NORTHWOOD UNIVERSITY
MINER HALL LOWER - LEVEL RENOVATIONS
MIDLAND, MICHIGAN

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MINER HALL LOWER-LEVEL RENOVATIONS

LOCATION
NORTHWOOD UNIVERSITY
4000 WHITING DRIVE
MIDLAND, MICHIGAN 48640

OWNER
NORTHWOOD UNIVERSITY
4000 WHITING DRIVE
MIDLAND, MICHIGAN 48640

ARCHITECT
WTA ARCHITECTS
100 SOUTH JEFFERSON AVENUE, SUITE 601
SAGINAW, MICHIGAN 48607
Telephone: 989-752-8107
Fax: 989-752-3125

MECHANICAL/ELECTRICAL ENGINEER
MACMILLAN ASSOCIATES INC.
714 EAST MIDLAND STREET
BAY CITY, MICHIGAN 48706

DESCRIPTION OF PROJECT
The subject project includes renovations to the lower level interior of the Northwood University Miner Hall that was compromised during the 2020 floods. The lower level contained existing office space and will be used for Student Life meeting and gathering areas as well as Physical plant offices in the future. Work consists of but is not limited to demolition of existing construction, new exterior site stair, new accessible access ramp, new wall partitions, toilet rooms, casework, interior finishes, new mechanical unit and distribution system, new lighting and power. In addition minor soil removal, grading and seeding for disturbed soils for the new Mechanical Unit and Slab.

TYPE OF BIDS REQUESTED
Electronic Signed and Sealed proposals for construction of:

MINER HALL LOWER-LEVEL RENOVATIONS
TIME AND PLACE

Electronic proposals will be received until 2:00 p.m., Eastern Time on August 16th. All proposals shall be emailed to:

smithsp@northwood.edu

Steven Smith
Physical Plant Director
Northwood University

PRE-BID WALK-THROUGH

A mandatory pre-bid walk-through for General Contractors will be held on July 26th, 2022, at 10:00 a.m. Contractors will meet at the Front (South) Entry of the Miner Hall Building

REQUEST FOR INFORMATION

All RFI’s must be submitted in written electronic form and submitted to the Architect Via Email to scsutora@wtaarch.com until August 5th at 3:00pm Local time

PROPOSAL GUARANTEE

Each proposal must be accompanied by a proposal guarantee in an amount equal to five percent (5%) of the basic proposal. Guarantee shall be in the form of a certified check or bid bond executed by and approved surety company, made payable to Delta College. Proposal guarantee shall run for a period of thirty (30) days.

ACCESS TO BIDDING DOCUMENTS

Digital Documents:
Drawings and specifications can be accessed and downloaded from the WTA Info Exchange website:

Contact: Scott Csutora
e. scsutora@wtaarch.com

CONTRACT SECURITY

Successful bidder will be required to furnish a "performance bond" and a "labor and material payment bond", each bond in the amount of 100% of his contract, as required in the "Instructions to Bidders".

CONTRACT REQUIREMENTS

The All Trades Contractor and every subcontractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex or national origin. The All Trades Contractor will take affirmative action to ensure that applicants are employed and that employees are treated during employment without regard to their race, color, religion, sex or national origin. Such action shall include, but not be limited to, the following: employment, upgrading, demotion or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training including apprenticeship. The contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided setting forth the provisions of this Equal Opportunity Clause.
RIGHTS RESERVED BY OWNER

The Owner reserves the right to reject any or all proposals and to waive any irregularities in bidding, or to accept the lowest responsible proposal, that in the opinion of the Owner will serve the best interest of the Owner. The Owner will not be obligated to accept the lowest proposal. The Owner further reserves the right to approve all subcontractors.

WITHDRAWAL OF PROPOSALS

No proposals may be withdrawn for a period of thirty (30) days after the receipt of proposals.

END OF SECTION 000116
DEFINITIONS

1. Bidding Documents include the Invitation to Bid, Instructions to Bidders, the bid form, other sample bidding and contract forms and the proposed Contract Documents including and Addenda issued prior to receipt of bids. The Contract Documents proposed for the Work consists of the Owner-Contractor Agreement, the Conditions of the Contract (General, Supplementary and other Conditions), the Drawings, the Specifications and all Addenda issued prior to and all Modifications issued after execution of the Contract.

2. All definitions set forth in the General Conditions of the Contract for Construction, AIA Document A201, or in other Contract Documents are applicable to the Bidding Documents.

3. Addenda are written or graphic instruments issued by the Architect prior to the execution of the Contracts which modify or interpret the Bidding Documents by addition, deletion, clarifications or corrections.

4. A Bid is a complete and properly signed proposal to do the Work or designated portion thereof for the sums stipulated therein, submitted in accordance with the Bidding Documents.

5. The Base Bid is the sum stated 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 for sums stated in Alternate Bids.

6. An Alternate Bid (or Alternate) is an amount stated in the Bid to be added to or deducted from the amount of the Base Bid if the corresponding change in the Work, as described in the Bidding Documents, is accepted.

7. A Unit Price is an amount stated in the Bid as a price per unit of measurement for materials or services as described in the Bidding Documents or in the proposed Contract Documents.

8. A Bidder is a person or entity who submits a Bid.

9. A Sub-bidder is a person or entity who submits a bid to a Bidder for materials or labor for a portion of the Work.

BIDDER'S REPRESENTATION

1. Each Bidder by making his Bid represents that:

   A. He has read and understands the Bidding Documents and his Bid is made in accordance therewith.

   B. He has visited the site, has familiarized himself with the local conditions under which the Work is to be performed and has correlated his observations with the requirements of the proposed Contract Documents.

   C. His Bid is based upon the materials, systems and equipment required by the Bidding Documents without exception.

BIDDING DOCUMENTS

1. Bidders may obtain complete sets of the Bidding Documents from the issuing office designated
in the Invitation to Bid in the number and for the deposit sum, if any, stated therein.

2. Bidders shall use complete sets of Bidding Documents in preparing Bids; neither the Owner nor the Architect assume any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.

3. The Owner or the Architect in making copies of the Bidding Documents available on the above terms do so only for the purpose of obtaining Bids on the Work and do not confer a license or grant for any other use.

4. Bidders and Sub-bidders shall promptly notify the Architect of any ambiguity, inconsistency or error which they may discover upon examination of the Bidding Documents or of the site and local conditions.

5. Bidders and Sub-bidders requiring clarification or interpretation of the Bidding Documents shall make a request to the Architect at least seven days prior to the date for receipt of Bids.

6. Any interpretation, correction or change of the Bidding Documents will be made by Addendum. Interpretations, corrections or changes of the Bidding Documents made in any other manner will not be binding, and Bidders shall not rely upon such interpretations, corrections and changes.

7. No substitution will be considered prior to receipt of Bids unless request for approval has been received by the Architect at least seven days prior to the date for receipt of Bids. Each such request shall include the name of the material or equipment for which it is to be substituted and a complete description of the proposed substitute including drawings, cuts, performance and test data and any other information necessary for an evaluation. A statement setting forth any changes in other materials, equipment or other Work that incorporation of the substitute would require shall be included. The burden of proof of the merit of the proposed substitute is upon the proposer. The Architect's decision of approval or disapproval of a proposed substitution shall be final.

8. If the Architect approves any proposed substitution prior to receipt of Bids, such approval will set forth in an Addendum. Bidders shall not rely upon approvals made in any other manner.

9. No substitutions will be considered after the Contract award unless specifically provided in the Contract Documents.

10. Addenda will be mailed or delivered to all who are known by the Architect to have received a complete set of Bidding Documents.

11. Copies of Addenda will be made available for inspection wherever Bidding Documents are on file for that purpose.

12. No Addenda will be issued later than two days prior to the date for receipt of Bids except an Addendum withdrawing the request for Bids or one which includes postponement of the date for receipt of Bids.

13. Each Bidder shall ascertain prior to submitting his bid that he has received all Addenda issued, and he shall acknowledge their receipt in his Bid.

BIDDING PROCEDURE

1. Bids shall be submitted on forms included with the Bidding Documents.
2. All blanks on the bid form shall be filled in by typewriter or manually in ink.

3. Where so indicated by the makeup of the bid forms, sums shall be expressed in both words and figures, and in case of discrepancy between the two, the amount written in words shall govern.

4. Any interlineation, alteration or erasure must be initialed by the signer of the Bid.

5. All requested Alternates shall be bid. If no change in the Base Bid is required enter "No Change."

6. Each copy of the Bid shall include the legal name of the Bidder and a statement that the Bidder is a sole proprietor, a partnership, a corporation, or some other legal entity. Each copy shall be signed by the person or persons legally authorized to bind the Bidder to a contract. A Bid by a corporation shall be further given the state of incorporation and have the corporate seal affixed. A Bid submitted by an agent shall have a current power of attorney attached certifying the agent’s authority to bind the Bidder.

7. If so stipulated in the Invitation to Bid, each Bid shall be accompanied by a bid security in the form and amount required pledging that the Bidder will enter into a contract with the Owner on the terms stated in his Bid and will, if required, furnish bonds covering the faithful performance of the Contract and the payment of all obligations arising thereunder. Should the Bidder refuse to enter into such Contract or fail to furnish such bonds if required, the amount of the bid security shall be forfeited to the Owner as liquidated damages, not as a penalty.

8. A surety bond is required and shall be written on AIA Document A310, Bid Bond, and the attorney-in-fact who executes the bond on behalf of the surety shall affix to the bond a certified and current copy of his power of attorney.

9. The Owner will have the right to retain the bid security of Bidders to whom an award is being considered until either (a) the Contract has been executed and bonds, if required, have been furnished, or (b) the specified time has elapsed so that Bids may be withdrawn, or (c) all Bids have been rejected.

10. All copies of the Bid, the bid security, if any, and any other documents required to be submitted with the Bid shall be enclosed in a sealed opaque envelope. The envelope shall be addressed to the party receiving the Bids and shall be identified with the Project name, the Bidder's name and address and, if applicable, the designated portion of the Work for which the Bid is submitted. If the Bid is sent by mail the sealed envelope shall be enclosed in a separate mailing envelope with the notation "SEALED BID ENCLOSED" on the face thereof.

11. Bids shall be deposited at the designated location prior to the time and date for receipt of Bids indicated in the Invitation to Bid, or any extension thereof made by Addendum. Bids received after the time and date for receipt of Bids will be returned unopened.

12. The Bidder shall assume full responsibility for timely delivery at the location designated for receipt of Bids.

13. Oral, telephonic or telegraphic Bids are invalid and will not receive consideration.

14. A Bid may not be modified, withdrawn or canceled by the Bidder during the stipulated time period following the time and date designated for the receipt of Bids, and each Bidder so agrees in submitting his Bid.

15. Prior to the time and date designated for receipt of Bids, any Bid submitted may be modified or
withdrawn by notice to the party receiving Bids at the place designated for receipt of Bids. Such notice shall be in writing over the signature of the Bidder or by telegram; if by telegram, written confirmation over the signature of the Bidder shall be mailed and postmarked on or before the date and time set for receipt of Bids, and it shall be so worded as not reveal the amount of the original Bid.

16. Withdrawn Bids may be resubmitted up to the time designated for the receipt of Bids provided that they are then fully in conformance with these Instructions to Bidders.

17. Bid security, if any is required, shall be in an amount sufficient for the Bid as modified or resubmitted.

CONSIDERATION OF BIDS

1. The Owner shall have the right to reject any or all Bids and to reject a Bid not accompanied by any required bid security or by other data required by the Bidding Documents, or to reject a Bid which is in any way incomplete or irregular.

2. It is the intent of the Owner to award a Contract to the lowest responsible Bidder provided the Bid has been submitted in accordance with the requirements of the Bidding Documents and does not exceed the funds available. The Owner shall have the right to waive any informality or irregularity in any Bid or Bids received and to accept the Bid or Bids which, in his judgement, is in his own best interest.

3. The Owner shall have the right to accept Alternates in any order or combination, and to determine the low Bidder on the basis of the sum of the Base Bid and the Alternates accepted.

POST BID INFORMATION

1. Bidders to whom award a Contract is under consideration shall submit to the Architect, upon request, a properly executed AIA Document A305, Contractor's Qualification Statement, unless such a Statement has been previously required and resubmitted as a prerequisite to the issuance of Bidding Documents.

2. The Bidder shall, within seven days of notification of selection for the award of a Contract for the Work, submit the following information to the Architect:

A. a designation of the Work to be performed by the Bidder with his own forces;
B. the proprietary names and the suppliers of principal items or systems of materials and equipment proposed for the Work;
C. a list of names of the Subcontractors or other persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for the principal portions of the Work.

3. The Bidder will be required to establish to the satisfaction of the Architect and the Owner the reliability and responsibility of the persons or entities proposed to furnish and perform the Work described in the Bidding Documents.

4. Prior to the award of the Contract, the Architect will notify the Bidder in writing if either the Owner or the Architect, after due investigation, has reasonable objection to any such proposed person or entity. If the Owner or Architect has reasonable objection to any such proposed person or entity, the Bidder may, at his option, (1) withdraw his Bid, or (2) submit an acceptable substitute person or entity with an adjustment in his bid price to cover the difference in cost occasioned by such substitution. The Owner may, at his discretion, accept the adjusted bid
price or he may disqualify the Bidder. In the event of either withdrawal or disqualification under this Subparagraph, bid security will not be forfeited.

5. Persons and entities proposed by the Bidder and to whom the Owner and the Architect have made no reasonable objection must be used on the Work for which they were proposed and shall not be changed except with the written consent of the Owner and the Architect.

PERMITS

1. Each bidder shall include in their proposal the cost of all required fees for permits and regulatory review fees for the project

PREVAILING WAGE REQUIREMENTS

1. This project does require the payment of prevailing wages.

PERFORMANCE BOND AND LABOR AND MATERIAL PAYMENT BOND

1. Prior to execution of the Contract, if required hereinafter, the Bidder shall furnish bonds covering the faithful performance of the Contract and the payment of all obligations arising thereunder in such form and amount as the Owner may prescribe. Bonds may be secured through the Bidder’s usual sources. If the furnishing of such bonds is stipulated, the cost shall be included in the Bid.

2. The Bidder shall deliver the required bonds to the Owner not later that the date of execution of the Contract, or if the Work is to be commenced prior thereto in response to a letter of intent, the Bidder shall, prior to commencement of the Work, submit evidence satisfactory to the Owner that such bonds will be furnished.

3. Unless otherwise required, the bonds shall be written on AIA Documents A311, Performance Bond and Labor and Material Payment Bond.

4. The Bidder shall require the attorney-in-fact who executes the required bonds on be half of the surety to affix thereto a certified and current copy of his power of attorney.

FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR

1. Unless otherwise required in the Bidding Documents, the Agreement for the Work will be written on AIA Document A101, Standard Form of Agreement Between Owner and Contractor, where the basis of payment is a Stipulated Sum.

WARRANTY

1. All work shall be guaranteed for a period of at least one (1) year and/or as more specifically stated in the contract documents after final payment but not earlier than substantial completion as determined by the Architect, and all service within that period shall be rendered without charge to the Owner.

INSURANCE REQUIREMENTS

1. The Contractor before commencing the Work shall furnish certificates of insurance meeting the attached requirements in Section 004500 CONTRACT INSURANCE REQUIREMENTS.
2. All insurance coverage shall be provided by insurance companies having policy holder ratings no lower than “A” and financial ratings not lower than “XII” in the Best’s Insurance Guide, latest edition in effect as of the date of the Contract.

3. The Contractor is responsible for determining that Subcontractors are adequately insured against claims arising out of or relating to the Work. The premium cost and charges for such insurance shall be paid by each Subcontractor.

4. The limits of liability as stated, may be arrived at using a Split-Limit or a Combined Single Limit basis. However, the total limit of liability shall not be less than that stated in the requirements.

NON-IRAN LINKED BUSINESS

1. By signing the proposal form, I certify and agree on behalf of myself and the company submitting this proposal the following: (1) that I am duly authorized to legally bind the company submitting this proposal; and (2) that the company submitting this proposal is not an “Iran linked business,” as that term is defined in Section 2(e) of the Iran Economic Sanctions Act, being Michigan Public Act No. 517 of 2012; and (3) That I and the company submitting this proposal will immediately comply with any further certifications or information submissions requested by the College in this regard.”

END OF SECTION 002113
NORTHWOOD UNIVERSITY
MINER HALL LOWER - LEVEL RENOVATIONS
MIDLAND, MICHIGAN

SECTION 004113 - BID FORM

Bidders Name: __________________________________________

Legal Address: __________________________________________

Telephone No.: __________________________________________

Proposal For: ALL TRADES CONSTRUCTION WORK

Project Name: NORTHWOOD UNIVERSITY - MINER HALL LOWER-LEVEL RENOVATIONS

Location: MIDLAND, MICHIGAN

PROPOSAL

NORTHWOOD UNIVERSITY

Proposal:

In response to your invitation to bid, the undersigned submits the following offer to enter into a contract with you and extends this offer for thirty (30) calendar days subsequent to the opening of bids. This offer has been prepared after our examination of the complete plans and specifications, together with their related documents, and our examination of the site and conditions surrounding the construction of the proposed work including the availability of materials, equipment and labor. Included in this offer are all costs necessary to complete the All Trades Construction Work in accordance with the contract documents prepared by WTA Architects, within the time set forth herein for the sum of:

$__________________________________________ Dollars

($__________________________________________), which amount includes the following addenda:

We acknowledge receipt of the following Addenda:

No. 1 dated ____________________________  No. 2 dated ____________________________

No. 3 dated ____________________________  No. 4 dated ____________________________
SCHEDULE OF ALTERNATES

(REFER TO SECTION 012300 - ALTERNATE FOR DESIGNATIONS)

ALTERNATE NO. 1:    BASED BID______________________________
                     DETDCUT ALTERNATE____________________

ALTERNATE NO. 2:    BASED BID______________________________
                     DETDCUT ALTERNATE____________________

ALTERNATE NO. 3:    BASED BID______________________________
                     DETDCUT ALTERNATE____________________

ALTERNATE NO. 4:    BASED BID______________________________
                     ADD ALTERNATE________________________

ALTERNATE NO. 5:    BASED BID______________________________
                     DETDCUT ALTERNATE____________________

ALTERNATE NO. 6:    BASED BID______________________________
                     DEDUCT ALTERNATE______________________

ALTERNATE NO. 7:    BASED BID______________________________
                     DETDCUT ALTERNATE______________________
FORFEITURE OF BID SECURITY

If within the thirty (30) days this offer is valid, a letter is sent notifying the undersigned of the acceptance of this proposal, the undersigned agrees to deliver within the 10 succeeding days surety bonds in the form specified or will forfeit the enclosed certified or cashier’s check or bid bond which accompanies this proposal.

FEE FOR CHANGES IN THE WORK

The undersigned hereby agrees to perform all additional changes in the work ordered by the Owner on the basis of reasonable expenditures, plus reasonable allowance of said cost for overhead and profit. Cost shall be limited to the following: Cost of materials, including sales tax and cost of delivery; cost of labor, including social security, old age and unemployment insurance and fringe benefits required by agreement or custom; workers’ or workmen’s compensation insurance; bond premiums; rental value of equipment and machinery; and the additional costs of supervision and field office personnel directly attributable to the change.

The undersigned hereby agrees to charge the following fees, based on a mark-up percentage of the actual cost for overhead and profit combined, as stated hereinafter:

- For all additional work performed by the contractor's own forces, a fee of _____ percent of the actual cost as defined above.

- For all additional work subcontracted by the contractor, a fee of _____ percent of the subcontract sum for management, overhead and profit.

TIME OF COMPLETION

The undersigned Bidder proposes and agrees hereby to commence the Work of the Contract Documents on a date specified in a Purchase Order to be issued by the Owner, and shall fully complete the Work within the following calendar days:

______________________________ calendar days

SIGNATURE

The bidder declares the following legal status in submitting this proposal: (check one)

( ) A Corporation organized and existing under the laws of the state of Michigan, ( ) A Partnership, ( ) An Individual

doing business as ________________________________

Respectfully submitted,

By  _____________________________________________

Title  _____________________________________________

Date  _____________________________________________

Fed. Employer Identification No.  _________________________
State License No. ________________________________

END OF SECTION 004113
SECTION 004500 – CONTRACT INSURANCE REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Contractor shall purchase from and maintain in a company or companies acceptable to Northwood University, having an AM Best rating of A-VII or better, and lawfully authorized to do business in the jurisdiction in which the Project is located, insurance of the types and in the amounts described below.

1.2 COMMERCIAL GENERAL AND UMBRELLA LIABILITY INSURANCE

Contractor shall maintain commercial general liability (CGL) and, if necessary, commercial umbrella insurance with a limit of not less than $5,000,000 each occurrence. If such CGL insurance contains a general aggregate limit, it shall apply separately to this project or location.

A. CGL insurance shall be written on ISO occurrence form CG 00 01 12 07 or newer (or a substitute form providing equivalent coverage) and shall cover liability arising from premises, operations, independent contractors, products-completed operations, personal injury and advertising injury, and liability assumed under an insured contract (including the tort liability of another assumed in a business contract.)

B. Northwood University, its elected and appointed officials, employees, students, volunteers, and agents shall be included as insured under the CGL, using ISO additional insured endorsement CG 20 10 or a substitute providing equivalent coverage, and under the commercial umbrella, if any. This insurance shall apply as primary insurance with respect to any other insurance or self-insurance programs afforded to Northwood University.

1.3 WAIVER OF SUBROGATION

Contractor waives all rights against Northwood University, its elected and appointed officials, employees, students, volunteers, and agents for recovery of damages to the extent these damages are covered by the commercial general liability or commercial umbrella liability insurance maintained pursuant to paragraph 1.1 of this agreement.

1.4 OWNERS AND CONTRACTORS PROTECTIVE LIABILITY INSURANCE

Contractor shall maintain Owners and Contractors Protective Liability (OCP) insurance on behalf of Northwood University, as named insured, with a limit of $5,000,000.

1.5 CONTINUING COMPLETED OPERATIONS LIABILITY INSURANCE

Contractor shall maintain commercial general liability (CGL) and, if necessary, commercial umbrella liability insurance with a limit of not less than $5,000,000 each occurrence for at least 5 years following substantial completion of the work.

A. Continuing CGL insurance shall be written on ISO occurrence form CG 00 01 12 07 (or a substitute form providing equivalent coverage) and shall, at minimum, cover liability arising from products-completed operations and liability assumed under an insured contract (including the tort liability of another assumed in a business contract.)
B. Continuing CGL insurance shall have a products-completed operations aggregate of at least two times its each occurrence limit.
C. Continuing commercial umbrella coverage, if any, shall include liability coverage for damage to the insured’s completed work equivalent to that provided under ISO form CG 00 01.
D. Such insurance shall name Northwood University as additional insured.

1.6 BUSINESS AUTO AND UMBRELLA LIABILITY INSURANCE

Contractor shall maintain business auto liability and, if necessary, commercial umbrella liability insurance with a limit of not less than $1,000,000 each accident.

A. Such insurance shall cover liability arising out of any auto (including owned, hired, and non-owned autos.)
B. Business auto coverage shall be written on ISO form CA 00 01, CA 00 05, CA 00 12, CA 00 20, or substitute form providing equivalent liability coverage. If necessary, the policy shall be endorsed to provide contractual liability coverage equivalent to that provided in the 2007 and later editions of CA 00 01.
C. Pollution liability coverage equivalent to that provided under the ISO pollution liability-broadened coverage for covered autos endorsement (CA 99 48) shall be provided, and the Motor Carrier Act endorsement (MCS 90) shall be attached.

1.7 WAIVER OF SUBROGATION

Contractor waives all rights against Northwood University, its elected and appointed officials, employees, students, volunteers, and agents for recovery of damages to the extent these damages are covered by the business auto liability or commercial umbrella liability insurance obtained by Contractor pursuant to Paragraph 1.0 of this Agreement or under any applicable auto physical damage coverage.

1.8 WORKERS COMPENSATION INSURANCE

Contractor shall maintain workers compensation and employers liability insurance.

A. The commercial umbrella and/or employers liability limits shall not be less than $1,000,000 each accident for bodily injury by accident or $1,000,000 each employee for bodily injury by disease.
B. The employer’s liability insurance shall name Northwood University as an additional insured.

1.9 WAIVER OF SUBROGATION

Contractor waives all rights against Northwood University, its elected and appointed officials, employees, students, volunteers, and agents for recovery of damages to the extent these damages are covered by the workers compensation and employer’s liability or commercial umbrella liability insurance obtained by Contractor pursuant to Paragraph 1.0 of this agreement.

1.10 SUBCONTRACTORS’ INSURANCE

Contractor shall cause each subcontractor employed by Contractor to purchase and maintain insurance of the type specified above. When requested by The university,
Contractor shall furnish copies of certificates of insurance evidencing coverage for each subcontractor.

1.11 EVIDENCE OF INSURANCE

Prior to commencing the work, Contractor shall furnish The university with a certificate(s) of insurance, executed by a duly authorized representative of each insurer, showing compliance with the insurance requirements set forth above. Coverage's shall be, written on an occurrence basis, shall be maintained without interruption from date of commencement of the Work until date of final payment and termination of any coverage required to be maintained after final payment. All such insurance shall be primary and any insurance or self-insurance maintained by The university shall be secondary and excess to that carried by Contractor. All such insurance shall be in form and substance reasonably satisfactory to the university.

A. All certificates shall provide for 30 days written notice to the university prior to the cancellation or material change of any insurance referred to therein.
B. The words “endeavor to” and “but failure to mail such notice shall impose no obligation or liability of any kind upon the company, its agents or representatives” shall be deleted from the certificate form’s cancellation provision.
C. Failure of The University to demand such certificate or other evidence of full compliance with these insurance requirements or failure of the university to identify a deficiency from evidence that is provided shall not be construed as a waiver of Contractor's obligation to maintain such insurance.
D. The University shall have the right, but not the obligation, of prohibiting Contractor or any subcontractor from entering the project site until such certificates or other evidence that insurance has been placed in complete compliance with these requirements is received and approved by The University.
E. Failure to maintain the required insurance may result in termination of this contract at university option.
F. If Contractor fails to maintain the insurance as set forth herein, The university shall have the right, but not the obligation, to purchase said insurance at the Contractor's expense.
G. With respect to insurance maintained after final payment in compliance with a requirement above, and additional certificate(s) evidencing such coverage shall be promptly provided to the university whenever requested.
H. Contractor shall provide certified copies of all insurance policies required above within 10 days of The university’s written request for said copies.

1.12 NO REPRESENTATION OF COVERAGE ADEQUACY

By requiring insurance herein, the university does not represent that coverage and limits will necessarily be adequate to protect Contractor and such coverage and limits shall not be deemed as a limitation on Contractor’s liability under the indemnities granted to the university in this contract.

