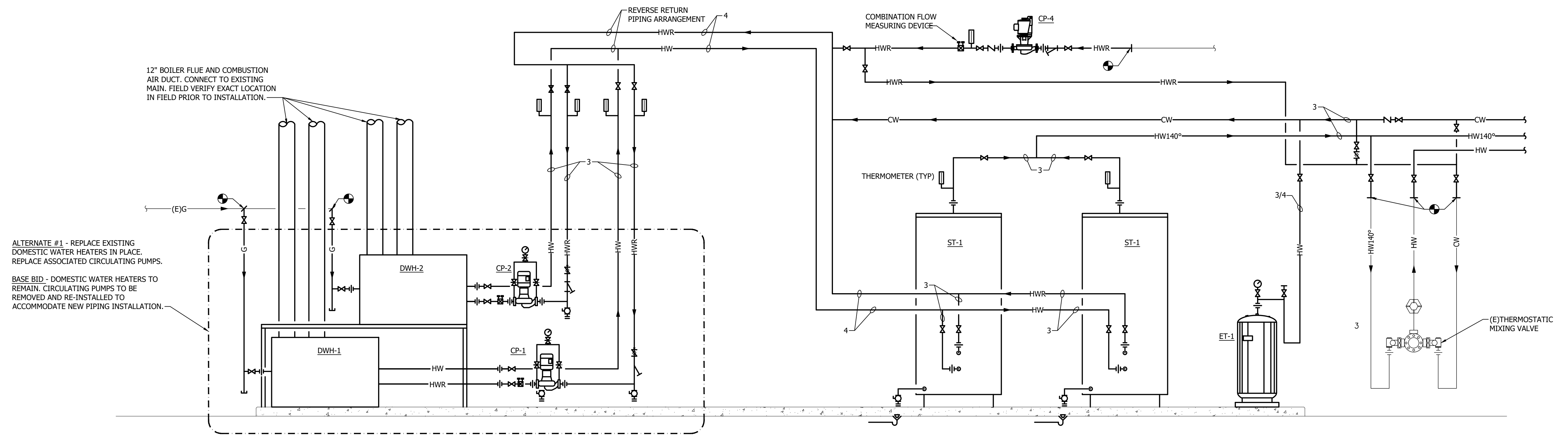
ELEVATION



DOMESTIC WATER HEATING DIAGRAM AREA B
NO SCALE



DOMESTIC WATER HEATING DIAGRAM - AREA A
NO SCALE



DOMESTIC WATER HEATING DIAGRAM - AREA A
NO SCALE

PIPING DIAGRAMS

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