1.13 CROSS-LIABILITY COVERAGE

If Contractors' liability policies do not contain the standard ISO separation of insureds provision, or a substantially similar clause, they shall be endorsed to provide cross-liability coverage.
1.1 POLICY

A. As a service to bidders, contractors, subcontractors, vendors, material suppliers and others needing electronic copies of drawing files, the Architect will provide CAD files via file transfer through the Project Website in accordance with the following policy.

1. By acceptance it is understood and agreed that the data and medium being supplied is to be used only for the project referenced.

2. It is further understood and agreed that the undersigned will hold WTA Architects harmless and indemnify WTA Architects from all claims, liabilities, losses, etc., including attorney's fees arising out of the use or misuse of the transferred items.

3. It is understood and agreed that the items transmitted are prepared from CAD files current at the time of preparation. **All files are AutoCAD 2021.** Contractor will specify on request form if an older version is required.

4. This information does not waive the need to verify and review current field conditions and the status of Addenda and/or Bulletin documentation.

5. As a record of information to be transmitted, WTA Architects will prepare a duplicate back-up for its files, which may be electronic or hard-copy.

6. Compensation for providing this material will be as follows:
   a. Base Fee of $250 for 1 to 3 drawings.
   b. Base Fee of $500 for 4 to 10 drawings.
   c. For each additional drawing after 10 the fee is $40.00 per drawing (i.e. 11 drawings = $540)
   d. The fee will be waived for the fire protection contractor.

7. Payment must be provided along with a signed copy of the Release Letter before files will be released.

1.2 REQUEST PROCEDURE

A. To receive files the attached Release Letter must be completed in full and submitted to the Project Manager at WTA Architects.

1. A signed copy of the Release Letter must be submitted; faxed or emailed copies will be accepted. However, files will not be exchanged until payment has been received.

2. Upon remittance of the signed Release Letter and Fee, allow five working days for processing.
Dear Sir:

Per your request, WTA Architects will transmit the requested CAD files via file transfer through the project website upon receipt of this letter with conditions of agreement as stated.

1. By acceptance it is understood and agreed that the data and medium being supplied is to be used only for the project referenced.
2. It is further understood and agreed that the undersigned will hold WTA Architects harmless and indemnify WTA Architects from all claims, liabilities, losses, etc., including attorney’s fees arising out of the use or misuse of the transferred items.
3. It is understood and agreed that the items transmitted are prepared from CAD files current at the time of preparation. All files are AutoCAD 2021, unless requested otherwise.
4. This information does not waive the need to verify and review current field conditions and the status of Addenda and/or Bulletin documentation.
5. As a record of information to be transmitted, we will prepare a duplicate back-up for our files, which may be electronic or hard-copy.
6. Compensation for providing this material will be as follows: Base Fee of $250 for 1 to 3 drawings and a Base Fee of $500 for 4 to 10 drawings; for each additional drawing after 10 the fee is $40.00 per drawing (i.e. 11 drawings = $540). All fees will be waived for the fire protection contractor. Payment must be provided along with a signed copy of this form before files will be released. Please remit to WTA Architects and allow five working days for processing.

Fee: $ ________________________ Drawings: ____________________________

Signed: ______________________ Printed Name/Title: ______________________

Firm Requesting: ____________________________

Phone: ______________________ Fax: ______________________

To be Completed by WTA Architects, Inc.

Released (Signed By): ______________________ WTA Architects, Inc.

Printed Name/Title: ______________________ Date: ______________________

AVAILABILITY OF ELECTRONIC FILES 000500 - 2
General Conditions of the Contract for Construction

for the following PROJECT:
(Name and location or address)

Northwood University
Renovation to:
Miner Hall – Lower Level

THE OWNER:
(Name, legal status and address)

Northwood University
4000 Whiting Drive
Midland, MI 488640
(800)622-9000

THE ARCHITECT:
(Name, legal status and address)

WTA Architects
100 S. Jefferson Ave., Ste. 601
Saginaw, Mi 48607
(989) 752-8107

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12 UNCOVERING AND CORRECTION OF WORK

ADDITIONS AND DELETIONS:
The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An Additions and Deletions Report that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

For guidance in modifying this document to include supplementary conditions, see AIA Document A803™, Guide for Supplementary Conditions.
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ARTICLE 1  GENERAL PROVISIONS

§ 1.1 Basic Definitions

§ 1.1.1 The Contract Documents
The Contract Documents are enumerated in the Agreement between the Owner and Contractor (hereinafter the Agreement) and consist of the Agreement, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, Addenda issued prior to execution of the Contract, other documents listed in the Agreement, and Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Construction Change Directive, or (4) a written order for a minor change in the Work issued by the Architect. Unless specifically enumerated in the Agreement, the Contract Documents do not include the advertisement or invitation to bid, Instructions to Bidders, sample forms, other information furnished by the Owner in anticipation of receiving bids or proposals, the Contractor’s bid or proposal, or portions of Addenda relating to bidding or proposal requirements.

§ 1.1.2 The Contract
The Contract Documents form the Contract for Construction. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. The Contract may be amended or modified only by a Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind (1) between the Contractor and the Architect or the Architect’s consultants, (2) between the Owner and a Subcontractor, or a Sub-subcontractor, (3) between the Owner and the Architect or the Architect’s consultants, or (4) between any persons or entities other than the Owner and the Contractor. The Architect shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of the Architect’s duties.

§ 1.1.3 The Work
The term "Work" means the construction and services required by the Contract Documents, whether completed or partially completed, and includes all other labor, materials, equipment, and services provided or to be provided by the Contractor to fulfill the Contractor’s obligations. The Work may constitute the whole or a part of the Project.

§ 1.1.4 The Project
The Project is the total construction of which the Work performed under the Contract Documents may be the whole or a part and which may include construction by the Owner and by Separate Contractors.

§ 1.1.5 The Drawings
The Drawings are the graphic and pictorial portions of the Contract Documents showing the design, location and dimensions of the Work, generally including plans, elevations, sections, details, schedules, and diagrams.

§ 1.1.6 The Specifications
The Specifications are that portion of the Contract Documents consisting of the written requirements for materials, equipment, systems, standards and workmanship for the Work, and performance of related services.

§ 1.1.7 Instruments of Service
Instruments of Service are representations, in any medium of expression now known or later developed, of the tangible and intangible creative work performed by the Architect and the Architect’s consultants under their respective professional services agreements. Instruments of Service may include, without limitation, studies, surveys, models, sketches, drawings, specifications, and other similar materials.

§ 1.1.8 Initial Decision Maker
The Initial Decision Maker is the person identified in the Agreement to render initial decisions on Claims in accordance with Section 15.2. The Initial Decision Maker shall not show partiality to the Owner or Contractor and shall not be liable for results of interpretations or decisions rendered in good faith.

§ 1.2 Correlation and Intent of the Contract Documents
§ 1.2.1 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all; performance by the Contractor shall be required only to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results.
§ 1.2.1.1 The invalidity of any provision of the Contract Documents shall not invalidate the Contract or its remaining provisions. If it is determined that any provision of the Contract Documents violates any law, or is otherwise invalid or unenforceable, then that provision shall be revised to the extent necessary to make that provision legal and enforceable. In such case the Contract Documents shall be construed, to the fullest extent permitted by law, to give effect to the parties’ intentions and purposes in executing the Contract.

§ 1.2.2 Organization of the Specifications into divisions, sections and articles, and arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade.

§ 1.2.3 Unless otherwise stated in the Contract Documents, words that have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings.

§ 1.3 Capitalization
Terms capitalized in these General Conditions include those that are (1) specifically defined, (2) the titles of numbered articles, or (3) the titles of other documents published by the American Institute of Architects.

§ 1.4 Interpretation
In the interest of brevity the Contract Documents frequently omit modifying words such as "all" and "any" and articles such as "the" and "an," but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement.

§ 1.5 Ownership and Use of Drawings, Specifications, and Other Instruments of Service
§ 1.5.1 The Architect and the Architect’s consultants shall be deemed the authors and owners of their respective Instruments of Service, including the Drawings and Specifications, and retain all common law, statutory, and other reserved rights in their Instruments of Service, including copyrights. The Contractor, Subcontractors, Sub-subcontractors, and suppliers shall not own or claim a copyright in the Instruments of Service. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with the Project is not to be construed as publication in derogation of the Architect’s or Architect’s consultants’ reserved rights.

§ 1.5.2 The Contractor, Subcontractors, Sub-subcontractors, and suppliers are authorized to use and reproduce the Instruments of Service provided to them, subject to any protocols established pursuant to Sections 1.7 and 1.8, solely and exclusively for execution of the Work. All copies made under this authorization shall bear the copyright notice, if any, shown on the Instruments of Service. The Contractor, Subcontractors, Sub-subcontractors, and suppliers may not use the Instruments of Service on other projects or for additions to the Project outside the scope of the Work without the specific written consent of the Owner, Architect, and the Architect’s consultants.

§ 1.6 Notice
§ 1.6.1 Except as otherwise provided in Section 1.6.2, where the Contract Documents require one party to notify or give notice to the other party, such notice shall be provided in writing to the designated representative of the party to whom the notice is addressed and shall be deemed to have been duly served if delivered in person, by mail, by courier, or by electronic transmission if a method for electronic transmission is set forth in the Agreement.

§ 1.6.2 Notice of Claims as provided in Section 15.1.3 shall be provided in writing and shall be deemed to have been duly served only if delivered to the designated representative of the party to whom the notice is addressed by certified or registered mail, or by courier providing proof of delivery.

§ 1.7 Digital Data Use and Transmission
The parties shall agree upon protocols governing the transmission and use of Instruments of Service or any other information or documentation in digital form. The parties will use AIA Document E203™-2013, Building Information Modeling and Digital Data Exhibit, to establish the protocols for the development, use, transmission, and exchange of digital data.

§ 1.8 Building Information Models Use and Reliance
Any use of, or reliance on, all or a portion of a building information model without agreement to protocols governing the use of, and reliance on, the information contained in the model and without having those protocols set forth in AIA Document E203™-2013, Building Information Modeling and Digital Data Exhibit, and the requisite AIA Document
ARTICLE 2  OWNER
§ 2.1 General
§ 2.1.1 The Owner is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Owner shall designate in writing a representative who shall have express authority to bind the Owner with respect to all matters requiring the Owner’s approval or authorization. Except as otherwise provided in Section 4.2.1, the Architect does not have such authority. The term “Owner” means the Owner or the Owner’s authorized representative.

§ 2.1.2 The Owner shall furnish to the Contractor, within fifteen days after receipt of a written request, information necessary and relevant for the Contractor to evaluate, give notice of, or enforce mechanic’s lien rights. Such information shall include a correct statement of the record legal title to the property on which the Project is located, usually referred to as the site, and the Owner’s interest therein.

§ 2.2 Evidence of the Owner’s Financial Arrangements
§ 2.2.1 Prior to commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner’s obligations under the Contract. The Contractor shall have no obligation to commence the Work until the Owner provides such evidence. If commencement of the Work is delayed under this Section 2.2.1, the Contract Time shall be extended appropriately.

§ 2.2.2 Following commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner’s obligations under the Contract only if (1) the Owner fails to make payments to the Contractor as the Contract Documents require; (2) the Contractor identifies in writing a reasonable concern regarding the Owner’s ability to make payment when due; or (3) a change in the Work materially changes the Contract Sum. If the Owner fails to provide such evidence, as required, within fourteen days of the Contractor’s request, the Contractor may immediately stop the Work and, in that event, shall notify the Owner that the Work has stopped. However, if the request is made because a change in the Work materially changes the Contract Sum under (3) above, the Contractor may immediately stop only that portion of the Work affected by the change until reasonable evidence is provided. If the Work is stopped under this Section 2.2.2, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor’s reasonable costs of shutdown, delay and start-up, plus interest as provided in the Contract Documents.

§ 2.2.3 After the Owner furnishes evidence of financial arrangements under this Section 2.2, the Owner shall not materially vary such financial arrangements without prior notice to the Contractor.

§ 2.2.4 Where the Owner has designated information furnished under this Section 2.2 as “confidential,” the Contractor shall keep the information confidential and shall not disclose it to any other person. However, the Contractor may disclose “confidential” information, after seven (7) days’ notice to the Owner, where disclosure is required by law, including a subpoena or other form of compulsory legal process issued by a court or governmental entity, or by court or arbitrator(s) order. The Contractor may also disclose “confidential” information to its employees, consultants, sureties, Subcontractors and their employees, Sub-subcontractors, and others who need to know the content of such information solely and exclusively for the Project and who agree to maintain the confidentiality of such information.

§ 2.3 Information and Services Required of the Owner
§ 2.3.1 Except for permits and fees that are the responsibility of the Contractor under the Contract Documents, including those required under Section 3.7.1, the Owner shall secure and pay for necessary approvals, easements, assessments and charges required for construction, use or occupancy of permanent structures or for permanent changes in existing facilities.

§ 2.3.2 The Owner shall retain an architect lawfully licensed to practice architecture, or an entity lawfully practicing architecture, in the jurisdiction where the Project is located. That person or entity is identified as the Architect in the Agreement and is referred to throughout the Contract Documents as if singular in number.
§ 2.3.3 If the employment of the Architect terminates, the Owner shall employ a successor to whom the Contractor has no reasonable objection and whose status under the Contract Documents shall be that of the Architect.

§ 2.3.4 The Owner shall furnish surveys describing physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site. The Contractor shall be entitled to rely on the accuracy of information furnished by the Owner but shall exercise proper precautions relating to the safe performance of the Work.

§ 2.3.5 The Owner shall furnish information or services required of the Owner by the Contract Documents with reasonable promptness. The Owner shall also furnish any other information or services under the Owner’s control and relevant to the Contractor’s performance of the Work with reasonable promptness after receiving the Contractor’s written request for such information or services.

§ 2.3.6 Unless otherwise provided in the Contract Documents, the Owner shall furnish to the Contractor one copy of the Contract Documents for purposes of making reproductions pursuant to Section 1.5.2.

§ 2.4 Owner’s Right to Stop the Work
If the Contractor fails to correct Work that is not in accordance with the requirements of the Contract Documents as required by Section 12.2 or repeatedly fails to carry out Work in accordance with the Contract Documents, the Owner may issue a written order to the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity, except to the extent required by Section 6.1.3.

§ 2.5 Owner’s Right to Carry Out the Work
If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a ten-day period after receipt of notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to other remedies the Owner may have, correct such default or neglect. Such action by the Owner and amounts charged to the Contractor are both subject to prior approval of the Architect and the Architect may, pursuant to Section 9.5.1, withhold or nullify a Certificate for Payment in whole or in part, to the extent reasonably necessary to reimburse the Owner for the reasonable cost of correcting such deficiencies, including Owner’s expenses and compensation for the Architect’s additional services made necessary by such default, neglect, or failure. If current and future payments are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner. If the Contractor disagrees with the actions of the Owner or the Architect, or the amounts claimed as costs to the Owner, the Contractor may file a Claim pursuant to Article 15.

ARTICLE 3 CONTRACTOR
§ 3.1 General
§ 3.1.1 The Contractor is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Contractor shall be lawfully licensed, if required in the jurisdiction where the Project is located. The Contractor shall designate in writing a representative who shall have express authority to bind the Contractor with respect to all matters under this Contract. The term "Contractor" means the Contractor or the Contractor’s authorized representative.

§ 3.1.2 The Contractor shall perform the Work in accordance with the Contract Documents.

§ 3.1.3 The Contractor shall not be relieved of its obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Architect in the Architect’s administration of the Contract, or by tests, inspections or approvals required or performed by persons or entities other than the Contractor.

§ 3.2 Review of Contract Documents and Field Conditions by Contractor
§ 3.2.1 Execution of the Contract by the Contractor is a representation that the Contractor has visited the site, become generally familiar with local conditions under which the Work is to be performed, and correlated personal observations with requirements of the Contract Documents.
§ 3.2.2 Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.3.4, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information in such form as the Architect may require. It is recognized that the Contractor’s review is made in the Contractor’s capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents.

§ 3.2.3 The Contractor is not required to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, but the Contractor shall promptly report to the Architect any nonconformity discovered by or made known to the Contractor as a request for information in such form as the Architect may require.

§ 3.2.4 If the Contractor believes that additional cost or time is involved because of clarifications or instructions the Architect issues in response to the Contractor’s notices or requests for information pursuant to Sections 3.2.2 or 3.2.3, the Contractor shall submit Claims as provided in Article 15. If the Contractor fails to perform the obligations of Sections 3.2.2 or 3.2.3, the Contractor shall pay such costs and damages to the Owner, subject to Section 15.1.7, as would have been avoided if the Contractor had performed such obligations. If the Contractor performs those obligations, the Contractor shall not be liable to the Owner or Architect for damages resulting from errors, inconsistencies or omissions in the Contract Documents, for differences between field measurements or conditions and the Contract Documents, or for nonconformities of the Contract Documents to applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities.

§ 3.3 Supervision and Construction Procedures
§ 3.3.1 The Contractor shall supervise and direct the Work, using the Contractor’s best skill and attention. The Contractor shall be solely responsible for, and have control over, construction means, methods, techniques, sequences, and procedures, and for coordinating all portions of the Work under the Contract. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences, or procedures, the Contractor shall evaluate the jobsite safety thereof and shall be solely responsible for the jobsite safety of such means, methods, techniques, sequences, or procedures. If the Contractor determines that such means, methods, techniques, sequences or procedures may not be safe, the Contractor shall give timely notice to the Owner and Architect, and shall propose alternative means, methods, techniques, sequences, or procedures. The Architect shall evaluate the proposed alternative solely for conformance with the design intent for the completed construction. Unless the Architect objects to the Contractor’s proposed alternative, the Contractor shall perform the Work using its alternative means, methods, techniques, sequences, or procedures.

§ 3.3.2 The Contractor shall be responsible to the Owner for acts and omissions of the Contractor’s employees, Subcontractors and their agents and employees, and other persons or entities performing portions of the Work for, or on behalf of, the Contractor or any of its Subcontractors.

§ 3.3.3 The Contractor shall be responsible for inspection of portions of Work already performed to determine that such portions are in proper condition to receive subsequent Work.

§ 3.4 Labor and Materials
§ 3.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

§ 3.4.2 Except in the case of minor changes in the Work approved by the Architect in accordance with Section 3.12.8 or ordered by the Architect in accordance with Section 7.4, the Contractor may make substitutions only with the consent of the Owner, after evaluation by the Architect and in accordance with a Change Order or Construction Change Directive.
§ 3.4.3 The Contractor shall enforce strict discipline and good order among the Contractor’s employees and other persons carrying out the Work. The Contractor shall not permit employment of unfit persons or persons not properly skilled in tasks assigned to them.

§ 3.5 Warranty
§ 3.5.1 The Contractor warrants to the Owner and Architect that materials and equipment furnished under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. The Contractor further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects, except for those inherent in the quality of the Work the Contract Documents require or permit. Work, materials, or equipment not conforming to these requirements may be considered defective. The Contractor’s warranty excludes remedy for damage or defect caused by abuse, alterations to the Work not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. If required by the Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

§ 3.5.2 All material, equipment, or other special warranties required by the Contract Documents shall be issued in the name of the Owner, or shall be transferable to the Owner, and shall commence in accordance with Section 9.8.4.

§ 3.6 Taxes
The Contractor shall pay sales, consumer, use and similar taxes for the Work provided by the Contractor that are legally enacted when bids are received or negotiations concluded, whether or not yet effective or merely scheduled to go into effect.

§ 3.7 Permits, Fees, Notices and Compliance with Laws
§ 3.7.1 Unless otherwise provided in the Contract Documents, the Contractor shall secure and pay for the building permit as well as for other permits, fees, licenses, and inspections by government agencies necessary for proper execution and completion of the Work that are customarily secured after execution of the Contract and legally required at the time bids are received or negotiations concluded.

§ 3.7.2 The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities applicable to performance of the Work.

§ 3.7.3 If the Contractor performs Work knowing it to be contrary to applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, the Contractor shall assume appropriate responsibility for such Work and shall bear the costs attributable to correction.

§ 3.7.4 Concealed or Unknown Conditions
If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall promptly provide notice to the Owner and the Architect before conditions are disturbed and in no event later than 14 days after first observance of the conditions. The Architect will promptly investigate such conditions and, if the Architect determines that they differ materially and cause an increase or decrease in the Contractor’s cost of, or required for, performance of any part of the Work, will recommend that an equitable adjustment be made in the Contract Sum or Contract Time, or both. If the Architect determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall promptly notify the Owner and Contractor, stating the reasons. If either party disputes the Architect’s determination or recommendation, that party may submit a Claim as provided in Article 15.

§ 3.7.5 If, in the course of the Work, the Contractor encounters human remains or recognizes the existence of burial markers, archaeological sites or wetlands not indicated in the Contract Documents, the Contractor shall immediately suspend any operations that would affect them and shall notify the Owner and Architect. Upon receipt of such notice, the Owner shall promptly take any action necessary to obtain governmental authorization required to resume the operations. The Contractor shall continue to suspend such operations until otherwise instructed by the Owner but shall continue with all other operations that do not affect those remain or features. Requests for adjustments in the Contract Sum and Contract Time arising from the existence of such remains or features may be made as provided in Article 15.
§ 3.8 Allowances
§ 3.8.1 The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. Items covered by allowances shall be supplied for such amounts and by such persons or entities as the Owner may direct, but the Contractor shall not be required to employ persons or entities to whom the Contractor has reasonable objection.

§ 3.8.2 Unless otherwise provided in the Contract Documents,
.1 allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;
.2 Contractor’s costs for unloading and handling at the site, labor, installation costs, overhead, profit, and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum but not in the allowances; and
.3 whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs and the allowances under Section 3.8.2.1 and (2) changes in Contractor’s costs under Section 3.8.2.2.

§ 3.8.3 Materials and equipment under an allowance shall be selected by the Owner with reasonable promptness.

§ 3.9 Superintendent
§ 3.9.1 The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project site during performance of the Work. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor.

§ 3.9.2 The Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the name and qualifications of a proposed superintendent. Within 14 days of receipt of the information, the Architect may notify the Contractor, stating whether the Owner or the Architect (1) has reasonable objection to the proposed superintendent or (2) requires additional time for review. Failure of the Architect to provide notice within the 14-day period shall constitute notice of no reasonable objection.

§ 3.9.3 The Contractor shall not employ a proposed superintendent to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not change the superintendent without the Owner’s consent, which shall not unreasonably be withheld or delayed.

§ 3.10 Contractor’s Construction and Submittal Schedules
§ 3.10.1 The Contractor, promptly after being awarded the Contract, shall submit for the Owner’s and Architect’s information a Contractor’s construction schedule for the Work. The schedule shall contain detail appropriate for the Project, including (1) the date of commencement of the Work, interim schedule milestone dates, and the date of Substantial Completion; (2) an apportionment of the Work by construction activity; and (3) the time required for completion of each portion of the Work. The schedule shall provide for the orderly progression of the Work to completion and shall not exceed time limits current under the Contract Documents. The schedule shall be revised at appropriate intervals as required by the conditions of the Work and Project.

§ 3.10.2 The Contractor, promptly after being awarded the Contract and thereafter as necessary to maintain a current submittal schedule, shall submit a submittal schedule for the Architect’s approval. The Architect’s approval shall not be unreasonably delayed or withheld. The submittal schedule shall (1) be coordinated with the Contractor’s construction schedule, and (2) allow the Architect reasonable time to review submittals. If the Contractor fails to submit a submittal schedule, or fails to provide submittals in accordance with the approved submittal schedule, the Contractor shall not be entitled to any increase in Contract Sum or extension of Contract Time based on the time required for review of submittals.

§ 3.10.3 The Contractor shall perform the Work in general accordance with the most recent schedules submitted to the Owner and Architect.

§ 3.11 Documents and Samples at the Site
The Contractor shall make available, at the Project site, the Contract Documents, including Change Orders, Construction Change Directives, and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and the approved Shop Drawings, Product Data, Samples, and similar required submittals. These shall be in electronic form or paper copy, available to the Architect and Owner, and
delivered to the Architect for submittal to the Owner upon completion of the Work as a record of the Work as constructed.

§ 3.12.1 Shop Drawings, Product Data and Samples
§ 3.12.1.1 Shop Drawings are drawings, diagrams, schedules, and other data specially prepared for the Work by the Contractor or a Subcontractor, Sub-subcontractor, manufacturer, supplier, or distributor to illustrate some portion of the Work.

§ 3.12.1.2 Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams, and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work.

§ 3.12.1.3 Samples are physical examples that illustrate materials, equipment, or workmanship, and establish standards by which the Work will be judged.

§ 3.12.4 Shop Drawings, Product Data, Samples, and similar submittals are not Contract Documents. Their purpose is to demonstrate how the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents for those portions of the Work for which the Contract Documents require submittals. Review by the Architect is subject to the limitations of Section 4.2.7. Informational submittals upon which the Architect is not expected to take responsive action may be so identified in the Contract Documents. Submittals that are not required by the Contract Documents may be returned by the Architect without action.

§ 3.12.5 The Contractor shall review for compliance with the Contract Documents, approve, and submit to the Architect, Shop Drawings, Product Data, Samples, and similar submittals required by the Contract Documents, in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the Owner or of separate Contractors.

§ 3.12.6 By submitting Shop Drawings, Product Data, Samples, and similar submittals, the Contractor represents to the Owner and Architect that the Contractor has (1) reviewed and approved them, (2) determined and verified materials, field measurements and field construction criteria related thereto, or will do so, and (3) checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

§ 3.12.7 The Contractor shall perform no portion of the Work for which the Contract Documents require submittal and review of Shop Drawings, Product Data, Samples, or similar submittals, until the respective submittal has been approved by the Architect.

§ 3.12.8 The Work shall be in accordance with approved submittals except that the Contractor shall not be relieved of responsibility for deviations from the requirements of the Contract Documents by the Architect’s approval of Shop Drawings, Product Data, Samples, or similar submittals, unless the Contractor has specifically notified the Architect of such deviation at the time of submittal and (1) the Architect has given written approval to the specific deviation as a minor change in the Work, or (2) a Change Order or Construction Change Directive has been issued authorizing the deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples, or similar submittals, by the Architect’s approval thereof.

§ 3.12.9 The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples, or similar submittals, to revisions other than those requested by the Architect on previous submittals. In the absence of such notice, the Architect’s approval of a resubmission shall not apply to such revisions.

§ 3.12.10 The Contractor shall not be required to provide professional services that constitute the practice of architecture or engineering unless such services are specifically required by the Contract Documents for a portion of the Work or unless the Contractor needs to provide such services in order to carry out the Contractor’s responsibilities for construction means, methods, techniques, sequences, and procedures. The Contractor shall not be required to provide professional services in violation of applicable law.

§ 3.12.10.1 If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required by the Contractor by the Contract Documents, the Owner and the Architect will
specify all performance and design criteria that such services must satisfy. The Contractor shall be entitled to rely upon
the adequacy and accuracy of the performance and design criteria provided in the Contract Documents. The
Contractor shall cause such services or certifications to be provided by an appropriately licensed design professional,
whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings, and
other submittals prepared by such professional. Shop Drawings, and other submittals related to the Work, designed or
certified by such professional, if prepared by others, shall bear such professional’s written approval when submitted to
the Architect. The Owner and the Architect shall be entitled to rely upon the adequacy and accuracy of the services,
certifications, and approvals performed or provided by such design professionals, provided the Owner and Architect
have specified to the Contractor the performance and design criteria that such services must satisfy. Pursuant to this
Section 3.12.10, the Architect will review and approve or take other appropriate action on submittals only for the
limited purpose of checking for conformance with information given and the design concept expressed in the Contract
Documents.

§ 3.12.10.2 If the Contract Documents require the Contractor’s design professional to certify that the Work has been
performed in accordance with the design criteria, the Contractor shall furnish such certifications to the Architect at the
time and in the form specified by the Architect.

§ 3.13 Use of Site
The Contractor shall confine operations at the site to areas permitted by applicable laws, statutes, ordinances, codes,
rules and regulations, lawful orders of public authorities, and the Contract Documents and shall not unreasonably
encumber the site with materials or equipment.

§ 3.14 Cutting and Patching
§ 3.14.1 The Contractor shall be responsible for cutting, fitting, or patching required to complete the Work or to make
its parts fit together properly. All areas requiring cutting, fitting, or patching shall be restored to the condition existing
prior to the cutting, fitting, or patching, unless otherwise required by the Contract Documents.

§ 3.14.2 The Contractor shall not damage or endanger a portion of the Work or fully or partially completed
construction of the Owner or Separate Contractors by cutting, patching, or otherwise altering such construction, or by
evacuation. The Contractor shall not cut or otherwise alter construction by the Owner or a Separate Contractor except
with written consent of the Owner and of the Separate Contractor. Consent shall not be unreasonably withheld. The
Contractor shall not unreasonably withhold, from the Owner or a Separate Contractor, its consent to cutting or
otherwise altering the Work.

§ 3.15 Cleaning Up
§ 3.15.1 The Contractor shall keep the premises and surrounding area free from accumulation of waste materials and
rubbish caused by operations under the Contract. At completion of the Work, the Contractor shall remove waste
materials, rubbish, the Contractor’s tools, construction equipment, machinery, and surplus materials from and about
the Project.

§ 3.15.2 If the Contractor fails to clean up as provided in the Contract Documents, the Owner may do so and the Owner
shall be entitled to reimbursement from the Contractor.

§ 3.16 Access to Work
The Contractor shall provide the Owner and Architect with access to the Work in preparation and progress wherever
located.

§ 3.17 Royalties, Patents and Copyrights
The Contractor shall pay all royalties and license fees. The Contractor shall defend suits or claims for infringement of
copyrights and patent rights and shall hold the Owner and Architect harmless from loss on account thereof, but shall
not be responsible for defense or loss when a particular design, process, or product of a particular manufacturer or
manufacturers is required by the Contract Documents, or where the copyright violations are contained in Drawings,
Specifications, or other documents prepared by the Owner or Architect. However, if an infringement of a copyright or
patent is discovered by, or made known to, the Contractor, the Contractor shall be responsible for the loss unless the
information is promptly furnished to the Architect.
§ 3.18 Indemnification
§ 3.18.1 To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, Architect, Architect’s consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys’ fees, arising out of or resulting from performance of the Work, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), but only to the extent caused by the negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss, or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity that would otherwise exist as to a party or person described in this Section 3.18.

§ 3.18.2 In claims against any person or entity indemnified under this Section 3.18 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, the indemnification obligation under Section 3.18.1 shall not be limited by a limitation on amount or type of damages, compensation, or benefits payable by or for the Contractor or a Subcontractor under workers’ compensation acts, disability benefit acts, or other employee benefit acts.

ARTICLE 4 ARCHITECT
§ 4.1 General
§ 4.1.1 The Architect is the person or entity retained by the Owner pursuant to Section 2.3.2 and identified as such in the Agreement.

§ 4.1.2 Duties, responsibilities, and limitations of authority of the Architect as set forth in the Contract Documents shall not be restricted, modified, or extended without written consent of the Owner, Contractor, and Architect. Consent shall not be unreasonably withheld.

§ 4.2 Administration of the Contract
§ 4.2.1 The Architect will provide administration of the Contract as described in the Contract Documents and will be an Owner’s representative during construction until the date the Architect issues the final Certificate for Payment. The Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents.

§ 4.2.2 The Architect will visit the site at intervals appropriate to the stage of construction, or as otherwise agreed with the Owner, to become generally familiar with the progress and quality of the portion of the Work completed, and to determine in general if the Work observed is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents. However, the Architect will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. The Architect will not have control over, charge of, or responsibility for the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work, since these are solely the Contractor’s rights and responsibilities under the Contract Documents.

§ 4.2.3 On the basis of the site visits, the Architect will keep the Owner reasonably informed about the progress and quality of the portion of the Work completed, and promptly report to the Owner (1) known deviations from the Contract Documents, (2) known deviations from the most recent construction schedule submitted by the Contractor, and (3) defects and deficiencies observed in the Work. The Architect will not be responsible for the Contractor’s failure to perform the Work in accordance with the requirements of the Contract Documents. The Architect will not have control over or charge of, and will not be responsible for acts or omissions of, the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work.

§ 4.2.4 Communications
The Owner and Contractor shall include the Architect in all communications that relate to or affect the Architect’s services or professional responsibilities. The Owner shall promptly notify the Architect of the substance of any direct communications between the Owner and the Contractor otherwise relating to the Project. Communications by and with the Architect’s consultants shall be through the Architect. Communications by and with Subcontractors and suppliers shall be through the Contractor. Communications by and with Separate Contractors shall be through the Owner. The Contract Documents may specify other communication protocols.
§ 4.2.5 Based on the Architect’s evaluations of the Contractor’s Applications for Payment, the Architect will review and certify the amounts due the Contractor and will issue Certificates for Payment in such amounts.

§ 4.2.6 The Architect has authority to reject Work that does not conform to the Contract Documents. Whenever the Architect considers it necessary or advisable, the Architect will have authority to require inspection or testing of the Work in accordance with Sections 13.4.2 and 13.4.3, whether or not the Work is fabricated, installed or completed. However, neither this authority of the Architect nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect to the Contractor, Subcontractors, suppliers, their agents or employees, or other persons or entities performing portions of the Work.

§ 4.2.7 The Architect will review and approve, or take other appropriate action upon, the Contractor’s submittals such as Shop Drawings, Product Data, and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect’s action will be taken in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness while allowing sufficient time in the Architect’s professional judgment to permit adequate review. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Architect’s review of the Contractor’s submittals shall not relieve the Contractor of the obligations under Sections 3.3, 3.5, and 3.12. The Architect’s review shall not constitute approval of safety precautions or of any construction means, methods, techniques, sequences, or procedures. The Architect’s approval of a specific item shall not indicate approval of an assembly of which the item is a component.

§ 4.2.8 The Architect will prepare Change Orders and Construction Change Directives, and may order minor changes in the Work as provided in Section 7.4. The Architect will investigate and make determinations and recommendations regarding concealed and unknown conditions as provided in Section 3.7.4.

§ 4.2.9 The Architect will conduct inspections to determine the date or dates of Substantial Completion and the date of final completion; issue Certificates of Substantial Completion pursuant to Section 9.8; receive and forward to the Owner, for the Owner’s review and records, written warranties and related documents required by the Contract and assembled by the Contractor pursuant to Section 9.10; and issue a final Certificate for Payment pursuant to Section 9.10.

§ 4.2.10 If the Owner and Architect agree, the Architect will provide one or more Project representatives to assist in carrying out the Architect’s responsibilities at the site. The Owner shall notify the Contractor of any change in the duties, responsibilities and limitations of authority of the Project representatives.

§ 4.2.11 The Architect will interpret and decide matters concerning performance under, and requirements of, the Contract Documents on written request of either the Owner or Contractor. The Architect’s response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness.

§ 4.2.12 Interpretations and decisions of the Architect will be consistent with the intent of, and reasonably inferable from, the Contract Documents and will be in writing or in the form of drawings. When making such interpretations and decisions, the Architect will endeavor to secure faithful performance by both Owner and Contractor, will not show partiality to either, and will not be liable for results of interpretations or decisions rendered in good faith.

§ 4.2.13 The Architect’s decisions on matters relating to aesthetic effect will be final if consistent with the intent expressed in the Contract Documents.

§ 4.2.14 The Architect will review and respond to requests for information about the Contract Documents. The Architect’s response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness. If appropriate, the Architect will prepare and issue supplemental Drawings and Specifications in response to the requests for information.
ARTICLE 5  SUBCONTRACTORS
§ 5.1 Definitions
§ 5.1.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include a Separate Contractor or the subcontractors of a Separate Contractor.

§ 5.1.2 A Sub-subcontractor is a person or entity who has a direct or indirect contract with a Subcontractor to perform a portion of the Work at the site. The term "Sub-subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Sub-subcontractor or an authorized representative of the Sub-subcontractor.

§ 5.2 Award of Subcontracts and Other Contracts for Portions of the Work
§ 5.2.1 Unless otherwise stated in the Contract Documents, the Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the persons or entities proposed for each principal portion of the Work, including those who are to furnish materials or equipment fabricated to a special design. Within 14 days of receipt of the information, the Architect may notify the Contractor whether the Owner or the Architect (1) has reasonable objection to any such proposed person or entity or (2) requires additional time for review. Failure of the Architect to provide notice within the 14-day period shall constitute notice of no reasonable objection.

§ 5.2.2 The Contractor shall not contract with a proposed person or entity to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not be required to contract with anyone to whom the Contractor has made reasonable objection.

§ 5.2.3 If the Owner or Architect has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner or Architect has no reasonable objection. If the proposed but rejected Subcontractor was reasonably capable of performing the Work, the Contract Sum and Contract Time shall be increased or decreased by the difference, if any, occasioned by such change, and an appropriate Change Order shall be issued before commencement of the substitute Subcontractor’s Work. However, no increase in the Contract Sum or Contract Time shall be allowed for such change unless the Contractor has acted promptly and responsively in submitting names as required.

§ 5.2.4 The Contractor shall not substitute a Subcontractor, person, or entity for one previously selected if the Owner or Architect makes reasonable objection to such substitution.

§ 5.3 Subcontractual Relations
By appropriate written agreement, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities, including the responsibility for safety of the Subcontractor’s Work that the Contractor, by these Contract Documents, assumes toward the Owner and Architect. Each subcontract agreement shall preserve and protect the rights of the Owner and Architect under the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the subcontract agreement, the benefit of all rights, remedies, and redress against the Contractor that the Contractor, by the Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the subcontract agreement, copies of the Contract Documents to which the Subcontractor will be bound, and, upon written request of the Subcontractor, identify to the Subcontractor terms and conditions of the proposed subcontract agreement that may be at variance with the Contract Documents. Subcontractors will similarly make copies of applicable portions of such documents available to their respective proposed Sub-subcontractors.

§ 5.4 Contingent Assignment of Subcontracts
§ 5.4.1 Each subcontract agreement for a portion of the Work is assigned by the Contractor to the Owner, provided that

.1 assignment is effective only after termination of the Contract by the Owner for cause pursuant to Section 14.2 and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor; and

.2 assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.
When the Owner accepts the assignment of a subcontract agreement, the Owner assumes the Contractor’s rights and obligations under the subcontract.

§ 5.4.2 Upon such assignment, if the Work has been suspended for more than 30 days, the Subcontractor’s compensation shall be equitably adjusted for increases in cost resulting from the suspension.

§ 5.4.3 Upon assignment to the Owner under this Section 5.4, the Owner may further assign the subcontract to a successor contractor or other entity. If the Owner assigns the subcontract to a successor contractor or other entity, the Owner shall nevertheless remain legally responsible for all of the successor contractor’s obligations under the subcontract.

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

§ 6.1 Owner’s Right to Perform Construction and to Award Separate Contracts

§ 6.1.1 The term "Separate Contractor(s)" shall mean other contractors retained by the Owner under separate agreements. The Owner reserves the right to perform construction or operations related to the Project with the Owner’s own forces, and with Separate Contractors retained under Conditions of the Contract substantially similar to those of this Contract, including those provisions of the Conditions of the Contract related to insurance and waiver of subrogation.

§ 6.1.2 When separate contracts are awarded for different portions of the Project or other construction or operations on the site, the term "Contractor" in the Contract Documents in each case shall mean the Contractor who executes each separate Owner-Contractor Agreement.

§ 6.1.3 The Owner shall provide for coordination of the activities of the Owner’s own forces and of each Separate Contractor with the Work of the Contractor, who shall cooperate with them. The Contractor shall participate with any Separate Contractors and the Owner in reviewing their construction schedules. The Contractor shall make any revisions to its construction schedule deemed necessary after a joint review and mutual agreement. The construction schedules shall then constitute the schedules to be used by the Contractor, Separate Contractors, and the Owner until subsequently revised.

§ 6.1.4 Unless otherwise provided in the Contract Documents, when the Owner performs construction or operations related to the Project with the Owner’s own forces or with Separate Contractors, the Owner or its Separate Contractors shall have the same obligations and rights that the Contractor has under the Conditions of the Contract, including, without excluding others, those stated in Article 3, this Article 6, and Articles 10, 11, and 12.

§ 6.2 Mutual Responsibility

§ 6.2.1 The Contractor shall afford the Owner and Separate Contractors reasonable opportunity for introduction and storage of their materials and equipment and performance of their activities, and shall connect and coordinate the Contractor’s construction and operations with theirs as required by the Contract Documents.

§ 6.2.2 If part of the Contractor’s Work depends for proper execution or results upon construction or operations by the Owner or a Separate Contractor, the Contractor shall, prior to proceeding with that portion of the Work, promptly notify the Architect of apparent discrepancies or defects in the construction or operations by the Owner or Separate Contractor that would render it unsuitable for proper execution and results of the Contractor’s Work. Failure of the Contractor to notify the Architect of apparent discrepancies or defects prior to proceeding with the Work shall constitute an acknowledgment that the Owner’s or Separate Contractor’s completed or partially completed construction is fit and proper to receive the Contractor’s Work. The Contractor shall not be responsible for discrepancies or defects in the construction or operations by the Owner or Separate Contractor that are not apparent.

§ 6.2.3 The Contractor shall reimburse the Owner for costs the Owner incurs that are payable to a Separate Contractor because of the Contractor’s delays, improperly timed activities or defective construction. The Owner shall be responsible to the Contractor for costs the Contractor incurs because of a Separate Contractor’s delays, improperly timed activities, damage to the Work or defective construction.

§ 6.2.4 The Contractor shall promptly remedy damage that the Contractor wrongfully causes to completed or partially completed construction or to property of the Owner or Separate Contractor as provided in Section 10.2.5.
§ 6.2.5 The Owner and each Separate Contractor shall have the same responsibilities for cutting and patching as are described for the Contractor in Section 3.14.

§ 6.3 Owner's Right to Clean Up
If a dispute arises among the Contractor, Separate Contractors, and the Owner as to the responsibility under their respective contracts for maintaining the premises and surrounding area free from waste materials and rubbish, the Owner may clean up and the Architect will allocate the cost among those responsible.

ARTICLE 7  CHANGES IN THE WORK
§ 7.1 General
§ 7.1.1 Changes in the Work may be accomplished after execution of the Contract, and without invalidating the Contract, by Change Order, Construction Change Directive or order for a minor change in the Work, subject to the limitations stated in this Article 7 and elsewhere in the Contract Documents.

§ 7.1.2 A Change Order shall be based upon agreement among the Owner, Contractor, and Architect. A Construction Change Directive requires agreement by the Owner and Architect and may or may not be agreed to by the Contractor. An order for a minor change in the Work may be issued by the Architect alone.

§ 7.1.3 Changes in the Work shall be performed under applicable provisions of the Contract Documents. The Contractor shall proceed promptly with changes in the Work, unless otherwise provided in the Change Order, Construction Change Directive, or order for a minor change in the Work.

§ 7.2 Change Orders
§ 7.2.1 A Change Order is a written instrument prepared by the Architect and signed by the Owner, Contractor, and Architect stating their agreement upon all of the following:
   .1 The change in the Work;
   .2 The amount of the adjustment, if any, in the Contract Sum; and
   .3 The extent of the adjustment, if any, in the Contract Time.

§ 7.3 Construction Change Directives
§ 7.3.1 A Construction Change Directive is a written order prepared by the Architect and signed by the Owner and Architect, directing a change in the Work prior to agreement on adjustment, if any, in the Contract Sum or Contract Time, or both. The Owner may by Construction Change Directive, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions, or other revisions, the Contract Sum and Contract Time being adjusted accordingly.

§ 7.3.2 A Construction Change Directive shall be used in the absence of total agreement on the terms of a Change Order.

§ 7.3.3 If the Construction Change Directive provides for an adjustment to the Contract Sum, the adjustment shall be based on one of the following methods:
   .1 Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;
   .2 Unit prices stated in the Contract Documents or subsequently agreed upon;
   .3 Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or
   .4 As provided in Section 7.3.4.

§ 7.3.4 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Architect shall determine the adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit as set forth in the Agreement, or if no such amount is set forth in the Agreement, a reasonable amount. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Architect may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.4 shall be limited to the following:
.1 Costs of labor, including applicable payroll taxes, fringe benefits required by agreement or custom, workers’ compensation insurance, and other employee costs approved by the Architect;
.2 Costs of materials, supplies, and equipment, including cost of transportation, whether incorporated or consumed;
.3 Rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;
.4 Costs of premiums for all bonds and insurance, permit fees, and sales, use, or similar taxes, directly related to the change; and
.5 Costs of supervision and field office personnel directly attributable to the change.

§ 7.3.5 If the Contractor disagrees with the adjustment in the Contract Time, the Contractor may make a Claim in accordance with applicable provisions of Article 15.

§ 7.3.6 Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Architect of the Contractor’s agreement or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum or Contract Time.

§ 7.3.7 A Construction Change Directive signed by the Contractor indicates the Contractor’s agreement therewith, including adjustment in Contract Sum and Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a Change Order.

§ 7.3.8 The amount of credit to be allowed by the Contractor to the Owner for a deletion or change that results in a net decrease in the Contract Sum shall be actual net cost as confirmed by the Architect. When both additions and credits covering related Work or substitutions are involved in a change, the allowance for overhead and profit shall be figured on the basis of net increase, if any, with respect to that change.

§ 7.3.9 Pending final determination of the total cost of a Construction Change Directive to the Owner, the Contractor may request payment for Work completed under the Construction Change Directive in Applications for Payment. The Architect will make an interim determination for purposes of monthly certification for payment for those costs and certify for payment the amount that the Architect determines, in the Architect’s professional judgment, to be reasonably justified. The Architect’s interim determination of cost shall adjust the Contract Sum on the same basis as a Change Order, subject to the right of either party to disagree and assert a Claim in accordance with Article 15.

§ 7.3.10 When the Owner and Contractor agree with a determination made by the Architect concerning the adjustments in the Contract Sum and Contract Time, or otherwise reach agreement upon the adjustments, such agreement shall be effective immediately and the Architect will prepare a Change Order. Change Orders may be issued for all or any part of a Construction Change Directive.

§ 7.4 Minor Changes in the Work
The Architect may order minor changes in the Work that are consistent with the intent of the Contract Documents and do not involve an adjustment in the Contract Sum or an extension of the Contract Time. The Architect’s order for minor changes shall be in writing. If the Contractor believes that the proposed minor change in the Work will affect the Contract Sum or Contract Time, the Contractor shall notify the Architect and shall not proceed to implement the change in the Work. If the Contractor performs the Work set forth in the Architect’s order for a minor change without prior notice to the Architect that such change will affect the Contract Sum or Contract Time, the Contractor waives any adjustment to the Contract Sum or extension of the Contract Time.

ARTICLE 8 TIME
§ 8.1 Definitions
§ 8.1.1 Unless otherwise provided, Contract Time is the period of time, including authorized adjustments, allotted in the Contract Documents for Substantial Completion of the Work.

§ 8.1.2 The date of commencement of the Work is the date established in the Agreement.

§ 8.1.3 The date of Substantial Completion is the date certified by the Architect in accordance with Section 9.8.
§ 8.1.4 The term "day" as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.

§ 8.2 Progress and Completion
§ 8.2.1 Time limits stated in the Contract Documents are of the essence of the Contract. By executing the Agreement, the Contractor confirms that the Contract Time is a reasonable period for performing the Work.

§ 8.2.2 The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, commence the Work prior to the effective date of insurance required to be furnished by the Contractor and Owner.

§ 8.2.3 The Contractor shall proceed expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time.

§ 8.3 Delays and Extensions of Time
§ 8.3.1 If the Contractor is delayed at any time in the commencement or progress of the Work by (1) an act or neglect of the Owner or Architect, of an employee of either, or of a Separate Contractor; (2) by changes ordered in the Work; (3) by labor disputes, fire, unusual delay in deliveries, unavoidable casualties, adverse weather conditions documented in accordance with Section 15.1.6.2, or other causes beyond the Contractor's control; (4) by delay authorized by the Owner pending mediation and binding dispute resolution; or (5) by other causes that the Contractor asserts, and the Architect determines, justify delay, then the Contract Time shall be extended for such reasonable time as the Architect may determine.

§ 8.3.2 Claims relating to time shall be made in accordance with applicable provisions of Article 15.

§ 8.3.3 This Section 8.3 does not preclude recovery of damages for delay by either party under other provisions of the Contract Documents.

ARTICLE 9 PAYMENTS AND COMPLETION
§ 9.1 Contract Sum
§ 9.1.1 The Contract Sum is stated in the Agreement and, including authorized adjustments, is the total amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents.

§ 9.1.2 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed so that application of such unit prices to the actual quantities causes substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted.

§ 9.2 Schedule of Values
Where the Contract is based on a stipulated sum or Guaranteed Maximum Price, the Contractor shall submit a schedule of values to the Architect before the first Application for Payment, allocating the entire Contract Sum to the various portions of the Work. The schedule of values shall be prepared in the form, and supported by the data to substantiate its accuracy, required by the Architect. This schedule, unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment. Any changes to the schedule of values shall be submitted to the Architect and supported by such data to substantiate its accuracy as the Architect may require, and unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's subsequent Applications for Payment.

§ 9.3 Applications for Payment
§ 9.3.1 At least ten days before the date established for each progress payment, the Contractor shall submit to the Architect an itemized Application for Payment prepared in accordance with the schedule of values, if required under Section 9.2, for completed portions of the Work. The application shall be notarized, if required, and supported by all data substantiating the Contractor's right to payment that the Owner or Architect require, such as copies of requisitions, and releases and waivers of liens from Subcontractors and suppliers, and shall reflect retainage if provided for in the Contract Documents.

§ 9.3.1.1 As provided in Section 7.3.9, such applications may include requests for payment on account of changes in the Work that have been properly authorized by Construction Change Directives, or by interim determinations of the Architect, but not yet included in Change Orders.

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§ 9.3.2 Applications for Payment shall not include requests for payment for portions of the Work for which the Contractor does not intend to pay a Subcontractor or supplier, unless such Work has been performed by others whom the Contractor intends to pay.

§ 9.3.3 The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all Work for which Certificates for Payment have been previously issued and payments received from the Owner shall, to the best of the Contractor’s knowledge, information, and belief, be free and clear of liens, claims, security interests, or encumbrances, in favor of the Contractor, Subcontractors, suppliers, or other persons or entities that provided labor, materials, and equipment relating to the Work.

§ 9.4 Certificates for Payment
§ 9.4.1 The Architect will, within seven days after receipt of the Contractor’s Application for Payment, either (1) issue to the Owner a Certificate for Payment in the full amount of the Application for Payment, with a copy to the Contractor; or (2) issue to the Owner a Certificate for Payment for such amount as the Architect determines is properly due, and notify the Contractor and Owner of the Architect’s reasons for withholding certification in part as provided in Section 9.5.1; or (3) withhold certification of the entire Application for Payment, and notify the Contractor and Owner of the Architect’s reason for withholding certification in whole as provided in Section 9.5.1.

§ 9.4.2 The issuance of a Certificate for Payment will constitute a representation by the Architect to the Owner, based on the Architect’s evaluation of the Work and the data in the Application for Payment, that, to the best of the Architect’s knowledge, information, and belief, the Work has progressed to the point indicated, the quality of the Work is in accordance with the Contract Documents, and that the Contractor is entitled to payment in the amount certified. The foregoing representations are subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to results of subsequent tests and inspections, to correction of minor deviations from the Contract Documents prior to completion, and to specific qualifications expressed by the Architect. However, the issuance of a Certificate for Payment will not be a representation that the Architect has (1) made exhaustive or continuous on-site inspections to check the quality or quantity of the Work; (2) reviewed construction means, methods, techniques, sequences, or procedures; (3) reviewed copies of requisitions received from Subcontractors and suppliers and other data requested by the Owner; to substantiate the Contractor’s right to payment; or (4) made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum.

§ 9.5 Decisions to Withhold Certification
§ 9.5.1 The Architect may withhold a Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Architect’s opinion the representations to the Owner required by Section 9.4.2 cannot be made. If the Architect is unable to certify payment in the amount of the Application, the Architect will notify the Contractor and Owner as provided in Section 9.4.1. If the Contractor and Architect cannot agree on a revised amount, the Architect will promptly issue a Certificate for Payment for the amount for which the Architect is able to make such representations to the Owner. The Architect may also withhold a Certificate for Payment or, because of subsequently discovered evidence, may nullify the whole or a part of a Certificate for Payment previously issued, to such extent as may be necessary in the Architect’s opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from acts and omissions described in Section 3.3.2, because of

. .1 defective Work not remedied;
. .2 third party claims filed or reasonable evidence indicating probable filing of such claims, unless security acceptable to the Owner is provided by the Contractor;
. .3 failure of the Contractor to make payments properly to Subcontractors or suppliers for labor, materials or equipment;
reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;

damage to the Owner or a Separate Contractor;

reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or

repeated failure to carry out the Work in accordance with the Contract Documents.

§ 9.5.2 When either party disputes the Architect's decision regarding a Certificate for Payment under Section 9.5.1, in whole or in part, that party may submit a Claim in accordance with Article 15.

§ 9.5.3 When the reasons for withholding certification are removed, certification will be made for amounts previously withheld.

§ 9.5.4 If the Architect withholds certification for payment under Section 9.5.1.3, the Owner may, at its sole option, issue joint checks to the Contractor and to any Subcontractor or supplier to whom the Contractor failed to make payment for Work properly performed or material or equipment suitably delivered. If the Owner makes payments by joint check, the Owner shall notify the Architect and the Contractor shall reflect such payment on its next Application for Payment.

§ 9.6 Progress Payments

§ 9.6.1 After the Architect has issued a Certificate for Payment, the Owner shall make payment in the manner and within the time provided in the Contract Documents, and shall so notify the Architect.

§ 9.6.2 The Contractor shall pay each Subcontractor, no later than seven days after receipt of payment from the Owner, the amount to which the Subcontractor is entitled, reflecting percentages actually retained from payments to the Contractor on account of the Subcontractor's portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in a similar manner.

§ 9.6.3 The Architect will, on request, furnish to a Subcontractor, if practicable, information regarding percentages of completion or amounts applied for by the Contractor and action taken thereon by the Architect and Owner on account of portions of the Work done by such Subcontractor.

§ 9.6.4 The Owner has the right to request written evidence from the Contractor that the Contractor has properly paid Subcontractors and suppliers amounts paid by the Owner to the Contractor for subcontracted Work. If the Contractor fails to furnish such evidence within seven days, the Owner shall have the right to contact Subcontractors and suppliers to ascertain whether they have been properly paid. Neither the Owner nor Architect shall have an obligation to pay, or to see to the payment of money to, a Subcontractor or supplier, except as may otherwise be required by law.

§ 9.6.5 The Contractor's payments to suppliers shall be treated in a manner similar to that provided in Sections 9.6.2, 9.6.3 and 9.6.4.

§ 9.6.6 A Certificate for Payment, a progress payment, or partial or entire use or occupancy of the Project by the Owner shall not constitute acceptance of Work not in accordance with the Contract Documents.

§ 9.6.7 Unless the Contractor provides the Owner with a payment bond in the full penal sum of the Contract Sum, payments received by the Contractor for Work properly performed by Subcontractors or provided by suppliers shall be held by the Contractor for those Subcontractors or suppliers who performed Work or furnished materials, or both, under contract with the Contractor for which payment was made by the Owner. Nothing contained herein shall require money to be placed in a separate account and not commingled with money of the Contractor, create any fiduciary liability or tort liability on the part of the Contractor for breach of trust, or entitle any person or entity to an award of punitive damages against the Contractor for breach of the requirements of this provision.

§ 9.6.8 Provided the Owner has fulfilled its payment obligations under the Contract Documents, the Contractor shall defend and indemnify the Owner from all loss, liability, damage or expense, including reasonable attorney's fees and litigation expenses, arising out of any lien claim or other claim for payment by any Subcontractor or supplier of any tier. Upon receipt of notice of a lien claim or other claim for payment, the Owner shall notify the Contractor. If approved by the applicable court, when required, the Contractor may substitute a surety bond for the property against which the lien or other claim for payment has been asserted.
§ 9.7 Failure of Payment
If the Architect does not issue a Certificate for Payment, through no fault of the Contractor, within seven days after receipt of the Contractor's Application for Payment, or if the Owner does not pay the Contractor within seven days after the date established in the Contract Documents, the amount certified by the Architect or awarded by binding dispute resolution, then the Contractor may, upon seven additional days' notice to the Owner and Architect, stop the Work until payment of the amount owing has been received. The Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided for in the Contract Documents.

§ 9.8 Substantial Completion
§ 9.8.1 Substantial Completion is the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use.

§ 9.8.2 When the Contractor considers that the Work, or a portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor shall prepare and submit to the Architect a comprehensive list of items to be completed or corrected prior to final payment. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

§ 9.8.3 Upon receipt of the Contractor's list, the Architect will make an inspection to determine whether the Work or designated portion thereof is substantially complete. If the Architect's inspection discloses any item, whether or not included on the Contractor's list, which is not sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work or designated portion thereof for its intended use, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Architect. In such case, the Contractor shall then submit a request for another inspection by the Architect to determine Substantial Completion.

§ 9.8.4 When the Work or designated portion thereof is substantially complete, the Architect will prepare a Certificate of Substantial Completion that shall establish the date of Substantial Completion; establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance; and fix the time within which the Contractor shall finish all items on the list accompanying the Certificate. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion.

§ 9.8.5 The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in the Certificate. Upon such acceptance, and consent of surety if any, the Owner shall make payment of retainage applying to the Work or designated portion thereof. Such payment shall be adjusted for Work that is incomplete or not in accordance with the requirements of the Contract Documents.

§ 9.9 Partial Occupancy or Use
§ 9.9.1 The Owner may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated by separate agreement with the Contractor, provided such occupancy or use is consented to by the insurer and authorized by public authorities having jurisdiction over the Project. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage, if any, security, maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor considers a portion substantially complete, the Contractor shall prepare and submit a list to the Architect as provided under Section 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect.

§ 9.9.2 Immediately prior to such partial occupancy or use, the Owner, Contractor, and Architect shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.
§ 9.9.3 Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.

§ 9.10 Final Completion and Final Payment
§ 9.10.1 Upon receipt of the Contractor’s notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Architect will promptly make such inspection. When the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Architect will promptly issue a final Certificate for Payment stating that to the best of the Architect’s knowledge, information and belief, and on the basis of the Architect’s on-site visits and inspections, the Work has been completed in accordance with the Contract Documents and that the entire balance found to be due the Contractor and noted in the final Certificate is due and payable. The Architect’s final Certificate for Payment will constitute a further representation that conditions listed in Section 9.10.2 as precedent to the Contractor’s being entitled to final payment have been fulfilled.

§ 9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner’s property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect, (3) a written statement that the Contractor knows of no reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment, (5) documentation of any special warranties, such as manufacturers’ warranties or specific Subcontractor warranties, and (6) if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts and releases and waivers of liens, claims, security interests, or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien, claim, security interest, or encumbrance. If a lien, claim, security interest, or encumbrance remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging the lien, claim, security interest, or encumbrance, including all costs and reasonable attorneys’ fees.

§ 9.10.3 If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the Architect so confirms, the Owner shall, upon application by the Contractor and certification by the Architect, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed, corrected, and accepted. If the remaining balance for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, and if bonds have been furnished, the written consent of the surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Architect prior to certification of such payment. Such payment shall be made under terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.

§ 9.10.4 The making of final payment shall constitute a waiver of Claims by the Owner except those arising from

-1 liens, Claims, security interests, or encumbrances arising out of the Contract and unsettled;
-2 failure of the Work to comply with the requirements of the Contract Documents;
-3 terms of special warranties required by the Contract Documents; or
-4 audits performed by the Owner, if permitted by the Contract Documents, after final payment.

§ 9.10.5 Acceptance of final payment by the Contractor, a Subcontractor, or a supplier, shall constitute a waiver of claims by that payee except those previously made in writing and identified by that payee as unsettled at the time of final Application for Payment.

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY
§ 10.1 Safety Precautions and Programs
The Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the performance of the Contract.

§ 10.2 Safety of Persons and Property
§ 10.2.1 The Contractor shall take reasonable precautions for safety of, and shall provide reasonable protection to prevent damage, injury, or loss to
employees on the Work and other persons who may be affected thereby;

2. the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody, or control of the Contractor, a Subcontractor, or a Sub-subcontractor; and

3. other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation, or replacement in the course of construction.

§ 10.2.2 The Contractor shall comply with, and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities, bearing on safety of persons or property or their protection from damage, injury, or loss.

§ 10.2.3 The Contractor shall implement, erect, and maintain, as required by existing conditions and performance of the Contract, reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards; promulgating safety regulations; and notifying the owners and users of adjacent sites and utilities of the safeguards.

§ 10.2.4 When use or storage of explosives or other hazardous materials or equipment, or unusual methods are necessary for execution of the Work, the Contractor shall exercise utmost care and carry on such activities under supervision of properly qualified personnel.

§ 10.2.5 The Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in Sections 10.2.1.2 and 10.2.1.3 caused in whole or in part by the Contractor, a Subcontractor, a Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible under Sections 10.2.1.2 and 10.2.1.3. The Contractor may make a Claim for the cost to remedy the damage or loss to the extent such damage or loss is attributable to acts or omissions of the Owner or Architect or anyone directly or indirectly employed by either of them, or by anyone for whose acts either of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Section 3.18.

§ 10.2.6 The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner and Architect.

§ 10.2.7 The Contractor shall not permit any part of the construction or site to be loaded so as to cause damage or create an unsafe condition.

§ 10.2.8 Injury or Damage to Person or Property
If either party suffers injury or damage to person or property because of an act or omission of the other party, or of others for whose acts such party is legally responsible, notice of the injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding 21 days after discovery. The notice shall provide sufficient detail to enable the other party to investigate the matter.

§ 10.3 Hazardous Materials and Substances
§ 10.3.1 The Contractor is responsible for compliance with any requirements included in the Contract Documents regarding hazardous materials or substances. If the Contractor encounters a hazardous material or substance not addressed in the Contract Documents and if reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a material or substance, including but not limited to asbestos or polychlorinated biphenyl (PCB), encountered on the site by the Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and notify the Owner and Architect of the condition.

§ 10.3.2 Upon receipt of the Contractor's notice, the Owner shall obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to cause it to be rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of the material or substance or who are to perform the task of removal or safe containment of the material or substance. The Contractor and the Architect will
promptly reply to the Owner in writing stating whether or not either has reasonable objection to the persons or entities proposed by the Owner. If either the Contractor or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor and the Architect have no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. By Change Order, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable additional costs of shutdown, delay, and start-up.

§ 10.3.3 To the fullest extent permitted by law, the Owner shall indemnify and hold harmless the Contractor, Subcontractors, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work in the affected area if in fact the material or substance presents the risk of bodily injury or death as described in Section 10.3.1 and has not been rendered harmless, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), except to the extent that such damage, loss, or expense is due to the fault or negligence of the party seeking indemnity.

§ 10.3.4 The Owner shall not be responsible under this Section 10.3 for hazardous materials or substances the Contractor brings to the site unless such materials or substances are required by the Contract Documents. The Owner shall be responsible for hazardous materials or substances required by the Contract Documents, except to the extent of the Contractor's fault or negligence in the use and handling of such materials or substances.

§ 10.3.5 The Contractor shall reimburse the Owner for the cost and expense the Owner incurs (1) for remediation of hazardous materials or substances the Contractor brings to the site and negligently handles, or (2) where the Contractor fails to perform its obligations under Section 10.3.1, except to the extent that the cost and expense are due to the Owner's fault or negligence.

§ 10.3.6 If, without negligence on the part of the Contractor, the Contractor is held liable by a government agency for the cost of remediation of a hazardous material or substance solely by reason of performing work as required by the Contract Documents, the Owner shall reimburse the Contractor for all cost and expense thereby incurred.

§ 10.4 Emergencies
In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury, or loss. Additional compensation or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Article 15 and Article 7.

ARTICLE 11 INSURANCE AND BONDS
§ 11.1 Contractor's Insurance and Bonds
§ 11.1.1 The Contractor shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Contractor shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Owner, Architect, and Architect's consultants shall be named as additional insureds under the Contractor's commercial general liability policy or as otherwise described in the Contract Documents.

§ 11.1.2 The Contractor shall provide surety bonds of the types, for such penal sums, and subject to such terms and conditions as required by the Contract Documents. The Contractor shall purchase and maintain the required bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

§ 11.1.3 Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the bonds or shall authorize a copy to be furnished.

§ 11.1.4 Notice of Cancellation or Expiration of Contractor's Required Insurance. Within three (3) business days of the date the Contractor becomes aware of an impending or actual cancellation or expiration of any insurance required by the Contract Documents, the Contractor shall provide notice to the Owner of such impending or actual cancellation or expiration. Upon receipt of notice from the Contractor, the Owner shall, unless the lapse in coverage arises from an act
or omission of the Owner, have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by the Contractor. The furnishing of notice by the Contractor shall not relieve the Contractor of any contractual obligation to provide any required coverage.

§ 11.2 Owner's Insurance
§ 11.2.1 The Owner shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Owner shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located.

§ 11.2.2 Failure to Purchase Required Property Insurance. If the Owner fails to purchase and maintain the required property insurance, with all of the coverages and in the amounts described in the Agreement or elsewhere in the Contract Documents, the Owner shall inform the Contractor in writing prior to commencement of the Work. Upon receipt of notice from the Owner, the Contractor may delay commencement of the Work and may obtain insurance that will protect the interests of the Contractor, Subcontractors, and Sub-Subcontractors in the Work. When the failure to provide coverage has been cured or resolved, the Contract Sum and Contract Time shall be equitably adjusted. In the event the Owner fails to procure coverage, the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent the loss to the Owner would have been covered by the insurance to have been procured by the Owner. The cost of the insurance shall be charged to the Owner by a Change Order. If the Owner does not provide written notice, and the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain the required insurance, the Owner shall reimburse the Contractor for all reasonable costs and damages attributable thereto.

§ 11.2.3 Notice of Cancellation or Expiration of Owner's Required Property Insurance. Within three (3) business days of the date the Owner becomes aware of an impending or actual cancellation or expiration of any property insurance required by the Contract Documents, the Owner shall provide notice to the Contractor of such impending or actual cancellation or expiration. Unless the lapse in coverage arises from an act or omission of the Contractor: (1) the Contractor, upon receipt of notice from the Owner, shall have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by either the Owner or the Contractor; (2) the Contract Time and Contract Sum shall be equitably adjusted; and (3) the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent any loss to the Owner would have been covered by the insurance had it not expired or been cancelled. If the Contractor purchases replacement coverage, the cost of the insurance shall be charged to the Owner by an appropriate Change Order. The furnishing of notice by the Owner shall not relieve the Owner of any contractual obligation to provide required insurance.

§ 11.3 Waivers of Subrogation
§ 11.3.1 The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents, and employees, each of the other; (2) the Architect and Architect's consultants; and (3) Separate Contractors, if any, and any of their subcontractors, sub-subcontractors, agents, and employees, for damages caused by fire, or other causes of loss, to the extent those losses are covered by property insurance required by the Agreement or other property insurance applicable to the Project, except such rights as they have to proceed of such insurance. The Owner or Contractor, as appropriate, shall require similar written waivers in favor of the individuals and entities identified above from the Architect, Architect's consultants, Separate Contractors, subcontractors, and sub-subcontractors. The policies of insurance purchased and maintained by each person or entity agreeing to waive claims pursuant to this section 11.3.1 shall not prohibit this waiver of subrogation. This waiver of subrogation shall be effective as to a person or entity (1) even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, (2) even though that person or entity did not pay the insurance premium directly or indirectly, or (3) whether or not the person or entity had an insurable interest in the damaged property.

§ 11.3.2 If during the Project construction period the Owner insures properties, real or personal or both, at or adjacent to the site by property insurance under policies separate from those insuring the Project, or if after final payment property insurance is to be provided on the completed Project through a policy or policies other than those insuring the Project during the construction period, to the extent permissible by such policies, the Owner waives all rights in accordance with the terms of Section 11.3.1 for damages caused by fire or other causes of loss covered by this separate property insurance.

§ 11.4 Loss of Use, Business Interruption, and Delay in Completion Insurance
The Owner, at the Owner’s option, may purchase and maintain insurance that will protect the Owner against loss of use of the Owner’s property, or the inability to conduct normal operations, due to fire or other causes of loss. The Owner waives all rights of action against the Contractor and Architect for loss of use of the Owner’s property, due to fire or other hazards however caused.

§11.5 Adjustment and Settlement of Insured Loss
§ 11.5.1 A loss insured under the property insurance required by the Agreement shall be adjusted by the Owner as fiduciary and made payable to the Owner as fiduciary for the insureds, as their interests may appear, subject to requirements of any applicable mortgagee clause and of Section 11.5.2. The Owner shall pay the Architect and Contractor their just shares of insurance proceeds received by the Owner, and by appropriate agreements the Architect and Contractor shall make payments to their consultants and Subcontractors in similar manner.

§ 11.5.2 Prior to settlement of an insured loss, the Owner shall notify the Contractor of the terms of the proposed settlement as well as the proposed allocation of the insurance proceeds. The Contractor shall have 14 days from receipt of notice to object to the proposed settlement or allocation of the proceeds. If the Contractor does not object, the Owner shall settle the loss and the Contractor shall be bound by the settlement and allocation. Upon receipt, the Owner shall deposit the insurance proceeds in a separate account and make the appropriate distributions. Thereafter, if no other agreement is made or the Owner does not terminate the Contract for convenience, the Owner and Contractor shall execute a Change Order for reconstruction of the damaged or destroyed Work in the amount allocated for that purpose. If the Contractor timely objects to either the terms of the proposed settlement or the allocation of the proceeds, the Owner may proceed to settle the insured loss, and any dispute between the Owner and Contractor arising out of the settlement or allocation of the proceeds shall be resolved pursuant to Article 15. Pending resolution of any dispute, the Owner may issue a Construction Change Directive for the reconstruction of the damaged or destroyed Work.

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK
§ 12.1 Uncovering of Work
§ 12.1.1 If a portion of the Work is covered contrary to the Architect’s request or to requirements specifically expressed in the Contract Documents, it must, if requested in writing by the Architect, be uncovered for the Architect’s examination and be replaced at the Contractor’s expense without change in the Contract Time.

§ 12.1.2 If a portion of the Work has been covered that the Architect has not specifically requested to examine prior to its being covered, the Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, the Contractor shall be entitled to an equitable adjustment to the Contract Sum and Contract Time as may be appropriate. If such Work is not in accordance with the Contract Documents, the costs of uncovering the Work, and the cost of correction, shall be at the Contractor’s expense.

§ 12.2 Correction of Work
§ 12.2.1 Before Substantial Completion
The Contractor shall promptly correct Work rejected by the Architect or failing to conform to the requirements of the Contract Documents, discovered before Substantial Completion and whether or not fabricated, installed or completed. Costs of correcting such rejected Work, including additional testing and inspections, the cost of uncovering and replacement, and compensation for the Architect’s services and expenses made necessary thereby, shall be at the Contractor’s expense.

§ 12.2.2 After Substantial Completion
§ 12.2.2.1 In addition to the Contractor’s obligations under Section 3.5, if, within one year after the date of Substantial Completion of the Work or designated portion thereof or after the date for commencement of warranties established under Section 9.9.1, or by terms of any applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of notice from the Owner to do so, unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. During the one-year period for correction of Work, if the Owner fails to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor and to make a claim for breach of warranty. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner or Architect, the Owner may correct it in accordance with Section 2.5.
§ 12.2.2.2 The one-year period for correction of Work shall be extended with respect to portions of Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual completion of that portion of the Work.

§ 12.2.2.3 The one-year period for correction of Work shall net be extended by corrective Work performed by the Contractor pursuant to this Section 12.2.

§ 12.2.3 The Contractor shall remove from the site portions of the Work that are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

§ 12.2.4 The Contractor shall bear the cost of correcting destroyed or damaged construction of the Owner or Separate Contractors, whether completed or partially completed, caused by the Contractor’s correction or removal of Work that is not in accordance with the requirements of the Contract Documents.

§ 12.2.5 Nothing contained in this Section 12.2 shall be construed to establish a period of limitation with respect to other obligations the Contractor has under the Contract Documents. Establishment of the one-year period for correction of Work as described in Section 12.2.2 relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor’s liability with respect to the Contractor’s obligations other than specifically to correct the Work.

§ 12.3 Acceptance of Nonconforming Work
If the Owner prefers to accept Work that is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Sum will be reduced as appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.

ARTICLE 13 MISCELLANEOUS PROVISIONS
§ 13.1 Governing Law
The Contract shall be governed by the law of the place where the Project is located, excluding that jurisdiction’s choice of law rules. If the parties have selected arbitration as the method of binding dispute resolution, the Federal Arbitration Act shall govern Section 15.4.

§ 13.2 Successors and Assigns
§ 13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns, and legal representatives to covenants, agreements, and obligations contained in the Contract Documents. Except as provided in Section 13.2.2, neither party to the Contract shall assign the Contract as a whole without written consent of the other. If either party attempts to make an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

§ 13.2.2 The Owner may, without consent of the Contractor, assign the Contract to a lender providing construction financing for the Project, if the lender assumes the Owner’s rights and obligations under the Contract Documents. The Contractor shall execute all consents reasonably required to facilitate the assignment.

§ 13.3 Rights and Remedies
§ 13.3.1 Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights, and remedies otherwise imposed or available by law.

§ 13.3.2 No action or failure to act by the Owner, Architect, or Contractor shall constitute a waiver of a right or duty afforded them under the Contract, nor shall such action or failure to act constitute approval of or acquiescence in a breach thereunder, except as may be specifically agreed upon in writing.

§ 13.4 Tests and Inspections
§ 13.4.1 Tests, inspections, and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules, and regulations or lawful orders of public authorities. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections, and
approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections, and approvals. The Contractor shall give the Architect timely notice of when and where tests and inspections are to be made so that the Architect may be present for such procedures. The Owner shall bear costs of tests, inspections, or approvals that do not become requirements until after bids are received or negotiations concluded. The Owner shall directly arrange and pay for tests, inspections, or approvals where building codes or applicable laws or regulations so require.

§ 13.4.2 If the Architect, Owner, or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection, or approval not included under Section 13.4.1, the Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection, or approval, by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Architect of when and where tests and inspections are to be made so that the Architect may be present for such procedures. Such costs, except as provided in Section 13.4.3, shall be at the Owner’s expense.

§ 13.4.3 If procedures for testing, inspection, or approval under Sections 13.4.1 and 13.4.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure, including those of repeated procedures and compensation for the Architect’s services and expenses, shall be at the Contractor’s expense.

§ 13.4.4 Required certificates of testing, inspection, or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor and promptly delivered to the Architect.

§ 13.4.5 If the Architect is to observe tests, inspections, or approvals required by the Contract Documents, the Architect will do so promptly and, where practicable, at the normal place of testing.

§ 13.4.6 Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work.

§ 13.5 Interest
Payments due and unpaid under the Contract Documents shall bear interest from the date payment is due at the rate the parties agree upon in writing or, in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT
§ 14.1 Termination by the Contractor
§ 14.1.1 The Contractor may terminate the Contract if the Work is stopped for a period of 30 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, for any of the following reasons:
.1 Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped;
.2 An act of government, such as a declaration of national emergency, that requires all Work to be stopped;
.3 Because the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4.1, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents; or
.4 The Owner has failed to furnish to the Contractor reasonable evidence as required by Section 2.2.

§ 14.1.2 The Contractor may terminate the Contract if, through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, repeated suspensions, delays, or interruptions of the entire Work by the Owner as described in Section 14.3, constitute in the aggregate more than 100 percent of the total number of days scheduled for completion, or 120 days in any 365-day period, whichever is less.

§ 14.1.3 If one of the reasons described in Section 14.1.1 or 14.1.2 exists, the Contractor may, upon seven days’ notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed, as well as reasonable overhead and profit on Work not executed, and costs incurred by reason of such termination.
§ 14.1.4 If the Work is stopped for a period of 60 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, or their agents or employees or any other persons or entities performing portions of the Work because the Owner has repeatedly failed to fulfill the Owner’s obligations under the Contract Documents with respect to matters important to the progress of the Work, the Contractor may, upon seven additional days’ notice to the Owner and the Architect, terminate the Contract and recover from the Owner as provided in Section 14.1.3.

§ 14.2 Termination by the Owner for Cause
§ 14.2.1 The Owner may terminate the Contract if the Contractor
  .1 repeatedly refuses or fails to supply enough properly skilled workers or proper materials;
  .2 fails to make payment to Subcontractors or suppliers in accordance with the respective agreements between the Contractor and the Subcontractors or suppliers;
  .3 repeatedly disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority; or
  .4 otherwise is guilty of substantial breach of a provision of the Contract Documents.

§ 14.2.2 When any of the reasons described in Section 14.2.1 exist, and upon certification by the Architect that sufficient cause exists to justify such action, the Owner may, without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor’s surety, if any, seven days’ notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:
  .1 Exclude the Contractor from the site and take possession of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;
  .2 Accept assignment of subcontracts pursuant to Section 5.4; and
  .3 Finish the Work by whatever reasonable method the Owner may deem expedient. Upon written request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.

§ 14.2.3 When the Owner terminates the Contract for one of the reasons stated in Section 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished.

§ 14.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Architect’s services and expenses made necessary thereby, and other damages incurred by the Owner and not expressly waived, such excess shall be paid to the Contractor. If such costs and damages exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case may be, shall be certified by the Initial Decision Maker, upon application, and this obligation for payment shall survive termination of the Contract.

§ 14.3 Suspension by the Owner for Convenience
§ 14.3.1 The Owner may, without cause, order the Contractor in writing to suspend, delay or interrupt the Work, in whole or in part for such period of time as the Owner may determine.

§ 14.3.2 The Contract Sum and Contract Time shall be adjusted for increases in the cost and time caused by suspension, delay, or interruption under Section 14.3.1. Adjustment of the Contract Sum shall include profit. No adjustment shall be made to the extent
  .1 that performance is, was, or would have been, so suspended, delayed, or interrupted, by another cause for which the Contractor is responsible; or
  .2 that an equitable adjustment is made or denied under another provision of the Contract.

§ 14.4 Termination by the Owner for Convenience
§ 14.4.1 The Owner may, at any time, terminate the Contract for the Owner’s convenience and without cause.

§ 14.4.2 Upon receipt of notice from the Owner of such termination for the Owner’s convenience, the Contractor shall
  .1 cease operations as directed by the Owner in the notice;
  .2 take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and
  .3 except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.
§ 14.4.3 In case of such termination for the Owner’s convenience, the Owner shall pay the Contractor for Work properly executed; costs incurred by reason of the termination, including costs attributable to termination of Subcontracts; and the termination fee, if any, set forth in the Agreement.

ARTICLE 15 CLAIMS AND DISPUTES
§ 15.1 Claims
§ 15.1.1 Definition
A Claim is a demand or assertion by one of the parties seeking, as a matter of right, payment of money, a change in the Contract Time, or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. The responsibility to substantiate Claims shall rest with the party making the Claim. This Section 15.1.1 does not require the Owner to file a Claim in order to impose liquidated damages in accordance with the Contract Documents.

§ 15.1.2 Time Limits on Claims
The Owner and Contractor shall commence all Claims and causes of action against the other and arising out of or related to the Contract, whether in contract, tort, breach of warranty or otherwise, in accordance with the requirements of the binding dispute resolution method selected in the Agreement and within the period specified by applicable law, but in any case not more than 10 years after the date of Substantial Completion of the Work. The Owner and Contractor waive all Claims and causes of action not commenced in accordance with this Section 15.1.2.

§ 15.1.3 Notice of Claims
§ 15.1.3.1 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered prior to expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party and to the Initial Decision Maker with a copy sent to the Architect, if the Architect is not serving as the Initial Decision Maker. Claims by either party under this Section 15.1.3.1 shall be initiated within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later.

§ 15.1.3.2 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party. In such event, no decision by the Initial Decision Maker is required.

§ 15.1.4 Continuing Contract Performance
§ 15.1.4.1 Pending final resolution of a Claim, except as otherwise agreed in writing or as provided in Section 9.7 and Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents.

§ 15.1.4.2 The Contract Sum and Contract Time shall be adjusted in accordance with the Initial Decision Maker’s decision, subject to the right of either party to proceed in accordance with this Article 15. The Architect will issue Certificates for Payment in accordance with the decision of the Initial Decision Maker.

§ 15.1.5 Claims for Additional Cost
If the Contractor wishes to make a Claim for an increase in the Contract Sum, notice as provided in Section 15.1.3 shall be given before proceeding to execute the portion of the Work that is the subject of the Claim. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4.

§ 15.1.6 Claims for Additional Time
§ 15.1.6.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, notice as provided in Section 15.1.3 shall be given. The Contractor’s Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay, only one Claim is necessary.

§ 15.1.6.2 If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, could not have been reasonably anticipated, and had an adverse effect on the scheduled construction.
§ 15.1.7 Waiver of Claims for Consequential Damages
The Contractor and Owner waive Claims against each other for consequential damages arising out of or relating to this Contract. This mutual waiver includes

.1 damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and

.2 damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit, except anticipated profit arising directly from the Work.

This mutual waiver is applicable, without limitation, to all consequential damages due to either party’s termination in accordance with Article 14. Nothing contained in this Section 15.1.7 shall be deemed to preclude assessment of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

§ 15.2 Initial Decision
§ 15.2.1 Claims, excluding those where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2 or arising under Sections 10.3, 10.4, and 11.5, shall be referred to the Initial Decision Maker for initial decision. The Architect will serve as the Initial Decision Maker, unless otherwise indicated in the Agreement. Except for those Claims excluded by this Section 15.2.1, an initial decision shall be required as a condition precedent to mediation of any Claim. If an initial decision has not been rendered within 30 days after the Claim has been referred to the Initial Decision Maker, the party asserting the Claim may demand mediation and binding dispute resolution without a decision having been rendered. Unless the Initial Decision Maker and all affected parties agree, the Initial Decision Maker will not decide disputes between the Contractor and persons or entities other than the Owner.

§ 15.2.2 The Initial Decision Maker will review Claims and within ten days of the receipt of a Claim take one or more of the following actions: (1) request additional supporting data from the claimant or a response with supporting data from the other party, (2) reject the Claim in whole or in part, (3) approve the Claim, (4) suggest a compromise, or (5) advise the parties that the Initial Decision Maker is unable to resolve the Claim if the Initial Decision Maker lacks sufficient information to evaluate the merits of the Claim or if the Initial Decision Maker concludes that, in the Initial Decision Maker’s sole discretion, it would be inappropriate for the Initial Decision Maker to resolve the Claim.

§ 15.2.3 In evaluating Claims, the Initial Decision Maker may, but shall not be obligated to, consult with or seek information from either party or from persons with special knowledge or expertise who may assist the Initial Decision Maker in rendering a decision. The Initial Decision Maker may request the Owner to authorize retention of such persons at the Owner’s expense.

§ 15.2.4 If the Initial Decision Maker requests a party to provide a response to a Claim or to furnish additional supporting data, such party shall respond, within ten days after receipt of the request, and shall either (1) provide a response on the requested supporting data, (2) advise the Initial Decision Maker when the response or supporting data will be furnished, or (3) advise the Initial Decision Maker that no supporting data will be furnished. Upon receipt of the response or supporting data, if any, the Initial Decision Maker will either reject or approve the Claim in whole or in part.

§ 15.2.5 The Initial Decision Maker will render an initial decision approving or rejecting the Claim, or indicating that the Initial Decision Maker is unable to resolve the Claim. This initial decision shall (1) be in writing; (2) state the reasons therefor; and (3) notify the parties and the Architect, if the Architect is not serving as the Initial Decision Maker, of any change in the Contract Sum or Contract Time or both. The initial decision shall be final and binding on the parties but subject to mediation and, if the parties fail to resolve their dispute through mediation, to binding dispute resolution.

§ 15.2.6 Either party may file for mediation of an initial decision at any time, subject to the terms of Section 15.2.6.1.

§ 15.2.6.1 Either party may, within 30 days from the date of receipt of an initial decision, demand in writing that the other party file for mediation. If such a demand is made and the party receiving the demand fails to file for mediation within 30 days after receipt thereof, then both parties waive their rights to mediate or pursue binding dispute resolution proceedings with respect to the initial decision.
§ 15.2.7 In the event of a Claim against the Contractor, the Owner may, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim. If the Claim relates to a possibility of a Contractor's default, the Owner may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

§ 15.2.8 If a Claim relates to or is the subject of a mechanic's lien, the party asserting such Claim may proceed in accordance with applicable law to comply with the lien notice or filing deadlines.

§ 15.3 Mediation
§ 15.3.1 Claims, disputes, or other matters in controversy arising out of or related to the Contract, except those waived as provided for in Sections 9.10.4, 9.10.5, and 15.1.7, shall be subject to mediation as a condition precedent to binding dispute resolution.

§ 15.3.2 The parties shall endeavor to resolve their Claims by mediation which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Mediation Procedures in effect on the date of the Agreement. A request for mediation shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the mediation. The request may be made concurrently with the filing of binding dispute resolution proceedings but, in such event, mediation shall proceed in advance of binding dispute resolution proceedings, which shall be stayed pending mediation for a period of 60 days from the date of filing, unless stayed for a longer period by agreement of the parties or court order. If an arbitration is stayed pursuant to this Section 15.3.2, the parties may nonetheless proceed to the selection of the arbitrator(s) and agree upon a schedule for later proceedings.

§ 15.3.3 Either party may, within 30 days from the date that mediation has been concluded without resolution of the dispute or 60 days after mediation has been demanded without resolution of the dispute, demand in writing that the other party file for binding dispute resolution. If such a demand is made and the party receiving the demand fails to file for binding dispute resolution within 60 days after receipt thereof, then both parties waive their rights to binding dispute resolution proceedings with respect to the initial decision.

§ 15.3.4 The parties shall share the mediator's fee and any filing fees equally. The mediation shall be held in the place where the Project is located, unless another location is mutually agreed upon. Agreements reached in mediation shall be enforceable as settlement agreements in any court having jurisdiction thereof.

§ 15.4 Arbitration
§ 15.4.1 If the parties have selected arbitration as the method for binding dispute resolution in the Agreement, any Claim subject to, but not resolved by, mediation shall be subject to arbitration which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Arbitration Rules in effect on the date of the Agreement. The Arbitration shall be conducted in the place where the Project is located, unless another location is mutually agreed upon. A demand for arbitration shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the arbitration. The party filing a notice of demand for arbitration must assert in the demand all Claims then known to that party on which arbitration is permitted to be demanded.

§ 15.4.1.1 A demand for arbitration shall be made no earlier than concurrently with the filing of a request for mediation, but in no event shall it be made after the date when the institution of legal or equitable proceedings based on the Claim would be barred by the applicable statute of limitations. For statute of limitations purposes, receipt of a written demand for arbitration by the person or entity administering the arbitration shall constitute the institution of legal or equitable proceedings based on the Claim.

§ 15.4.2 The award rendered by the arbitrator or arbitrators shall be final, and judgment may be entered upon it in accordance with applicable law in any court having jurisdiction thereof.

§ 15.4.3 The foregoing agreement to arbitrate and other agreements to arbitrate with an additional person or entity duly consented to by parties to the Agreement, shall be specifically enforceable under applicable law in any court having jurisdiction thereof.
§ 15.4.4 Consolidation or Joinder
§ 15.4.4.1 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may consolidate an arbitration conducted under this Agreement with any other arbitration to which it is a party provided that (1) the arbitration agreement governing the other arbitration permits consolidation, (2) the arbitrations to be consolidated substantially involve common questions of law or fact, and (3) the arbitrations employ materially similar procedural rules and methods for selecting arbitrator(s).

§ 15.4.4.2 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may include by joinder persons or entities substantially involved in a common question of law or fact whose presence is required if complete relief is to be accorded in arbitration, provided that the party sought to be joined consents in writing to such joinder. Consent to arbitration involving an additional person or entity shall not constitute consent to arbitration of any claim, dispute or other matter in question not described in the written consent.

§ 15.4.4.3 The Owner and Contractor grant to any person or entity made a party to an arbitration conducted under this Section 15.4, whether by joinder or consolidation, the same rights of joinder and consolidation as those of the Owner and Contractor under this Agreement.
FEDERAL CONTRACT CLAUSES

COMPLIANCE WITH FEDERAL LAW, REGULATIONS, AND EXECUTIVE ORDERS: Recommended Provision
This is an acknowledgement that FEMA financial assistance will be used to fund all or a portion of the contract. The contractor will comply with all applicable Federal law, regulations, executive orders, FEMA policies, procedures, and directives.

NO OBLIGATION BY FEDERAL GOVERNMENT: Recommended Provision
The Federal Government is not a party to this contract and is not subject to any obligations or liabilities to the non-Federal entity, contractor, or any other party pertaining to any matter resulting from the contract.

PROGRAM FRAUD AND FALSE OR FRAUDULENT STATEMENTS OR RELATED ACTS: Recommended Provision
The Contractor acknowledges that 31 U.S.C. Chap. 38 (Administrative Remedies for False Claims and Statements) applies to the Contractor’s actions pertaining to this contract.

DHS SEAL, LOGO, AND FLAGS: Recommended Provision
The contractor shall not use the DHS seal(s), logos, crests, or reproductions of flags or likenesses of DHS agency officials without specific FEMA preapproval.

ACCESS TO RECORDS: Recommended Provision
The following access to records requirements apply to this contract:

1. The Contractor agrees to provide Northwood University, the FEMA Administrator, the Comptroller General of the United States, or any of their authorized representatives access to any books, documents, papers, and records of the Contractor which are directly pertinent to this contract for the purposes of making audits, examinations, excerpts, and transcriptions.

2. The Contractor agrees to permit any of the foregoing parties to reproduce by any means whatsoever or to copy excerpts and transcriptions as reasonably needed.

3. The Contractor agrees to provide the FEMA Administrator or his authorized representatives access to construction or other work sites pertaining to the work being completed under the contract.

4. In compliance with the Disaster Recovery Act of 2018, the (write in name of the nonfederal entity) and the Contractor acknowledge and agree that no language in this contract is intended to prohibit audits or internal reviews by the FEMA Administrator or the Comptroller General of the United States.

Small and Minority Businesses, Women’s Business Enterprises, and Labor Surplus Area Firms
Owner encourages participation from small, minority-owned, women-owned, and labor surplus area business. Incorporation of these types of firms into the project team is encouraged.
Additionally, prime contracts are required, if subcontracts are to be let, to take the following affirmative steps 1 through 5 of this section.

1. Placing qualified small and minority businesses and women's business enterprises on solicitation lists;

2. Assuring that small and minority businesses, and women's business enterprises are solicited whenever they are potential sources;

3. Dividing total requirements, when economically feasible, into smaller tasks or quantities to permit maximum participation by small and minority businesses, and women's business enterprises;

4. Establishing delivery schedules, where the requirement permits, which encourage participation by small and minority businesses, and women's business enterprises;

5. Using the services and assistance, as appropriate, of such organizations as the Small Business Administration and the Minority Business Development Agency of the Department of Commerce.

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**Anti-Kickback Clause**

The Contractor hereby agrees to adhere to the mandate dictated by the Copeland "Anti-Kickback" Act which provides that each Contractor or subgrantee shall be prohibited from inducing, by any means, any person employed in the completion of work, to give up any part of the compensation to which he is otherwise entitled.

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**REMEDIES: Applies to all FEMA grant and cooperative agreement programs.**

Contracts for more than the simplified acquisition threshold, currently set at $250,000, must address administrative, contractual, or legal remedies in instances where contractors violate or breach contract terms, and provide for such sanctions and penalties as appropriate. See 2 C.F.R. Part 200, Appendix II, A.

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**TERMINATION FOR CAUSE AND CONVENIENCE: Applies to all FEMA grant and cooperative agreement programs.**

All contracts exceeding $10,000 must address termination for cause and for convenience by the non-Federal entity, including how it will be affected and the basis for settlement. See 2 C.F.R. Part 200, Appendix II, B.
EQUAL EMPLOYMENT OPPORTUNITY: This requirement applies to all FEMA grant and cooperative agreement programs and exact language below is required.

During the performance of this contract, the contractor agrees as follows:

(1) The contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, sexual orientation, gender identity, or national origin. The contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, color, religion, sex, sexual orientation, gender identity, or national origin. Such action shall include, but not be limited to the following: Employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided setting forth the provisions of this nondiscrimination clause.

(2) The contractor will, in all solicitations or advertisements for employees placed by or on behalf of the contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, sexual orientation, gender identity, or national origin.

(3) The contractor will not discharge or in any other manner discriminate against any employee or applicant for employment because such employee or applicant has inquired about, discussed, or disclosed the compensation of the employee or applicant or another employee or applicant. This provision shall not apply to instances in which an employee who has access to the compensation information of other employees or applicants as a part of such employee's essential job functions discloses the compensation of such other employees or applicants to individuals who do not otherwise have access to such information, unless such disclosure is in response to a formal complaint or charge, in furtherance of an investigation, proceeding, hearing, or action, including an investigation conducted by the employer, or is consistent with the contractor's legal duty to furnish information.

(4) The contractor will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice to be provided advising the said labor union or workers' representatives of the contractor's commitments under this section, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

(5) The contractor will comply with all provisions of Executive Order 11246 of September 24, 1965, and of the rules, regulations, and relevant orders of the Secretary of Labor.

(6) The contractor will furnish all information and reports required by Executive Order 11246 of September 24, 1965, and by rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records, and accounts by the administering agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

(7) In the event of the contractor's noncompliance with the nondiscrimination clauses of this contract or with any of the said rules, regulations, or orders, this contract may be canceled, terminated, or suspended in whole or in part and the contractor may be declared ineligible for further Government contracts or federally assisted construction contracts in accordance with procedures authorized in
Executive Order 11246 of September 24, 1965, and such other sanctions may be imposed and remedies invoked as provided in Executive Order 11246 of September 24, 1965, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.

(8) The contractor will include the portion of the sentence immediately preceding paragraph (1) and the provisions of paragraphs (1) through (8) in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to section 204 of Executive Order 11246 of September 24, 1965, so that such provisions will be binding upon each subcontractor or vendor. The contractor will take such action with respect to any subcontract or purchase order as the administering agency may direct as a means of enforcing such provisions, including sanctions for noncompliance:

Provided, however, that in the event a contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the administering agency, the contractor may request the United States to enter into such litigation to protect the interests of the United States. The applicant further agrees that it will be bound by the above equal opportunity clause with respect to its own employment practices when it participates in federally assisted construction work: Provided, that if the applicant so participating is a State, Territorial, or local government, the above equal opportunity clause is not applicable to any agency, instrumentality or subdivision of such government which does not participate in work on or under the contract.

The applicant agrees that it will assist and cooperate actively with the administering agency and the Secretary of Labor in obtaining the compliance of contractors and subcontractors with the equal opportunity clause and the rules, regulations, and relevant orders of the Secretary of Labor, that it will furnish the administering agency and the Secretary of Labor such information as they may require for the supervision of such compliance, and that it will otherwise assist the administering agency in the discharge of the agency's primary responsibility for securing compliance.

The applicant further agrees that it will refrain from entering into any contract or contract modification subject to Executive Order 11246 of September 24, 1965, with a contractor debarred from, or who has not demonstrated eligibility for, Government contracts and federally assisted construction contracts pursuant to the Executive Order and will carry out such sanctions and penalties for violation of the equal opportunity clause as may be imposed upon contractors and subcontractors by the administering agency or the Secretary of Labor pursuant to Part II, Subpart D of the Executive Order. In addition, the applicant agrees that if it fails or refuses to comply with these undertakings, the administering agency may take any or all of the following actions: Cancel, terminate, or suspend in whole or in part this grant (contract, loan, insurance, guarantee); refrain from extending any further assistance to the applicant under the program with respect to which the failure or refund occurred until satisfactory assurance of future compliance has been received from such applicant; and refer the case to the Department of Justice for appropriate legal proceedings.

DEBARMENT AND SUSPENSION: This requirement applies to all FEMA grant and cooperative agreement programs.

Suspension and Debarment
Non-Federal entities and contractors are subject to the debarment and suspension regulations implementing Executive Order 12549, Debarment and Suspension (1986) and Executive Order 12689, Debarment and Suspension (1989) at 2 C.F.R. Part 180 and the Department of Homeland Security’s regulations at 2 C.F.R. Part 3000 (Non-procurement Debarment and Suspension). Requirements: These regulations restrict awards, subawards, and contracts with certain parties that are debarred, suspended, or otherwise excluded from or ineligible for participation in Federal assistance programs and activities. See 2 C.F.R. Part 200, Appendix II, ¶ H; and 2 C.F.R. § 200.213. A contract award must not be made to parties listed in the SAM Exclusions. SAM Exclusions is the list maintained by the General Services Administration that contains the names of parties debarred, suspended, or otherwise excluded by agencies, as well as parties declared ineligible under statutory or regulatory authority other than Executive Order 12549. SAM exclusions can be accessed at [www.sam.gov](http://www.sam.gov). See 2 C.F.R. § 180.530.

In general, an “excluded” party cannot receive a Federal grant award or a contract within the meaning of a “covered transaction,” to include subawards and subcontracts. This includes parties that receive Federal funding indirectly, such as contractors to recipients and subrecipients.

1. This contract is a covered transaction for purposes of 2 C.F.R. pt. 180 and 2 C.F.R. pt. 3000. As such, the contractor is required to verify that none of the contractor’s principals (defined at 2 C.F.R. § 180.995) or its affiliates (defined at 2 C.F.R. § 180.905) are excluded (defined at 2 C.F.R. § 180.940) or disqualified (defined at 2 C.F.R. § 180.935).

2. The contractor must comply with 2 C.F.R. pt. 180, subpart C and 2 C.F.R. pt. 3000, subpart C, and must include a requirement to comply with these regulations in any lower tier covered transaction it enters into.

3. This certification is a material representation of fact relied upon by Northwood University. If it is later determined that the contractor did not comply with 2 C.F.R. pt. 180, subpart C and 2 C.F.R. pt. 3000, subpart C, in addition to remedies available to Northwood University, the Federal Government may pursue available remedies, including but not limited to suspension and/or debarment.

4. The bidder or proposer agrees to comply with the requirements of 2 C.F.R. pt. 180, subpart C and 2 C.F.R. pt. 3000, subpart C while this offer is valid and throughout the period of any contract that may arise from this offer. The bidder or proposer further agrees to include a provision requiring such compliance in its lower tier covered transactions.

**PROCUREMENT OF RECOVERED MATERIALS:** This requirement applies to all contracts awarded by a non-federal entity under FEMA grant and cooperative agreement programs.

Requirements: The requirements of Section 6002 include procuring only items designated in guidelines of the EPA at 40 C.F.R. Part 247 that contain the highest percentage of recovered materials practicable, consistent with maintaining a satisfactory level of competition, where the purchase price of the item exceeds $10,000 or the value of the quantity acquired by the preceding fiscal year exceeded $10,000; procuring solid waste management services in a manner that maximizes energy and resource recovery; and establishing an affirmative procurement program for procurement of recovered materials identified in the EPA guidelines.
1. In the performance of this contract, the Contractor shall make maximum use of products containing recovered materials that are EPA-designated items unless the product cannot be acquired—
   a. Competitively within a timeframe providing for compliance with the contract performance schedule;
   b. Meeting contract performance requirements; or
   c. At a reasonable price.

2. Information about this requirement, along with the list of EPA-designated items, is available at EPA’s Comprehensive Procurement Guidelines web site, https://www.epa.gov/smm/comprehensive-procurement-guideline-cpg-program.

3. The Contractor also agrees to comply with all other applicable requirements of Section 6002 of the Solid Waste Disposal Act.”

CLEAN AIR ACT AND THE FEDERAL WATER POLLUTION CONTROL ACT: This requirement applies to contracts awarded by a non-Federal entity of amounts exceeding $150,000 under a federal grant.

Clean Air Act

1. The contractor agrees to comply with all applicable standards, orders or regulations issued pursuant to the Clean Air Act, as amended, 42 U.S.C. § 7401 et seq.

2. The contractor agrees to report each violation to the Northwood University and understands and agrees that the Northwood University will, in turn, report each violation as required to assure notification to the Federal Emergency Management Agency, and the appropriate Environmental Protection Agency Regional Office.

3. The contractor agrees to include these requirements in each subcontract exceeding $150,000 financed in whole or in part with Federal assistance provided by FEMA.

Federal Water Pollution Control Act

1. The contractor agrees to comply with all applicable standards, orders, or regulations issued pursuant to the Federal Water Pollution Control Act, as amended, 33 U.S.C. 1251 et seq.

2. The contractor agrees to report each violation to the Northwood University and understands and agrees that the Northwood University will, in turn, report each violation as required to assure notification to the Federal Emergency Management Agency, and the appropriate Environmental Protection Agency Regional Office.

3. The contractor agrees to include these requirements in each subcontract exceeding $150,000 financed in whole or in part with Federal assistance provided by FEMA.

BYRD ANTI-LOBBING AMENDMENT: This requirement applies to all FEMA grant and cooperative agreement programs. Contractors that apply or bid for a contract of $100,000 or more under a federal grant must file the required certification. See 2 C.F.R. Part 200, Appendix II, I; 31 U.S.C. § 1352; and 44 C.F.R. Part 18
Byrd Anti-Lobbying Amendment, 31 U.S.C. § 1352 (as amended) Contractors who apply or bid for an award of $100,000 or more shall file the required certification. Each tier certifies to the tier above that it will not and has not used Federal appropriated funds to pay any person or organization for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, officer or employee of Congress, or an employee of a Member of Congress in connection with obtaining any Federal contract, grant, or any other award covered by 31 U.S.C. § 1352. Each tier shall also disclose any lobbying with non-Federal funds that takes place in connection with obtaining any Federal award. Such disclosures are forwarded from tier-to-tier up to the recipient who in turn will forward the certification(s) to the awarding agency.

Required Certification: If applicable, contractors must sign and submit to the non-Federal entity the following certification.
APPENDIX A, 44 C.F.R. PART 18 – CERTIFICATION REGARDING LOBBYING

Certification for Contracts, Grants, Loans, and Cooperative Agreements

The undersigned certifies, to the best of his or her knowledge and belief, that:

1. No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of an agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

2. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, “Disclosure Form to Report Lobbying,” in accordance with its instructions.

3. The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly. This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure. The Contractor, ______________, certifies or affirms the truthfulness and accuracy of each statement of its certification and disclosure, if any. In addition, the Contractor understands and agrees that the provisions of 31 U.S.C. Chap. 38, Administrative Remedies for False Claims and Statements, apply to this certification and disclosure, if any.

________________________________________
Signature of Contractor’s Authorized Official

________________________________________
Name and Title of Contractor’s Authorized Official

______________________________
Date
FOR CONSTRUCTION CONTRACTS:

**CONTRACT WORK HOURS AND SAFETY STANDARDS ACT:** This requirement applies to all FEMA contracts awarded by the non-federal entity exceeding $100,000 under grant and cooperative agreement programs that involve the employment of mechanics or laborers. It is applicable to construction work. These requirements do not apply to the purchase of supplies or materials or articles ordinarily available on the open market, or contracts for transportation or transmission of intelligence.

Compliance with the Contract Work Hours and Safety Standards Act.

(1) **Overtime requirements.** No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.

(2) **Violation; liability for unpaid wages; liquidated damages.** In the event of any violation of the clause set forth in paragraph (b)(1) of this section the contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (b)(1) of this section, in the sum of $26 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (b)(1) of this section.

(3) **Withholding for unpaid wages and liquidated damages.** The Northwood University shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (b)(2) of this section.

(4) **Subcontracts.** The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraph (b)(1) through (4) of this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (b)(1) through (4) of this section.
PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Project information.
   2. Work covered by Contract Documents.
   3. Phased construction.
   4. Work under separate contracts.
   5. Access to site.
   6. Coordination with occupants.
   7. Work restrictions.
   8. Specification and drawing conventions.

B. Related Requirements:
   1. Section 015000 “Temporary Facilities and Controls” for limitations and procedures governing temporary use of Owner’s facilities.

1.2 PROJECT INFORMATION

A. Project Identification: Renovations To: Northwood University Miner Hall Lower Level.
   1. Project Location: 4000 Whiting Drive; Midland, Michigan 48640.

B. Owner: City of Midland.
   1. Owner’s Representative: Steven Smith, Physical Plan Director 989-837-4294

C. Architect: WTA Architects; 100 S. Jefferson Ave.; Saginaw, Michigan 48607; ph. 989-752-8107

1.3 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of Project is defined by the Contract Documents and consists of the following:
   1. The subject project includes renovations to the lower level interior of the Northwood University Miner Hall that was compromised during the 2020 floods. The lower level contained existing office space and will be used for Student Life meeting and gathering areas as well as Physical plant offices in the future. Work consist of but is not limited to: new interior finishes, mechanical and electrical work. In addition work scope includes exterior repair and mitigation.

B. Type of Contract.
1. Project will be constructed under a single prime contract.

1.4 WORK UNDER SEPARATE CONTRACTS

A. General: Cooperate fully with separate contractors so work on those contracts may be carried out smoothly, without interfering with or delaying work under this Contract or other contracts. Coordinate the Work of this Contract with work performed under separate contracts.

B. Concurrent Work: Owner will award separate contract(s) for the following construction operations at Project site. Those operations will be conducted simultaneously with work under this Contract.

1. Furnishings.

1.5 ACCESS TO SITE

A. General: Contractor shall have limited use of Project site for construction operations as indicated on Drawings by the scope of construction work and as indicated by requirements of this Section.

1. Lower level of Miner Hall will not be in use during construction, but dorms on the floors above will be.

B. Use of Site: Limit use of Project site to work in areas indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.

1. Limits: Confine construction operations to areas being worked in per schedule.
2. Driveways, Walkways and Entrances: Keep driveways, loading areas, and entrances serving premises clear and available to Owner, Owner’s employees, patrons and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
   a. Schedule deliveries to minimize use of driveways and entrances by construction operations.
   b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

C. Condition of Existing Building: Maintain portions of existing building affected by construction operations in a weathertight condition throughout construction period. Repair damage caused by construction operations.

1.6 COORDINATION WITH OCCUPANTS

A. Full Owner Occupancy: Owner will occupy floors above during most of the construction period. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner’s day-to-day operations. Maintain existing exits unless otherwise indicated.
1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and approval of authorities having jurisdiction.

2. Notify Owner not less than 72 hours in advance of activities that will affect Owner's operations on floors above.

1.7 WORK RESTRICTIONS

A. Work Restrictions, General: Comply with restrictions on construction operations.

1. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.

B. On-Site Work Hours: Work in the existing building may be performed during normal business working hours of, unless otherwise indicated.

C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:

1. Notify Owner not less than two days in advance of proposed utility interruptions.

2. Obtain Owner's written permission before proceeding with utility interruptions.

D. Noise, Vibration, and Odors: Coordinate operations that may result in high levels of noise and vibration, odors, or other disruption to Owner occupancy with Owner.

1. Notify Owner not less than two days in advance of proposed disruptive operations.

2. Obtain Owner's written permission before proceeding with disruptive operations.

E. Controlled Substances: Use of tobacco products and other controlled substances within the existing building and on Project site is not permitted.

1.8 SPECIFICATION AND DRAWING CONVENTIONS

A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.

B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.

C. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:
SECTION 012300 - ALTERNATES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for alternates.

1.2 DEFINITIONS

A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the bidding requirements that may be added to or deducted from the base bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.

1. Alternates described in this Section are part of the Work only if enumerated in the Agreement.

2. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

1.3 PROCEDURES

A. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.

1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.

B. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated revisions to alternates.

C. Execute accepted alternates under the same conditions as other work of the Contract.

D. Schedule: A schedule of alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.
PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

A. Alternate No. 1:
   1. Base Bid: Furnish and install all architectural, mechanical and electrical drawings as show for Large Breakout Room 024 and Storage Room O23.
   2. Deduct Alternate: Remove Breakroom 024 and Storage room 023 from scope of work. (VAV’s, Lighting, Mechanical Distribution, Arch finishes, etc.)

B. Alternate No. 2:
   1. Base Bid: Furnish and install MPC-1 – Metal Panel Ceilings as indicated on drawing A9.01
   2. Deduct Alternate: Remove MPC-1 from work scope.

C. Alternate No. 3:
   1. Base Bid: Furnish and Install new masonry opening and door as shown on construction documents.
   2. Deduct Alternate: Remove opening and door from scope of work.

D. Alternate No. 4
   1. Base Bid: In Women’s Locker Room 026, Men’s Locker Room 027, and Physical Plant Break room 028, ceiling to be painted concrete deck. Install (2) 8'-0” Type J fixtures in locker rooms and (3) 8'-0” type J fixtures in Physical plant break room.
   2. Add Alternate: In Women’s Locker Room 026, Men’s Locker Room 027, and Physical Plant Break room 028, install ceiling and lighting as shown.

E. Alternate No. 5
   1. Base Bid: Furnish and Install LMC-1 Linear Metal Ceiling as specified.
   2. Deduct Alternate: Furnish and Install in similar fashion:
      a. Certainteed Ecophon solo baffles -(data sheet attached)
      b. Solo Baffle Hook Mounting
      c. Utilize 5”h & 10”h baffles
      d. Thickness: all the same 1-1/2”
      e. Color To be Selected from manufacturer standard range of colors
F. Alternate No. 6

1. Base Bid: Furnish and Install LMC-1 Linear Metal Ceiling as specified.
2. Deduct Alternate: Furnish and Install in similar fashion:
   a. Armstrong Tectum Baffles
   b. Steel Channel Mounting
   c. Utilize all 11-3/4" h baffles
   d. Thickness: all the same 1-1/2"
   e. To be field Painted

G. Alternate No. 7

1. Base Bid: Furnish and Install LMC-1 Linear Metal Ceiling as specified.
2. Deduct Alternate: Furnish and Install in similar fashion:
   a. MDC Zintra Box Baffle
   b. Random Dimension (39.4" x 94.5" x 8") (Qty of 10)
   c. Color: Zintra Timber color TBD

END OF SECTION 012300
1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
SECTION 012500 - SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for substitutions.

B. Related Section:

1. Division 01 Section "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.

1.2 DEFINITIONS

A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.

1.3 SUBMITTALS

A. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Substitution Request Form: Use form approved by the Architect.

2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:

   a. Statement indicating why specified product or fabrication, or installation cannot be provided, if applicable.
   b. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.
   c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable specification section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
   d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
   e. Samples, where applicable or requested.
   f. Certificates and qualification data, where applicable or requested.
   g. List of similar installations for completed projects with project names and addresses and names of architects and owners.
   h. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
   i. Research reports evidencing compliance with building code in effect for Project, from applicable code organization.
j. Detailed comparison of Contractor's construction schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.

k. Cost information, including a proposal of change, if any, in the Contract Sum.

l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.

m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.


b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

1.4 QUALITY ASSURANCE

A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage qualified testing agency to perform compatibility tests recommended by manufacturers.

PART 2 - PRODUCTS

2.1 SUBSTITUTIONS

A. Substitutions for Cause: Submit requests for substitution immediately upon discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.

1. Conditions: Architect will consider Contractor’s request for substitution when the following conditions are satisfied:

a. Requested substitution is consistent with the Contract Documents and will produce indicated results.

b. Requested substitution will not adversely affect Contractor’s construction schedule.

c. Requested substitution has received necessary approvals of authorities having jurisdiction.

d. Requested substitution is compatible with other portions of the Work.

e. Requested substitution has been coordinated with other portions of the Work.

f. Requested substitution provides specified warranty.
g. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

B. Substitutions for Convenience: Architect will consider requests for substitution if received within 30 days after commencement of the Work.

1. Conditions: Architect will consider Contractor’s request for substitution when the following conditions are satisfied:

a. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.

b. Requested substitution does not require extensive revisions to the Contract Documents.

c. Requested substitution is consistent with the Contract Documents and will produce indicated results.

d. Requested substitution will not adversely affect Contractor’s construction schedule.

e. Requested substitution has received necessary approvals of authorities having jurisdiction.

f. Requested substitution is compatible with other portions of the Work.

g. Requested substitution has been coordinated with other portions of the Work.

h. Requested substitution provides specified warranty.

i. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

PART 3 - EXECUTION (Not Used)

END OF SECTION 012500
PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for handling and processing Contract modifications.

1.2 MINOR CHANGES IN THE WORK

A. Architect will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA Document G710, "Architect's Supplemental Instructions."

1.3 PROPOSAL REQUESTS

A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.

1. Proposal Requests issued by Architect are not instructions either to stop work in progress or to execute the proposed change.

2. Within 14 days after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.

   a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
   b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
   c. Include costs of labor and supervision directly attributable to the change.
   d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
   e. Quotation Form: Use forms acceptable to Architect.

B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Architect.

1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.

2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.

3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Include costs of labor and supervision directly attributable to the change.
5. Include an updated Contractor’s construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
6. Comply with requirements in Division 01 Section “Substitution Procedures” if the proposed change requires substitution of one product or system for product or system specified.

1.4 ADMINISTRATIVE CHANGE ORDERS

A. Allowance Adjustment: Refer to Division 01 Section “Allowances” for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect actual costs of allowances.

B. Unit Price Adjustment: Refer to Division 01 Section “Unit Prices” for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect measured scope of unit price work.

1.5 CHANGE ORDER PROCEDURES


1.6 CONSTRUCTION CHANGE DIRECTIVE


1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.

B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.

1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012600

CONTRACT MODIFICATION PROCEDURES

012600 - 2
SECTION 012900 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.

1.2 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor’s construction schedule.

1. Correlate line items in the schedule of values with other required administrative forms and schedules, including the following:
   a. Application for Payment forms with continuation sheets.
   b. Submittal schedule.
   c. Items required to be indicated as separate activities in Contractor’s construction schedule.

2. Submit the schedule of values to Architect at earliest possible date but no later than fourteen days before the date scheduled for submittal of initial Applications for Payment.

3. Sub-schedules for Phased Work: Where the Work is separated into phases requiring separately phased payments, provide sub-schedules showing values correlated with each phase of payment.

B. Format and Content: Use the Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.

1. Identification: Include the following Project identification on the schedule of values:
   a. Project name and location.
   b. Name of Architect.
   c. Architect’s project number.
   d. Contractor’s name and address.
   e. Date of submittal.

2. Arrange schedule of values consistent with format of AIA Document G703.

3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide multiple line items for principal subcontract amounts in excess of five percent of Contract Sum.

4. Round amounts to nearest whole dollar; total shall equal the Contract Sum.

5. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.

6. Provide separate line items in the schedule of values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
7. Allowances: Provide a separate line item in the schedule of values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.

8. Each item in the schedule of values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
   a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the schedule of values or distributed as general overhead expense, at Contractor's option.

9. Schedule Updating: Update and resubmit the schedule of values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.3 APPLICATIONS FOR PAYMENT

A. Each Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.

1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.

B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.

C. Payment Application Times: Progress payments shall be submitted to Architect by the tenth of the month. The period covered by each Application for Payment is one month, ending on the last day of the month.

D. Application for Payment Forms: Use AIA Document G702 and AIA Document G703 as form for Applications for Payment.

E. Application for Payment Forms: Use forms provided by Owner for Applications for Payment. Sample copies are included in the Project Manual.

F. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.

   1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
   2. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.

G. Transmittal: Submit three signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.

   1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.
H. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from entities lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.

1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
2. When an application shows completion of an item, submit conditional final or full waivers.
3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
4. Waiver Forms: Submit waivers of lien on forms, executed in a manner acceptable to Owner.

I. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:

1. List of subcontractors.
2. Schedule of values.
3. Contractor's construction schedule (preliminary if not final).
4. Schedule of unit prices.
5. Submittal schedule (preliminary if not final).
6. List of Contractor's staff assignments.
7. List of Contractor's principal consultants.
10. Initial progress report.
12. Certificates of insurance and insurance policies.

J. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.

1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
2. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

K. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:

1. Evidence of completion of Project closeout requirements.
2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
3. Updated final statement, accounting for final changes to the Contract Sum.
7. Evidence that claims have been settled.
8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012900
SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:

1. Coordination drawings.
2. Requests for Information (RFIs).
3. Project meetings.
4. Project Sequencing

B. Related Sections:

1. Division 01 Section "Multiple Contract Summary" for a description of the division of work among separate contracts and responsibility for coordination activities not in this Section.
2. Division 01 Section "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.

1.2 DEFINITIONS

A. RFI: Request from Owner, Architect, or Contractor seeking information from each other during construction.

1.3 COORDINATION

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.

B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.
C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Contractor's construction schedule.
2. Preparation of the schedule of values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Preinstallation conferences.
7. Project closeout activities.
8. Startup and adjustment of systems.
9. Project closeout activities.

1.4 COORDINATION DRAWINGS

A. Coordination Drawings, General: Prepare coordination drawings in accordance with requirements in individual Sections, where installation is not completely shown on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.

1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:

   a. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
   b. Indicate dimensions shown on the Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

B. Coordination Drawing Organization: Organize coordination drawings as follows:

1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire protection, fire alarm, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid.
2. Plenum Space: Indicate subframing for support of ceiling and wall systems, mechanical and electrical equipment, and related Work. Locate components within ceiling plenum to accommodate layout of light fixtures indicated on Drawings.
3. Mechanical Rooms: Provide coordination drawings for mechanical rooms showing plans and elevations of mechanical, plumbing, fire protection, fire alarm, and electrical equipment.
4. Structural Penetrations: Indicate penetrations and openings required for all disciplines.
5. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.
6. Review: Architect will review coordination drawings to confirm that the Work is being coordinated, but not for the details of the coordination, which are the Contractor's responsibility.

1.5 REQUESTS FOR INFORMATION (RFIs)

A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.

1. Architect will return RFIs submitted to Architect by other entities controlled by Contractor with no response.
2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.

B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:

1. Project name.
2. Project number.
3. Date.
4. Name of Contractor.
5. Name of Architect.
6. RFI number, numbered sequentially.
7. RFI subject.
8. Specification Section number and title and related paragraphs, as appropriate.
9. Drawing number and detail references, as appropriate.
10. Field dimensions and conditions, as appropriate.
11. Contractor's suggested resolution. If Contractor's solution(s) impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
12. Contractor's signature.
13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.

C. RFI Forms: AIA Document G716 or software-generated form with substantially the same content as indicated above, acceptable to Architect.

D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow seven working days for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.

1. The following RFIs will be returned without action:

   a. Requests for approval of submittals.
   b. Requests for approval of substitutions.
   c. Requests for coordination information already indicated in the Contract Documents.
   d. Requests for adjustments in the Contract Time or the Contract Sum.
   e. Requests for interpretation of Architect's actions on submittals.
   f. Incomplete RFIs or inaccurately prepared RFIs.

2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt of additional information.
3. Architect’s action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Division 01 Section "Contract Modification Procedures."
   a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 10 days of receipt of the RFI response.

E. On receipt of Architect’s action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within seven days if Contractor disagrees with response.

F. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number.
   1. Project name.
   2. Name and address of Contractor.
   3. Name and address of Architect.
   4. RFI number including RFIs that were dropped and not submitted.
   5. RFI description.
   6. Date the RFI was submitted.
   7. Date Architect’s response was received.
   8. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.

1.6 PROJECT MEETINGS

A. General: Schedule and conduct meetings and conferences at Project site, unless otherwise indicated.
   1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
   2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
   3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within five days of the meeting.

B. Preconstruction Conference: Architect will schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement.
   1. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
   2. Agenda: Discuss items of significance that could affect progress, including the following:
      a. Tentative construction schedule.
      b. Phasing.
      c. Critical work sequencing and long-lead items.
      d. Designation of key personnel and their duties.
e. Procedures for processing field decisions and Change Orders.
f. Procedures for RFIs.
g. Procedures for testing and inspecting.
h. Procedures for processing Applications for Payment.
i. Distribution of the Contract Documents.
j. Submittal procedures.
k. Sustainable design requirements.
l. Preparation of record documents.
m. Use of the premises and existing building.
n. Work restrictions.
o. Working hours.
p. Owner’s occupancy requirements.
q. Responsibility for temporary facilities and controls.
r. Procedures for moisture and mold control.
s. Procedures for disruptions and shutdowns.
t. Construction waste management and recycling.
u. Parking availability.
v. Office, work, and storage areas.
w. Equipment deliveries and priorities.
x. First aid.
y. Security.
z. Progress cleaning.

3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.

C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.

1. Attendees: 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 Architect of scheduled meeting dates.

2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:

   b. Options.
   c. Related RFIs.
   d. Related Change Orders.
   e. Purchases.
   f. Deliveries.
   g. Submittals.
   h. Review of mockups.
   i. Possible conflicts.
   j. Compatibility problems.
   k. Time schedules.
   l. Weather limitations.
   m. Manufacturer’s written recommendations.
   n. Warranty requirements.
   o. Compatibility of materials.
   p. Acceptability of substrates.
   q. Temporary facilities and controls.
   r. Space and access limitations.
   s. Regulations of authorities having jurisdiction.
t. Testing and inspecting requirements.
u. Installation procedures.
v. Coordination with other work.
w. Required performance results.
x. Protection of adjacent work.
y. Protection of construction and personnel.

3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

D. Progress Meetings: Conduct progress meetings at monthly intervals.

1. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.

2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

a. Contractor’s Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor’s construction 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.

1) Review schedule for next period.

b. Review present and future needs of each entity present, including the following:

1) Interface requirements.
2) Sequence of operations.
3) Status of submittals.
4) Deliveries.
5) Off-site fabrication.
6) Access.
7) Site utilization.
8) Temporary facilities and controls.
9) Progress cleaning.
10) Quality and work standards.
11) Status of correction of deficient items.
12) Field observations.
13) Status of RFIs.
14) Status of proposal requests.
15) Pending changes.
16) Status of Change Orders.
17) Pending claims and disputes.
18) Documentation of information for payment requests.

3. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.

   a. Schedule Updating: Revise Contractor’s construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

1.7 PROJECT SEQUENCING

A. Within seven (7) days of receiving a letter of intent, the contractor is to develop and present to the Architect and Owner a complete schedule of construction activities and sequencing for review and approval.

B. The contractor’s schedule of construction will need to identify how the contractor will provide adequate manpower for the project. The contractor will need to staff the project appropriately to complete the work on schedule. This includes scheduling second and third shifts and weekends when necessary.

1. The contractor will need to clearly represent to the owner at the post-bid interview that they will be able to provide adequate manpower for the job.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100
PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:

1. Contractor's construction schedule.
2. Daily construction reports.
3. Field condition reports.

B. Related Section:

1. Division 01 Section "Multiple Contract Summary" for preparing a combined Contractor's Construction Schedule.

1.2 DEFINITIONS

A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.

1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
2. Predecessor Activity: An activity that precedes another activity in the network.
3. Successor Activity: An activity that follows another activity in the network.

B. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of the Project.

C. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.

D. Float: The measure of leeway in starting and completing an activity. is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.

1.3 INFORMATIONAL SUBMITTALS

A. Format for Submittals: Submit required submittals in the following format:

1. PDF electronic file.
2. Three paper copies.
B. Start-up Network Diagram: Of size required to display entire network for entire construction period. Show logic ties for activities.

C. Contractor’s Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.
   1. Submit a working electronic copy of schedule, using software indicated, and labeled to comply with requirements for submittals. Include type of schedule (initial or updated) and date on label.

D. CPM Reports: Concurrent with CPM schedule, submit each of the following reports. Format for each activity in reports shall contain activity number, activity description, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float in calendar days.
   1. Activity Report: List of all activities sorted by activity number and then early start date, or actual start date if known.
   2. Logic Report: List of preceding and succeeding activities for all activities, sorted in ascending order by activity number and then early start date, or actual start date if known.
   3. Total Float Report: List of all activities sorted in ascending order of total float.

E. Daily Construction Reports: Submit at weekly intervals.

F. Field Condition Reports: Submit at time of discovery of differing conditions.

1.4 COORDINATION

A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.

B. Coordinate Contractor’s construction schedule with the schedule of values, list of subcontracts, submittal schedule, progress reports, payment requests, and other required schedules and reports.
   1. Secure time commitments for performing critical elements of the Work from entities involved.
   2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.1 CONTRACTOR’S CONSTRUCTION SCHEDULE, GENERAL

A. Time Frame: Extend schedule from date established for commencement of the Work to date of final completion.
   1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.
B. Activities: Treat each story or separate area as a separate numbered activity for each principal element of the Work. Comply with the following:

1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Architect.
2. Procurement Activities: Include procurement process activities for the following long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
3. Submittal Review Time: Include review and resubmittal times indicated in Division 01 Section "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's construction schedule with submittal schedule.
4. Startup and Testing Time: Include not less than 15 days for startup and testing.
5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's and Construction Manager's administrative procedures necessary for certification of Substantial Completion.
6. Punch List and Final Completion: Include not more than 30 days for punch list and final completion.

C. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.

1. Phasing: Arrange list of activities on schedule by phase.
2. Work under More Than One Contract: Include a separate activity for each contract.
3. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.
4. Work Restrictions: Show the effect of the following items on the schedule:
   a. Coordination with existing construction.
   b. Limitations of continued occupancies.
   c. Uninterruptible services.
   d. Partial occupancy before Substantial Completion.
   e. Use of premises restrictions.
   g. Seasonal variations.
   h. Environmental control.
5. Work Stages: Indicate important stages of construction for each major portion of the Work.

D. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and final completion.

E. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:

1. Unresolved issues.
2. Unanswered RFIs.
3. Rejected or unreturned submittals.
4. Notations on returned submittals.
F. Recovery Schedule: When periodic update indicates the Work is 14 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule.

G. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules.

2.2 CONTRACTOR’S CONSTRUCTION SCHEDULE (GANTT CHART)

A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal Gantt-chart-type, Contractor’s construction schedule within 14 days of date established for commencement of the Work.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.

1. For construction activities that require three months or longer to complete, indicate an estimated completion percentage in 10 percent increments within time bar.

2.3 CONTRACTOR’S CONSTRUCTION SCHEDULE (CPM SCHEDULE)

A. General: Prepare network diagrams using AON (activity-on-node) format.

B. Start-up Network Diagram: Submit diagram within 14 days of date established for commencement of the Work. Outline significant construction activities for the first 90 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

C. CPM Schedule: Prepare Contractor’s construction schedule using a time-scaled CPM network analysis diagram for the Work.

1. Develop network diagram in sufficient time to submit CPM schedule so it can be accepted for use no later than 30 days after date established for commencement of the Work.

   a. Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all work within applicable completion dates, regardless of Architect’s approval of the schedule.

2. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.

3. Use “one workday” as the unit of time for individual activities. Indicate nonworking days and holidays incorporated into the schedule in order to correlate with Contract Time.

D. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the start-up network diagram, prepare a skeleton network to identify probable critical paths.
1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:

   a. Preparation and processing of submittals.
   b. Mobilization and demobilization.
   c. Purchase of materials.
   d. Delivery.
   e. Fabrication.
   f. Utility interruptions.
   g. Installation.
   h. Work by Owner that may affect or be affected by Contractor's activities.
   i. Testing.
   j. Punch list and final completion.
   k. Activities occurring following final completion.

2. Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with Contract milestone dates.

3. Processing: Process data to produce output data on a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.

4. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.

   a. Subnetworks on separate sheets are permissible for activities clearly off the critical path.

E. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using a network fragment to demonstrate the effect of the proposed change on the overall project schedule.

F. Initial Issue of Schedule: Prepare initial network diagram from a sorted activity list indicating straight "early start-total float." Identify critical activities. Prepare tabulated reports showing the following:

   1. Contractor or subcontractor and the Work or activity.
   2. Description of activity.
   3. Principal events of activity.
   4. Immediate preceding and succeeding activities.
   5. Early and late start dates.
   6. Early and late finish dates.
   7. Activity duration in workdays.
   8. Total float or slack time.
   10. Dollar value of activity (coordinated with the schedule of values).

G. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:

   1. Identification of activities that have changed.
   2. Changes in early and late start dates.
3. Changes in early and late finish dates.
5. Changes in the critical path.
6. Changes in total float or slack time.

2.4 REPORTS

A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:

1. List of subcontractors at Project site.
2. List of separate contractors at Project site.
3. Approximate count of personnel at Project site.
4. Equipment at Project site.
5. Material deliveries.
6. High and low temperatures and general weather conditions, including presence of rain or snow.
7. Accidents.
8. Meetings and significant decisions.
9. Unusual events.
10. Stoppages, delays, shortages, and losses.
11. Meter readings and similar recordings.
13. Orders and requests of authorities having jurisdiction.
14. Change Orders received and implemented.
15. Construction Change Directives received and implemented.
16. Services connected and disconnected.
17. Equipment or system tests and startups.
18. Partial completions and occupancies.
19. Substantial Completions authorized.

B. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

PART 3 - EXECUTION

3.1 CONTRACTOR’S CONSTRUCTION SCHEDULE

A. Contractor’s Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.

1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.

3. As the Work progresses, indicate final completion percentage for each activity.

B. Distribution: Distribute copies of approved schedule to Architect Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.

1. Post copies in Project meeting rooms and temporary field offices.
2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION 013200
SECTION 013300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

B. Related Sections:

1. Division 01 Section "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.
2. Division 01 Section "Operation and Maintenance Data" for submitting operation and maintenance manuals.
3. Division 01 Section "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.

1.2 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action.

B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements.

1.3 ACTION SUBMITTALS

A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or modifications to submittals noted by the Architect and additional time for handling and reviewing submittals required by those corrections.

1.4 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

B. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.

1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.

2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.

3. Resubmittal Review: Allow 15 days for review of each resubmittal.

C. Identification and Information: Identify and incorporate information in each electronic submittal file as follows:

1. Assemble complete submittal package into a single indexed file with links enabling navigation to each item.

2. Name file with submittal number or other unique identifier, including revision identifier.

   a. File name shall use project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g., LNHS-061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., LNHS-061000.01.A).

3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Architect.

4. Include the following information on an inserted cover sheet:

   a. Project name.
   b. Date.
   c. Name and address of Architect.
   d. Name of Contractor.
   e. Name of firm or entity that prepared submittal.
   f. Name of subcontractor.
   g. Name of supplier.
   h. Name of manufacturer.
   i. Number and title of appropriate Specification Section.
   j. Drawing number and detail references, as appropriate.
   k. Location(s) where product is to be installed, as appropriate.
   l. Related physical samples submitted directly.
   m. Other necessary identification.

D. Options: Identify options requiring selection by the Architect.

E. Deviations: Identify deviations from the Contract Documents on submittals.

F. Transmittal: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will return submittals, without review, received from sources other than Contractor.
2. On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.

G. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
1. Note date and content of previous submittal.
2. Note date and content of revision in label or title block and clearly indicate extent of revision.
3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.

H. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

I. Use for Construction: Use only final submittals that are marked with approval notation from Architect’s action stamp.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

A. General Submittal Procedure Requirements:
2. Submit electronic submittals via email as PDF electronic files.
3. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Division 01 Section “Closeout Procedures.”
4. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
   a. Provide a digital signature with digital certificate on electronically-submitted certificates and certifications where indicated.
   b. Provide a notarized statement on original paper copy certificates and certifications where indicated.
5. Test and Inspection Reports Submittals: Comply with requirements specified in Division 01 Section “Quality Requirements.”
B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:
   a. Manufacturer's catalog cuts.
   b. Manufacturer's product specifications.
   c. Standard color charts.
   d. Statement of compliance with specified referenced standards.
   e. Testing by recognized testing agency.
   f. Application of testing agency labels and seals.
   g. Notation of coordination requirements.
   h. Availability and delivery time information.

4. For equipment, include the following in addition to the above, as applicable:
   a. Wiring diagrams showing factory-installed wiring.
   b. Printed performance curves.
   c. Operational range diagrams.
   d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.

5. Submit Product Data before or concurrent with Samples.
6. Submit Product Data in the following format:
   a. PDF electronic file.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
   a. Identification of products.
   b. Schedules.
   c. Compliance with specified standards.
   d. Notation of coordination requirements.
   e. Notation of dimensions established by field measurement.
   f. Relationship and attachment to adjoining construction clearly indicated.
   g. Seal and signature of professional engineer if specified.

2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches (215 by 280 mm) but no larger than 24 by 36 inches (610 by 914 mm).
3. Submit Shop Drawings in the following format:
   a. PDF electronic file.
D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.

1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
2. Identification: Attach label on unexposed side of Samples that includes the following:
   a. Generic description of Sample.
   b. Product name and name of manufacturer.
   c. Sample source.
   d. Number and title of applicable Specification Section.

3. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
   a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
   b. Samples not incorporated into the Work, or otherwise designated as Owner’s property, are the property of Contractor.

4. Samples for Initial Selection: Submit manufacturer’s color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
   a. Number of Samples: Submit one full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer’s product line. Architect will return submittal with options selected.

5. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
   a. Number of Samples: Submit three sets of Samples. Architect will retain two Sample sets; remainder will be returned. Mark up and retain one returned Sample set as a Project record sample.
     1) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.

E. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:

1. Submit product schedule in the following format:
NORTHWOOD UNIVERSITY  Project No. 2021016
MINER HALL LOWER - LEVEL RENOVATIONS
MIDLAND, MICHIGAN

a. PDF electronic file.

F. Contractor’s Construction Schedule: Comply with requirements specified in Division 01 Section “Construction Progress Documentation.”

G. Application for Payment: Comply with requirements specified in Division 01 Section "Payment Procedures."

H. Schedule of Values: Comply with requirements specified in Division 01 Section “Payment Procedures.”

I. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design.

1. Submit subcontract list in the following format:
   a. PDF electronic file.
   b. Since Federal funding is anticipated for this project, this solicitation and any contract arising from this solicitation is subject to compliance with all applicable Federal contract clauses. The prime contractor, if subcontractors are anticipated or let, must also attempt to take the five affirmative steps to assure that small, minority-owned, women-owned, veteran-owned and labor surplus area businesses as defined by FEMA.

J. Coordination Drawings: Comply with requirements specified in Division 01 Section "Project Management and Coordination."

K. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.


M. Installer Certificates: Submit written statements on manufacturer’s letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

N. Manufacturer Certificates: Submit written statements on manufacturer’s letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

O. Product Certificates: Submit written statements on manufacturer’s letterhead certifying that product complies with requirements in the Contract Documents.

P. Material Certificates: Submit written statements on manufacturer’s letterhead certifying that material complies with requirements in the Contract Documents.
Q. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

R. Product Test Reports: Submit written reports indicating current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

S. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project.

T. Schedule of Tests and Inspections: Comply with requirements specified in Division 01 Section “Quality Requirements.”

U. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.

V. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

W. Field Test Reports: Submit reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

X. Maintenance Data: Comply with requirements specified in Division 01 Section “Operation and Maintenance Data.”

Y. Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

2.2 DELEGATED-DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit [digitally-signed PDF electronic file] [and] [three] paper copies of certificate, signed and sealed by the responsible design professional, for each
product and system specifically assigned to Contractor to be designed or certified by a design professional.

1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

PART 3 - EXECUTION

3.1 CONTRACTOR’S REVIEW

A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.

B. Project Closeout and Maintenance/Material Submittals: Refer to requirements in Division 01 Section “Closeout Procedures.”

C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor’s approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ARCHITECT’S ACTION

A. General: Architect will not review submittals that do not bear Contractor’s approval stamp and will return them without action.

B. Action Submittals: Architect will review each submittal, make marks to indicate corrections or modifications required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.

1. No Exception Taken.
2. Rejected.
3. Note Markings.
4. Comments Attached.
5. Confirm.
6. Resubmit.

C. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.

D. Incomplete submittals are not acceptable, will be considered nonresponsive, and will be returned without review.

E. Submittals not required by the Contract Documents may not be reviewed and may be discarded.
END OF SECTION 013300
SECTION 014000 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

   1. Specified tests, inspections, and related actions do not limit Contractor’s other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.

   2. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

C. Related Sections:

   1. Divisions 02 through 49 Sections for specific test and inspection requirements.

1.2 DEFINITIONS

A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect.

C. Mockups: Full size physical assemblies that are constructed on-site. Mockups are constructed to verify selections made under sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.

D. Preconstruction Testing: Tests and inspections performed specifically for the Project before products and materials are incorporated into the Work to verify performance or compliance with specified criteria.

E. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.
F. Source Quality-Control Testing: Tests and inspections that are performed at the source, i.e., plant, mill, factory, or shop.

G. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

I. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.

1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade or trades.

J. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.3 CONFLICTING REQUIREMENTS

A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Architect for a decision before proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.4 INFORMATIONAL SUBMITTALS

A. Contractor’s Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility sent to authorities having jurisdiction before starting work on the following systems.

1. Seismic-force resisting system, designated seismic system, or component listed in the designated seismic system quality assurance plan prepared by the Architect.
2. Main wind-force resisting system or a wind-resisting component listed in the wind-force-resisting system quality assurance plan prepared by the Architect.

B. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
1.5 REPORTS AND DOCUMENTS

A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:

1. Date of issue.
2. Project title and number.
3. Name, address, and telephone number of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and reinspecting.

B. Manufacturer's Field Reports: Prepare written information documenting tests and inspections specified in other Sections. Include the following:

1. Name, address, and telephone number of representative making report.
2. Statement on condition of substrates and their acceptability for installation of product.
3. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
4. Results of operational and other tests and a statement of whether observed performance complies with requirements.
5. Other required items indicated in individual Specification Sections.

C. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.6 QUALITY ASSURANCE

A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

D. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work 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.
Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar to those indicated for this Project in material, design, and extent.

Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.

Requirements of authorities having jurisdiction shall supersede requirements for specialists.

Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 329; and with additional qualifications specified in individual Sections; and where required by authorities having jurisdiction, that is acceptable to authorities.

1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
2. NVLAP: A testing agency accredited according to NIST’s National Voluntary Laboratory Accreditation Program.

Manufacturer’s Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer’s products that are similar in material, design, and extent to those indicated for this Project.

Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:

1. Contractor responsibilities include the following:
   a. Provide test specimens representative of proposed products and construction.
   b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
   c. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.
   d. When testing is complete, remove test specimens, assemblies, mockups do not reuse products on Project.

2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect, with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:

1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.
2. Notify Architect seven days in advance of dates and times when mockups will be constructed.
3. Demonstrate the proposed range of aesthetic effects and workmanship.
4. Obtain Architect’s approval of mockups before starting work, fabrication, or construction.
   a. Allow seven days for initial review and each re-review of each mockup.

5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.

6. Demolish and remove mockups when directed, unless otherwise indicated.

K. Laboratory Mockups: Comply with requirements of preconstruction testing and those specified in individual Specification Sections in Divisions 02 through 49.

1.7 QUALITY CONTROL

A. Owner Responsibilities: Where quality-control services are indicated as Owner’s responsibility, Owner will engage a qualified testing agency to perform these services.
   1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
   2. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.

B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor’s responsibility. Perform additional quality-control activities required to verify that the Work complies with requirements, whether specified or not.
   1. Where services are indicated as Contractor’s responsibility, engage a qualified testing agency to perform these quality-control services.
      a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
   2. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
   3. Where quality-control services are indicated as Contractor’s responsibility, submit a certified written report, in duplicate, of each quality-control service.
   4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor’s responsibility.
   5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

C. Manufacturer’s Field Services: Where indicated, engage a manufacturer’s representative to observe and inspect the Work. Manufacturer’s representative’s services include examination of substrates and conditions, verification of materials, inspection of completed portions of the Work, and submittal of written reports.

D. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor’s responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.

1. Notify Architect, and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
6. Do not perform any duties of Contractor.

F. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:

1. Access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
4. Facilities for storage and field curing of test samples.
5. Delivery of samples to testing agencies.
6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
7. Security and protection for samples and for testing and inspecting equipment at Project site.

G. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.

1.8 SPECIAL TESTS AND INSPECTIONS

A. Special Tests and Inspections: The Contractor will engage a qualified testing agency or special inspector as required by authorities having jurisdiction, as indicated in individual Specification Sections, and as follows:

1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviewing the completeness and adequacy of those procedures to perform the Work.
2. Notifying Architect and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect with copy to Contractor and to authorities having jurisdiction.
4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
6. Retesting and reinspecting corrected work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 REPAIR AND PROTECTION
A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Division 01 Section "Execution."

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000
PART 1 - GENERAL

1.1 DEFINITIONS

A. General: Basic Contract definitions are included in the Conditions of the Contract.

B. "Approved": When used to convey Architect’s action on Contractor’s submittals, applications, and requests, "approved" is limited to Architect’s duties and responsibilities as stated in the Conditions of the Contract.

C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."

D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."

E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.

F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

G. "Install": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

H. "Provide": Furnish and install, complete and ready for the intended use.

I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.2 INDUSTRY STANDARDS

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.

C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

1.3 ABBREVIATIONS AND ACRONYMS

A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Gale’s “Encyclopedia of Associations” or in Columbia Books’ “National Trade & Professional Associations of the United States.”

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 014200
SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

B. Related Section:

1. Division 01 Section "Summary" for work restrictions and limitations on utility interruptions.

1.2 USE CHARGES

A. General: Installation and removal of and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Owner's construction forces, Architect, testing agencies, and authorities having jurisdiction.

B. Water and Sewer Service from Existing System: Water from Owner’s existing water system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

C. Electric Power Service from Existing System: Electric power from Owner’s existing system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

1.3 INFORMATIONAL SUBMITTALS

A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.

1.4 QUALITY ASSURANCE

A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

C. Accessible Temporary Egress: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board’s ADA-ABA Accessibility Guidelines.
1.5 PROJECT CONDITIONS

A. Temporary Use of Permanent Facilities: Engage installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Chain-Link Fencing: Minimum 2-inch (50-mm), 0.148-inch- (3.8-mm-) thick, galvanized steel, chain-link fabric fencing; minimum 6 feet (1.8 m) high with galvanized steel pipe posts; minimum 2-3/8-inch- (60-mm-) OD line posts and 2-7/8-inch- (73-mm-) OD corner and pull posts, with 1-5/8-inch- (42-mm-) OD top rails.

B. Portable Chain-Link Fencing: Minimum 2-inch (50-mm), 0.148-inch- (3.8-mm-) thick, galvanized steel, chain-link fabric fencing; minimum 6 feet (1.8 m) high with galvanized steel pipe posts; minimum 2-3/8-inch- (60-mm-) OD line posts and 2-7/8-inch- (73-mm-) OD corner and pull posts, with 1-5/8-inch- (42-mm-) OD top and bottom rails. Provide bases for supporting posts.

C. Wood Enclosure Fence: Plywood, 6 feet (1.8 m) high, framed with four 2-by-4-inch (50-by-100-mm) rails, with preservative-treated wood posts spaced not more than 8 feet (2.4 m) apart.

2.2 TEMPORARY FACILITIES

A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.

B. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.

2.3 EQUIPMENT

A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

B. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.

1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.

2. Heating Units: Listed and labeled for type of fuel being consumed, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

3. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 at each return air grille in system and remove at end of construction and clean HVAC system as required in Division 01 Section "Closeout Procedures."
PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.

1. Locate facilities to limit site disturbance as specified in Division 01 Section “Summary.”

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

3.2 TEMPORARY UTILITY INSTALLATION

A. General: Install temporary service or connect to existing service.

1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.

B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.

1. Connect temporary sewers to municipal system as directed by authorities having jurisdiction.

C. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction.

D. Water Service: Connect to Owner’s existing water service facilities. Clean and maintain water service facilities in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.

E. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.

1. Toilets: Use of Owner’s existing toilet facilities will be permitted, as long as facilities are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.

F. Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.

G. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.
H. Electric Power Service: Connect to Owner's existing electric power service. Maintain equipment in a condition acceptable to Owner.

I. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.
   1. Install electric power service overhead, unless otherwise indicated.
   2. Connect temporary service to Owner's existing power source, as directed by Owner.

J. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
   1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.

K. Telephone Service: Provide temporary telephone service in common-use facilities for use by all construction personnel. Install one telephone line(s) for each field office.
   1. Provide additional telephone lines for the following:
      a. Provide a dedicated telephone line for each facsimile machine in each field office.
   2. At each telephone, post a list of important telephone numbers.
      a. Police and fire departments.
      b. Ambulance service.
      c. Contractor’s home office.
      d. Architect’s office.
      e. Engineers’ offices.
      f. Owner’s office.
      g. Principal subcontractors’ field and home offices.
   3. Provide superintendent with cellular telephone or portable two-way radio for use when away from field office.

3.3 SUPPORT FACILITIES INSTALLATION

A. General: Comply with the following:
   1. Provide construction for temporary offices, shops, and sheds located within construction area or within 30 feet (9 m) of building lines that is noncombustible according to ASTM E 136. Comply with NFPA 241.
   2. Maintain support facilities until Architect schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.

B. Traffic Controls: Comply with requirements of authorities having jurisdiction.
   1. Protect existing site improvements to remain including curbs, pavement, and utilities.
   2. Maintain access for fire-fighting equipment and access to fire hydrants.

C. Parking: Use designated areas of Owner’s existing parking areas for construction personnel.
D. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.

1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties nor endanger permanent Work or temporary facilities.
2. Remove snow and ice as required to minimize accumulations.

E. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.

1. Identification Signs: Provide Project identification signs as indicated on Drawings.
2. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.
   a. Provide temporary, directional signs for construction personnel and visitors.
3. Maintain and touchup signs so they are legible at all times.

F. Waste Disposal Facilities: Comply with requirements specified in Division 01 Section "Construction Waste Management and Disposal."

G. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with Division 01 Section "Execution" for progress cleaning requirements.

H. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.

1. Truck cranes and similar devices used for hoisting materials are considered “tools and equipment” and not temporary facilities.

I. Existing Elevator Use: Use of Owner's existing elevators will be permitted, provided elevators are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore elevators to condition existing before initial use, including replacing worn cables, guide shoes, and similar items of limited life.

1. Do not load elevators beyond their rated weight capacity.
2. Provide protective coverings, barriers, devices, signs, or other procedures to protect elevator car and entrance doors and frame. If, despite such protection, elevators become damaged, engage elevator Installer to restore damaged work so no evidence remains of correction work. Return items that cannot be refinished in field to the shop, make required repairs and refinish entire unit, or provide new units as required.

J. Temporary Stairs: Until permanent stairs are available, provide temporary stairs where ladders are not adequate.

K. Existing Stair Usage: Use of Owner's existing stairs will be permitted, provided stairs are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore stairs to condition existing before initial use.

1. Provide protective coverings, barriers, devices, signs, or other procedures to protect stairs and to maintain means of egress. If stairs become damaged, restore damaged areas so no evidence remains of correction work.
L. **Temporary Use of Permanent Stairs:** Use of new stairs for construction traffic will be permitted, provided stairs are protected and finishes restored to new condition at time of Substantial Completion.

### 3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. **Environmental Protection:** Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.

B. **Temporary Erosion and Sedimentation Control:** Comply with requirements of 2003 EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent and requirements specified in Division 31 Section "Site Clearing."

C. **Temporary Erosion and Sedimentation Control:** Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to undisturbed areas and to adjacent properties and walkways, according to requirements of 2003 EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.

D. **Stormwater Control:** Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.

E. **Tree and Plant Protection:** Comply with requirements specified in Division 01 Section "Temporary Tree and Plant Protection."

F. **Tree and Plant Protection:** Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.

G. **Pest Control:** Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals so Project will be free of pests and their residues at Substantial Completion. Obtain extended warranty for Owner. Perform control operations lawfully, using environmentally safe materials.

H. **Security Enclosure and Lockup:** Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each work day.

I. **Barricades, Warning Signs, and Lights:** Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.

J. **Temporary Egress:** Maintain temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction.

K. **Temporary Enclosures:** Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.

1. Where heating or cooling is needed and permanent enclosure is not complete, insulate temporary enclosures.
L. Temporary Partitions: Provide floor-to-ceiling dustproof partitions to limit dust and dirt migration and to separate areas occupied by Owner from fumes and noise.

1. Construct dustproof partitions with gypsum wallboard with joints taped on occupied side, and fire-retardant plywood on construction operations side.

2. Construct dustproof partitions with two layers of 6-mil (0.14-mm) polyethylene sheet on each side. Cover floor with two layers of 6-mil (0.14-mm) polyethylene sheet, extending sheets 18 inches (460 mm) up the sidewalls. Overlap and tape full length of joints. Cover floor with fire-retardant treated plywood.

   a. Construct vestibule and airlock at each entrance through temporary partition with not less than 48 inches (1219 mm) between doors. Maintain water-dampened foot mats in vestibule.

3. Where fire-resistance-rated temporary partitions are indicated or are required by authorities having jurisdiction, construct partitions according to the rated assemblies.

4. Insulate partitions to control noise transmission to occupied areas.

5. Seal joints and perimeter. Equip partitions with gasketed dustproof doors and security locks where openings are required.

6. Protect air-handling equipment.

7. Provide walk-off mats at each entrance through temporary partition.


1. Prohibit smoking in construction areas.

2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.

3. Develop and supervise an overall fire-prevention and protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.

4. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

3.5 MOISTURE AND MOLD CONTROL


B. Exposed Construction Phase: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect materials from water damage and keep porous and organic materials from coming into prolonged contact with concrete.

C. Partially Enclosed Construction Phase: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:

1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.

2. Keep interior spaces reasonably clean and protected from water damage.
3. Discard or replace water-damaged and wet material.
4. Discard, replace or clean stored or installed material that begins to grow mold.
5. Perform work in a sequence that allows any wet materials adequate time to dry before enclosing the material in drywall or other interior finishes.

D. Controlled Construction Phase of Construction: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:
   1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
   2. Remove materials that can not be completely restored to their manufactured moisture level within 48 hours.

3.6 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.

B. Maintenance: Maintain facilities in good operating condition until removal.
   1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.

C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.

D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been 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 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 Contractor. Owner reserves right to take possession of Project identification signs.
   2. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Division 01 Section “Closeout Procedures.”

END OF SECTION 015000
SECTION 016000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers’ standard warranties on products; special warranties; and comparable products.

B. Related Section:

1. Division 01 Section "Substitution Procedures" for requests for substitutions.

1.2 DEFINITIONS

A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.

2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.

3. Comparable Product: Product that is demonstrated and approved through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

B. Basis-of-Design Product Specification: A specification in which a specific manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of additional manufacturers named in the specification.

1.3 ACTION SUBMITTALS

A. Comparable Product Requests: Submit request for consideration of each comparable product. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Architect’s Action: If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Architect will notify Contractor of approval or rejection of proposed
comparable product request within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.

a. Form of Approval: As specified in Division 01 Section "Submittal Procedures."
b. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.

B. Basis-of-Design Product Specification Submittal: Comply with requirements in Division 01 Section "Submittal Procedures." Show compliance with requirements.

1.4 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.

B. Delivery and Handling:

1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.

C. Storage:

1. Store products to allow for inspection and measurement of quantity or counting of units.
2. Store materials in a manner that will not endanger Project structure.
3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
4. Store foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
6. Protect stored products from damage and liquids from freezing.
1.6 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer’s disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

1. Manufacturer’s Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.

1. Manufacturer’s Standard Form: Modified to include Project-specific information and properly executed.
2. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
3. Refer to Divisions 02 through 49. Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Division 01 Section “Closeout Procedures.”

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.

1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
4. Where products are accompanied by the term “as selected,” Architect will make selection.

B. Product Selection Procedures:

1. Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor’s convenience will not be considered.
2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with
requirements. Comparable products or substitutions for Contractor's convenience will not be considered.

3. Products:

a. Restricted List: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered, unless otherwise indicated.
b. Nonrestricted List: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product.

4. Manufacturers:

a. Restricted List: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered, unless otherwise indicated.
b. Nonrestricted List: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed, or a product by an unnamed manufacturer, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed manufacturer's product.

5. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.

C. Visual Matching Specification: Where Specifications require "match Architect's sample", provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.

1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Division 01 Section "Substitution Procedures" for proposal of product.

D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 COMPARABLE PRODUCTS

A. Conditions for Consideration: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with these requirements:
1. Evidence that the proposed product does not require revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.

2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.

3. Evidence that proposed product provides specified warranty.

4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.

5. Samples, if requested.

PART 3 - EXECUTION (Not Used)

END OF SECTION 016000
PART 1 - GENERAL

1.1 SUMMARY

A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:

2. Field engineering and surveying.
3. Installation of the Work.
4. Cutting and patching.
5. Coordination of Owner-installed products.
6. Progress cleaning.
7. Starting and adjusting.
8. Protection of installed construction.

B. Related Sections:

1. Division 01 Section "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.
2. Division 07 Section "Penetration Firestopping" for patching penetrations in fire-rated construction.

1.2 INFORMATIONAL SUBMITTALS

A. Certificates: Submit certificate signed by land surveyor or professional engineer certifying that location and elevation of improvements comply with requirements.

B. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

1.3 QUALITY ASSURANCE

A. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.

1. Structural Elements: When cutting and patching structural elements, notify Architect of locations and details of cutting and await directions from the Architect before proceeding. Shore, brace, and support structural element during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection.

2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.

3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in
reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.

4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

1.4 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections.

B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to the Architect for the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.

1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; underground electrical services, and other utilities.

2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
2. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
3. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
4. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Existing Utility Information: Furnish information to local utility and Owner that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

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

C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of the Contractor, submit a request for information to Architect according to requirements in Division 01 Section “Project Management and Coordination.”

3.3 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect promptly.

3.4 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

1. Make vertical work plumb and make horizontal work level.
2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.

B. Comply with manufacturer’s written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
E. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

F. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

G. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
2. Allow for building movement, including thermal expansion and contraction.
3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

H. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

I. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.5 CUTTING AND PATCHING

A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Temporary Support: Provide temporary support of work to be cut.

C. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

D. Adjacent Occupied Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

E. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to prevent interruption to occupied areas.

F. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer’s written recommendations.
1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.

2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.

3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.

4. Excavating and Backfilling: Comply with requirements in applicable Division 31 Sections where required by cutting and patching operations.

5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.

6. Proceed with patching after construction operations requiring cutting are complete.

G. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.

2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.

3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.

4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.

5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.

H. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.6 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.


2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F (27 deg C).

3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
1. Remove liquid spills promptly.
2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways.

H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.7 STARTING AND ADJUSTING

A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

B. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.

C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Manufacturer’s Field Service: Comply with qualification requirements in Division 01 Section “Quality Requirements.”

3.8 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

1. Special attention to lay-down and project trailer areas. These site areas to be protected and restored (if necessary) to original condition. Including parking surfaces, curbs, concrete walks, landscaping, turf, etc.
a. The contractor will be responsible to document existing conditions, prior to construction activities, with photos or video. One copy of the photos or video will be turned over to the owner prior to construction activities. Any disputed items in the project site area not previously documented may be the responsibility of the contractor to restore.

B. Comply with manufacturer’s written instructions for temperature and relative humidity.

3.9 CORRECTION OF THE WORK

A. Repair or remove and replace defective construction. Restore damaged substrates and finishes.

1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.

B. Restore permanent facilities used during construction to their specified condition.

C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION 017300
PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:

1. Substantial Completion procedures.
2. Final completion procedures.
3. Warranties.
4. Final cleaning.

B. Related Sections:

1. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
2. Division 01 Section "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
3. Division 01 Section "Demonstration and Training" for requirements for instructing Owner’s personnel.
4. Divisions 02 through 49 Sections for specific closeout and special cleaning requirements for the Work in those Sections.

1.2 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete with request.

1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
2. Advise Owner of pending insurance changeover requirements.
3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
4. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
5. Prepare and submit Project Record Documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.
6. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer’s name and model number where applicable.
7. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner’s personnel of changeover in security provisions.
8. Complete startup testing of systems.
10. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
11. Advise Owner of changeover in heat and other utilities.
12. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
13. Complete final cleaning requirements, including touchup painting.
14. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for final completion.

1.3 FINAL COMPLETION

A. Preliminary Procedures: Before requesting final inspection for determining final completion, complete the following:

1. Submit a final Application for Payment according to Division 01 Section "Payment Procedures."
2. Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
4. Submit pest-control final inspection report and warranty.
5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.

B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.4 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.
1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.
2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
3. Submit list of incomplete items in the following format:
   a. PDF electronic file.

1.5 WARRANTIES

A. Submittal Time: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.

B. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.

   1. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch (215-by-280-mm) paper.

   2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.

   3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.

   4. Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide table of contents at beginning of document.

C. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

   1. Use cleaning products that meet Green Seal GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.
3.1 FINAL CLEANING

A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer’s written instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:
   a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
   b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
   c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
   d. Remove tools, construction equipment, machinery, and surplus material from Project site.
   e. Remove snow and ice to provide safe access to building.
   f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
   g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
   h. Sweep concrete floors broom clean in unoccupied spaces.
   i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
   j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
   k. Remove labels that are not permanent.
   l. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.

   1) Do not paint over “UL” and other required labels and identification, including mechanical and electrical nameplates.

   m. Wipe surfaces of mechanical and electrical equipment[ elevator equipment] and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
   n. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
CLOSEOUT PROCEDURES

END OF SECTION 017700

o. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
p. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
q. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
r. Leave Project clean and ready for occupancy.

C. Pest Control: Engage an experienced, licensed exterminator to make a final inspection and rid Project of rodents, insects, and other pests. Prepare a report.
SECTION 017823 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:

1. Operation and maintenance documentation directory.
2. Emergency manuals.
3. Operation manuals for systems, subsystems, and equipment.
4. Product maintenance manuals.
5. Systems and equipment maintenance manuals.

B. Related Sections:

1. Divisions 02 through 49 Sections for specific operation and maintenance manual requirements for the Work in those Sections.

1.2 CLOSEOUT SUBMITTALS

A. Format: Submit operations and maintenance manuals in the following format:


   a. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically-linked operation and maintenance directory.

   b. Enable inserted reviewer comments on draft submittals.

PART 2 - PRODUCTS

2.1 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:

1. Title page.
2. Table of contents.

B. Title Page: Include the following information:

1. Subject matter included in manual.
2. Name and address of Project.
3. Name and address of Owner.
4. Date of submittal.
5. Name and contact information for Contractor.
6. Name and contact information for Architect.
7. Name and contact information for Commissioning Agent.
8. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
9. Cross-reference to related systems in other operation and maintenance manuals.

C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.

D. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.

1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
2. File Names and Bookmarks: Enable bookmarking of individual documents based upon file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel upon opening file.

2.2 EMERGENCY MANUALS

A. Content: Organize manual into a separate section for each of the following:

1. Type of emergency.
2. Emergency instructions.
3. Emergency procedures.

B. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:

1. Fire.
2. Flood.
5. Power failure.
7. System, subsystem, or equipment failure.
8. Chemical release or spill.

C. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.

D. Emergency Procedures: Include the following, as applicable:

1. Instructions on stopping.
2. Shutdown instructions for each type of emergency.
3. Operating instructions for conditions outside normal operating limits.
4. Required sequences for electric or electronic systems.
5. Special operating instructions and procedures.

2.3 OPERATION MANUALS

A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:

2. Performance and design criteria if Contractor is delegated design responsibility.
3. Operating standards.
4. Operating procedures.
5. Operating logs.
6. Wiring diagrams.
7. Control diagrams.
8. Piped system diagrams.
9. Precautions against improper use.
10. License requirements including inspection and renewal dates.

B. Descriptions: Include the following:

1. Product name and model number. Use designations for products indicated on Contract Documents.
2. Manufacturer’s name.
3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

C. Operating Procedures: Include the following, as applicable:

1. Startup procedures.
2. Equipment or system break-in procedures.
3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.

D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.
2.4 PRODUCT MAINTENANCE MANUALS

A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.

C. Product Information: Include the following, as applicable:

1. Product name and model number.
2. Manufacturer's name.
3. Color, pattern, and texture.
5. Reordering information for specially manufactured products.

D. Maintenance Procedures: Include manufacturer's written recommendations and the following:

1. Inspection procedures.
2. Types of cleaning agents to be used and methods of cleaning.
3. List of cleaning agents and methods of cleaning detrimental to product.
4. Schedule for routine cleaning and maintenance.
5. Repair instructions.

E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

2.5 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.

B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.

C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:

1. Standard maintenance instructions and bulletins.
2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
3. Identification and nomenclature of parts and components.
4. List of items recommended to be stocked as spare parts.

D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:

1. Test and inspection instructions.
2. Troubleshooting guide.
3. Precautions against improper maintenance.
4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
5. Aligning, adjusting, and checking instructions.
6. Demonstration and training video recording, if available.

E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.

F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers’ maintenance documentation and local sources of maintenance materials and related services.

G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.

H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

A. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner’s operating personnel for types of emergencies indicated.

B. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

C. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.

D. Manufacturers’ Data: Where manuals contain manufacturers’ standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.

E. Drawings: Prepare drawings supplementing manufacturers’ printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.
1. Do not use original project record documents as part of operation and maintenance manuals.

F. Comply with Division 01 Section "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION 017823
SECTION 017839 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for project record documents, including the following:
   1. Record Drawings.
   2. Record Specifications.
   3. Record Product Data.

B. Related Sections:
   1. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
   2. Divisions 02 through 49 Sections for specific requirements for project record documents of the Work in those Sections.

1.2 CLOSEOUT SUBMITTALS

A. Record Drawings: Comply with the following:
   1. Number of Copies: Submit two sets of marked-up record prints.
   2. Number of Copies: Submit copies of record Drawings as follows:
      a. Initial Submittal: Submit PDF electronic files of marked-up record prints and two sets of plots from corrected record digital data files. Architect will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.
      b. Final Submittal: Submit PDF electronic files of marked-up record prints. Print each Drawing, whether or not changes and additional information were recorded.
      c. Final Submittal: Submit PDF electronic files of marked-up record prints, two sets of record digital data files, and two sets of record digital data file plots. Plot each drawing file, whether or not changes and additional information were recorded.

B. Record Specifications: Submit annotated PDF electronic files of Project’s Specifications, including addenda and contract modifications.

C. Record Product Data: Submit annotated PDF electronic files and directories of each submittal.
2.1 RECORD DRAWINGS

A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings.

1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.

   a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
   b. Record data as soon as possible after obtaining it.
   c. Record and check the markup before enclosing concealed installations.

2. Mark the Contract Drawings and Shop Drawings completely and accurately. Utilize personnel proficient at recording graphic information in production of marked-up record prints.

3. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.

4. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

B. Record Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, review marked-up record prints with Architect. When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:

1. Format: Same digital data software program, version, and operating system as the original Contract Drawings.
2. Format: DWG, Version 2010, operating in Microsoft Windows operating system.
3. Format: Annotated PDF electronic file with comment function enabled.
4. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
5. Refer instances of uncertainty to Architect through General Contractor for resolution.

C. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.

1. Record Prints: Organize record prints and newly prepared record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
2. Format: Annotated PDF electronic file with comment function enabled.
3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
4. Identification: As follows:

   a. Project name.
   b. Date.
   c. Designation "PROJECT RECORD DRAWINGS."
d. Name of Architect.

e. Name of Contractor.

2.2 RECORD SPECIFICATIONS

A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
4. Note related Change Orders, Record Product Data and record Drawings where applicable.

B. Format: Submit record Specifications as annotated PDF electronic file.

2.3 RECORD PRODUCT DATA

A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
3. Note related Change Orders, Record Specifications, and record Drawings where applicable.

B. Format: Submit record Product Data as annotated PDF electronic file.

2.4 MISCELLANEOUS RECORD SUBMITTALS

A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

B. Format: Submit miscellaneous record submittals as PDF electronic file.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and modifications to project record documents as they occur; do not wait until the end of Project.
B. Maintenance of Record Documents and Samples: Store record documents and Samples in the field office apart from the Contract Documents used for construction. Do not use project record documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to project record documents for Architect’s reference during normal working hours.

END OF SECTION 017839
SECTION 024119 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Demolition and removal of selected portions of building.
2. Demolition and removal of selected site elements.
3. Salvage of existing items to be reused or recycled.

1.2 DEFINITIONS

A. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged or removed and reinstalled.

B. Remove and Salvage: Carefully detach from existing construction, in a manner to prevent damage, and deliver to Owner ready for reuse.

C. Remove and Reinstall: Detach items from existing construction, prepare for reuse, and reinstall where indicated.

D. Existing to Remain: Existing items of construction that are not to be permanently removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.3 PREINSTALLATION MEETINGS

A. Predemolition Conference: Conduct conference at Project site.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For refrigerant recovery technician.

B. Predemolition Photographs or Video: Submit before Work begins.

C. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician.

1.5 CLOSEOUT SUBMITTALS

A. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.
1.6 QUALITY ASSURANCE

A. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program.

1.7 FIELD CONDITIONS

A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.

B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
   1. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.

E. Storage or sale of removed items or materials on-site is not permitted.

F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
   1. Maintain fire-protection facilities in service during selective demolition operations.

1.8 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ANSI/ASSE A10.6 and NFPA 241.
3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped before starting selective demolition operations.

B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

C. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.

D. Perform an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective building demolition operations.

E. Survey of Existing Conditions: Record existing conditions by use of preconstruction videotapes.

   1. Comply with requirements specified in Section 013233 “Photographic Documentation.”

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.

   1. Comply with requirements for existing services/systems interruptions specified in Section 011000 “Summary.”

B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.

   1. Owner will arrange to shut off indicated services/systems when requested by Contractor.
   2. Arrange to shut off indicated utilities with utility companies.
   3. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
   4. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated to be removed.

   a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
   b. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material.
   c. Equipment to Be Removed: Disconnect and cap services and remove equipment.
d. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
e. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
f. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
g. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material.

C. Refrigerant: Remove refrigerant from mechanical equipment to be selectively demolished according to 40 CFR 82 and regulations of authorities having jurisdiction.

3.3 PREPARATION

A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Comply with requirements for access and protection specified in Section 015000 “Temporary Facilities and Controls.”

B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

C. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.

3.4 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
2. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
3. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain fire watch and portable fire-suppression devices during flame-cutting operations.
4. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
5. Dispose of demolished items and materials promptly. Comply with requirements in Section 017419 “Construction Waste Management and Disposal.”
B. Removed and Salvaged Items:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Store items in a secure area until delivery to Owner.
4. Transport items to Owner's storage area designated by Owner.
5. Protect items from damage during transport and storage.

C. Removed and Reinstalled Items:

1. Clean and repair items to functional condition adequate for intended reuse.
2. Pack or crate items after cleaning and repairing. Identify contents of containers.
3. Protect items from damage during transport and storage.
4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

D. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.5 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Except for items or materials indicated to be recycled, reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.

1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
4. Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."

B. Burning: Do not burn demolished materials.

C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.6 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION 024119
PART 1 - GENERAL

1.1 SUMMARY

A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes for the following:
   1. Concrete foundations and footings.
   2. Concrete sills.
   3. Concrete retaining walls.
   4. Concrete slabs-on-grade.
   5. Installation (only) of sleeves for other trades.
   6. Equipment pads and bases.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product specified.
B. Design Mixtures: For each concrete mixture.

1.3 INFORMATIONAL SUBMITTALS

A. Material certificates.
B. Material test reports.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
   1. Manufacturer certified according to NRMCA’s “Certification of Ready Mixed Concrete Production Facilities.”
B. Testing Agency Qualifications: An independent agency, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

1.5 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing on concrete mixtures.

1.6 FIELD CONDITIONS

A. Cold-Weather Placement: Comply with ACI 306.1.
   1. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
B. Hot-Weather Placement: Comply with ACI 301 (ACI 301M).
PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

A. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
   1. ACI 301 (ACI 301M).
   2. ACI 117 (ACI 117M).

2.2 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

2.3 STEEL REINFORCEMENT

A. Rebars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.

B. Plain-Steel Welded-Wire Reinforcement: ASTM A 1064/A 1064M, plain, fabricated from as-drawn steel wire into flat sheets.


D. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI’s “Manual of Standard Practice.”

2.4 CONCRETE MATERIALS

A. Cementitious Materials:
   1. Portland Cement: ASTM C 150/C 150M, Type I.
   2. Fly Ash: ASTM C 618, Class F or C.
   3. Slag Cement: ASTM C 989/C 989M, Grade 100 or 120.

B. Normal-Weight Aggregates: ASTM C 33/C 33M, graded.
   2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Air-Entraining Admixture: ASTM C 260/C 260M.

D. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
   1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
   2. Retarding Admixture: ASTM C 494/C 494M, Type B.
   3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
   4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
   5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
   6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

E. Water: ASTM C 94/C 94M and potable.
2.5 VAPOR RETARDERS
A. Sheet Vapor Retarder: ASTM E 1745, Class B. Include manufacturer’s recommended adhesive or pressure-sensitive tape.
B. Sheet Vapor Retarder: Polyethylene sheet, ASTM D 4397, not less than 10 mils (0.25 mm) thick.

2.6 CURING MATERIALS
A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) when dry.
C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
D. Water: Potable.
E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.
F. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, nondissipating, certified by curing compound manufacturer to not interfere with bonding of floor covering.

2.7 FLOOR HARDENER MATERIALS
A. Magnesium fluorsilicate concrete hardener and dustproofer: MasterKure HD 300WB.
B. Provide at all floors where the floor finish is called out to be “sealed concrete”.
C. See Specification Section 033543 “Polished Concrete Finishing” for floors called out to be “polished concrete”.

2.8 RELATED MATERIALS

2.9 CONCRETE MIXTURES, GENERAL
A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301 (ACI 301M).
B. Cementitious Materials: Use fly ash, pozzolan, slag cement, and silica fume as needed to reduce the total amount of portland cement, which would otherwise be used, by not less than 40 percent.
C. Admixtures: Use admixtures according to manufacturer’s written instructions.
   1. Use water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
   2. Use water-reducing and -retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
   3. Use water-reducing admixture in pumped concrete, concrete required to be watertight, and concrete with a w/c ratio below 0.50.

2.10 CONCRETE MIXTURES FOR BUILDING ELEMENTS
A. Proportion normal-weight concrete mixture as follows:
   1. Minimum Compressive Strength: at 28 days as follows:
      a. Footings, Foundation Walls and Piers: 3,000 psi.
CAST-IN-PLACE CONCRETE

2.11 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI’s “Manual of Standard Practice.”
B. Conform with requirements of ACI 315 where specific details are not shown or where the drawings and specifications are not more demanding.
C. Bundle, tag and mark all reinforcement. Use metal tags indicating bar size, lengths and other information corresponding to markings shown on shop drawings.

2.12 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and ASTM C 1116/C 1116M, and furnish batch ticket information.

1. When air temperature is between 85 and 90 deg F (30 and 32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 FORMWORK INSTALLATION

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301 (ACI 301M), to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117 (ACI 117M).
C. Chamfer exterior corners and edges of permanently exposed concrete.

3.2 EMBEDDED ITEM INSTALLATION

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

3.3 VAPOR-RETARDER INSTALLATION

A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer’s written instructions.

1. Lap joints 6 inches (150 mm) and seal with manufacturers recommended tape.

3.4 STEEL REINFORCEMENT INSTALLATION

A. General: Comply with CRSI’s “Manual of Standard Practice” for fabricating, placing, and supporting reinforcement.
1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
2. Accurately position, support and secure reinforcement against displacement by formwork, construction or concrete placement operations. Provide supports for reinforcement including bolsters, chairs, spacers and other devices suitable for proper spacing, supporting and fastening reinforcing in place. Use wire bar type supports complying with CRSI “Manual of Standard Practice”.
3. Use minimum #5 carrying bars where required.
4. Use supports with sand plates horizontal runners for slabs on grade where base materials shall not support chair legs.
5. Space reinforcing bars to comply with ACI 318.
6. Relocate bars to avoid interference of other embedded items but not more than one bar diameter without approval.
7. Locate last reinforcing bar within 2 inches of last leg of continuous bar support.
8. Place reinforcement to obtain proper coverage for concrete protection. Arrange, space and tie bars and bar supports together with steel wire. Set wire tie ends to concrete. Place and tie column dowels.
9. Splice reinforcement with contact lapped splices in accordance with ACI 318 Class B considering both basic and top bar tables, unless indicated otherwise on the drawings.
10. Protect installed reinforcing from construction loads.

3.5 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:
   1. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- (3.2-mm-) wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

3.6 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections are completed.
B. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
   1. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301 (ACI 301M).
C. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
   1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
   2. Slope surfaces uniformly to drains where required.
3.7 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
   1. Apply to concrete surfaces not exposed to public view.

B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
   1. Apply to concrete surfaces exposed to public view, to receive a rubbed finish, or to be covered with a coating or covering material applied directly to concrete.

C. Rubbed Finish: Apply the following to smooth-formed-finished as-cast concrete where indicated:
   1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.
   2. Grout-Cleaned Finish: Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes. Mix 1 part portland cement to 1-1/2 parts fine sand with a 1:1 mixture of bonding admixture and water. Add white portland cement in amounts determined by trial patches, so color of dry grout matches adjacent surfaces. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap and keep surface damp by fog spray for at least 36 hours.

D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.8 FINISHING FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power-driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.
   1. Apply float finish to surfaces to receive trowel finish.

C. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
   1. Apply a trowel finish to surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
   2. Finish and measure surface, so gap at any point between concrete surface and an unleveled, freestanding, 10-ft.- (3.05-m-) long straightedge resting on two high spots and placed anywhere on the surface does not exceed 3/16 inch (4.8 mm).

D. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces where ceramic or quarry tile is to be installed by either thickset or thinset method. While concrete is still plastic, slightly scarify surface with a fine broom.
   1. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.
E. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated.
   1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route.

3.9 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 (ACI 301M) for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m x h) before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for remainder of curing period.

D. Cure concrete scheduled to receive a liquid hardener as specified in paragraph 3.10.

E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
   1. Moisture Curing: Keep surfaces continuously moist for not less than seven days.
   2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
   3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recruit areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
      a. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound does not interfere with bonding of floor covering used on Project.
   4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recruit areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.10 APPLICATION OF LIQUID HARDENERS

A. Cure concrete surfaces scheduled to receive a liquid hardener by the following method and as directed by the liquid hardener manufacturer:
   1. Water curing following the guidelines in ACI 308, “Standard Practice for Curing Concrete.”

B. Apply three (3) coats of liquid hardener per manufacturer’s written instructions to achieve the appearance of a polished sheen.

C. Mask any glass, aluminum or polished metal surfaces in the application area as well as any contraction or control joints that have not been filled to prevent possible adhesion problems.
D. All surfaces to be treated with the liquid hardener must be dry, clean, and free of all dust, dirt, debris, oil, grease, sealers, or curing compounds.

E. Apply the first coat of liquid hardener by roller, spray, brush, or squeegee. Bubbling indicates reaction of MasterKure HD 300WB with the concrete. Distribute evenly and mop up excess solution or puddles.

F. After the first application, allow the floor to dry until no longer visibly wet.

G. If crystals develop during the second application, flush the surface liberally with clean water. Use hot water if available. At the same time, rapidly brush the floor with a stiff-bristled broom.

H. Mop up excess water and allow the surface to dry.

I. As the last application is drying, wait for the uniform appearance of white crystals. Flood the floor with water and buff with a commercial floor buffer using an abrasive pad. Continue buffing until the floor acquires a patina or polish and the whiteness is gone.

3.11 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect’s approval.

3.12 FIELD QUALITY CONTROL

A. Special Inspections: The General Contractor will engage a qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

END OF SECTION 033000
PART 1 - GENERAL

1.1 SUMMARY

A. Section includes polished concrete finishing.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Submit polished concrete finishes manufacturer’s specifications and test data.
   2. Submit polished concrete finishes describing product to be provided, giving manufacturer's name and product name for the specified material proposed to be provided under this section.
   3. Submit polished concrete finishes manufacturer's recommended installation procedures; which when approved by the Architect, will become the basis for accepting or rejecting actual installation procedures used on the work.
   4. Submit polished concrete finishes technical data sheet giving descriptive data, curing time, and application requirements.

B. Sustainable Design Submittals:
   1. Laboratory Test Reports: For liquid floor treatments, indicating compliance with requirements for low-emitting materials.

C. Samples: For each type of product requiring color selection.

1.3 QUALITY ASSURANCE

A. Installer Qualifications:
   1. Use an experienced installer and adequate number of skilled workmen who are thoroughly trained and experienced in the necessary craft.
   2. The special concrete finish manufacturer shall certify applicator.
   3. Applicator shall be familiar with the specified requirements and the methods needed for proper performance of work of this section.

B. Manufacturer’s Certification:
   1. Provide letter of certification from concrete finish manufacturer stating that installer is certified applicator of special concrete finishes and is familiar with proper procedures and installation requirements required by the manufacturer.

C. Field Sample Panels: After approval of samples, produce field sample panels to demonstrate the approved range of selections made under Sample submittals. Produce a minimum of three sets of full-scale panels, approximately 50 square feet minimum, to demonstrate the expected range of finish, color, and appearance variations.
   1. Locate panels as indicated or, if not indicated, as directed by Architect.
   2. Maintain field sample panels during construction in an undisturbed condition as a standard for judging the completed Work.
   3. Demolish and remove field sample panels when directed.
   4. Approved mock-ups may become part of the completed work if undisturbed at time of substantial completion.
D. Protection
   1. No satisfactory chemical or cleaning procedure is available to remove petroleum stains from the concrete surface. Prevention is therefore essential.
      a. All hydraulic powered equipment must be diapered to avoid staining of the concrete.
      b. No trade will park vehicles on the inside slab. If necessary to complete their scope of work, drop cloths will be placed under vehicles at all times.
      c. No pipe cutting machine will be used on the inside floor slab.
      d. Steel will not be placed on interior slab to avoid rust staining.
      e. Acids and acidic detergents will not come into contact with slab.
      f. All trades informed that the slab must be protected at all times.

1.4 PROJECT CONDITIONS

A. Environmental limitations:
   1. Comply with manufacturers written instructions for substrate temperature and moisture content, ambient temperature and humidity, ventilation, and other conditions affecting topping performance.
      a. Concrete Floor Flatness rating recommended at least 40.
      b. Concrete Floor Levelness rating recommended at least 30.
      c. Concrete must be cured a minimum of 45 days or as directed by the manufacturer before application of Retro Plate can begin.

B. Close areas to traffic during floor application and after application, for time period recommended in writing by manufacturer.

PART 2 - PRODUCTS

2.1 LIQUID FLOOR TREATMENTS

   A. Densifier

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS:

   A. Examine substrate, with installer present, for conditions affecting performance of finish. Correct conditions detrimental to timely and proper work. Do not proceed until unsatisfactory conditions are corrected.
   B. Prior to application, verify that floor surfaces are free of construction latents.

3.2 APPLICATION

   A. Start any of the floor finish applications in presence of manufacturer’s technical representative.
   B. Hardening and Polishing of Concrete Surface
      1. Concrete must be in place a minimum of 45 days or as directed by the manufacturer before application can begin.
2. Application is to take place at least 10 days prior to racking and other in-store accessory installation, thus providing a complete, uninhibited concrete slab for application.

3. Only a certified applicator shall apply Liquid Floor Treatments. Applicable procedures must be followed as recommended by the product manufacturer and as required to match approved test sample.

4. Achieve waterproofing, hardening, dust-proofing, and abrasion resistance of the surface without changing the natural appearance of the concrete, except for the sheen.

5. Apply joint filler per manufactures written instructions. Overfill joint to ensure complete fill and shave off excess material flush with concrete floor surface to achieve a smooth, uniform surface free of voids and gaps.

3.3 POLISHING

A. Polish: Level 3; Polished. – Full Mechanical Grind

B. Apply polished concrete finish system to cured and prepared slabs.

1. Machine grind floor surfaces to receive polished finishes level and smooth.

2. Apply liquid floor treatment for polished concrete in polishing sequence and according to manufacturer’s written instructions, allowing recommended drying time between successive coats.

3. Apply densifier for polished concrete in polishing sequence and according to manufacturer’s written instructions.

4. Continue polishing with progressively finer-grit diamond polishing pads to gloss level, to match approved mockup.

5. Control and dispose of waste products produced by grinding and polishing operations.


END OF SECTION 033543
PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Concrete masonry units.
   2. Clay face brick.
   3. Mortar and grout.
   4. Steel reinforcing bars.
   5. Masonry-joint reinforcement.
   6. Ties and anchors.
   7. Miscellaneous masonry accessories.
   8. Masonry waste disposal.

B. Products Installed but not Furnished under this section:

1.2 DEFINITIONS

A. CMU(s): Concrete masonry unit(s).
B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.
B. Shop Drawings: For reinforcing steel. Detail bending, lap lengths, and placement of unit masonry reinforcing bars. Comply with ACI 315.
C. Samples for Verification: For each type and color of exposed masonry unit.

1.4 INFORMATIONAL SUBMITTALS

A. Material Certificates: For each type and size of product. For masonry units, include material test reports substantiating compliance with requirements.
B. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.
   1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C 109/C 109M for compressive strength, ASTM C 1506 for water retention, and ASTM C 91/C 91M for air content.
   2. Include test reports, according to ASTM C 1019, for grout mixes required to comply with compressive strength requirement.

1.5 QUALITY ASSURANCE

A. Sample Panels: Build sample panels to verify selections made under Sample submittals and to demonstrate aesthetic effects. Comply with requirements in Section 014000 "Quality Requirements" for mockups.
   1. Build sample panels for typical exterior wall in sizes approximately 48 inches (1200 mm) long by 48 inches (1200 mm) high by full thickness.
1.6 FIELD CONDITIONS

A. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.


PART 2 - PRODUCTS

2.1 UNIT MASONRY, GENERAL

A. Masonry Standard: Comply with TMS 602/ACI 530.1/ASCE 6, except as modified by requirements in the Contract Documents.

B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated. Do not use units where such defects are exposed in the completed Work.

C. Fire-Resistance Ratings: Comply with requirements for fire-resistance-rated assembly designs indicated.

1. Where fire-resistance-rated construction is indicated, units shall be listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction.

2.2 CONCRETE MASONRY UNITS

A. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.

1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.

B. CMUs: ASTM C 90.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2150 psi (14.8 MPa).

2. Density Classification: Normal weight.

2.3 BRICK

A. General: Provide shapes indicated and as follows, with exposed surfaces matching finish and color of exposed faces of adjacent units:

1. For ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces, provide units without cores or frogs and with exposed surfaces finished.

2. Provide square-edged units for outside corners.

B. Clay Face Brick: Facing brick complying with ASTM C 216.

1. Match Existing Brick color and style

2. Grade: SW.

3. Type: FBX.

4. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 3350 psi (23.10 MPa).

5. Initial Rate of Absorption: Less than 20 g/30 sq. in. (20 g/194 sq. cm) per minute when tested according to ASTM C 67.
6. Efflorescence: Provide brick that has been tested according to ASTM C 67 and is rated “not effloresced.”
7. Size: Bricks manufactured to the following actual dimensions within tolerances specified in ASTM C 216:
   a. Modular: 3-1/2 to 3-5/8 inches thick by 2-1/4 inches high by 7-1/2 to 7-5/8 inches long.

2.4 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C 150/C 150M, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
B. Hydrated Lime: ASTM C 207, Type S.
C. Portland Cement-Lime Mix: Packaged blend of Portland cement and hydrated lime containing no other ingredients.
D. Masonry Cement: ASTM C 91/C 91M.
E. Aggregate for Mortar: ASTM C 144.
   1. For joints less than 1/4-inch (6 mm) thick, use aggregate graded with 100 percent passing the No. 16 (1.18-mm) sieve.
   2. White-Mortar Aggregates: Natural white sand or crushed white stone.
F. Ready-Mixed Mortar: Cementitious materials, water, and aggregate complying with requirements specified in the Article; combined with set-controlling admixtures to produce a ready-mixed mortar complying with ASTM C1142.
H. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494/C 494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.
I. Water: Potable.

2.5 REINFORCEMENT

A. Uncoated-Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60 (Grade 420).
B. Masonry-Joint Reinforcement, General: ASTM A 951/A 951M.
   1. Interior Walls: Galvanized carbon steel, ASTM A641, Class I, (0.1 oz. zinc coating per sq. ft.)
   2. Exterior Walls: Hot-dip galvanized carbon steel, ASTM A153, Class B-2, (1.5 oz. zinc coating per sq. ft.)
   3. Wire Size for Side Rods: 0.148-inch (3.77-mm) diameter.
   4. Wire Size for Cross Rods: 0.148-inch (3.77-mm) diameter.
   5. Wire Size for Veneer Ties: 0.148-inch (3.77-mm) diameter.
   6. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches (407 mm) o.c.
   7. Provide in lengths of not less than 10 feet (3 m), with prefabricated corner and tee units.
C. Masonry-Joint Reinforcement for Single-Wythe Masonry: Ladder or truss type with single pair of side rods.
D. Masonry-Joint Reinforcement for Multiwythe Masonry:
   1. Ladder type with one side rod at each face shell of hollow masonry units more than 4 inches (100 mm) wide, plus one side rod at each wythe of masonry 4 inches (100 mm) wide or less.
   2. Adjustable (two-piece) type, either ladder or truss design, with one side rod at each face shell of backing wythe and with separate adjustable ties with pintle-and-eye
connections having a maximum horizontal play of 1/16 inch (1.5 mm) and maximum vertical adjustment of 1-1/4 inches (32 mm). Size ties to extend at least halfway through facing wythe but with at least 5/8-inch (16-mm) cover on outside face. Ties have hooks or clips to engage a continuous horizontal wire in the facing wythe.

2.6 TIES AND ANCHORS

A. General: Ties and anchors shall extend at least 1-1/2 inches (38 mm) into veneer but with at least a 5/8-inch (16-mm) cover on outside face.

B. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated:
   3. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

C. Individual Wire Ties: Rectangular units with closed ends and not less than 4 inches (100 mm) wide.

D. Adjustable Anchors for Connecting to Structural Steel Framing: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
   1. Anchor Section for Welding to Steel Frame: Crimped 1/4-inch- (6.35-mm-) diameter, hot-dip galvanized-steel wire.
   2. Tie Section: Triangular-shaped wire tie made from 0.187-inch- (4.76-mm-) diameter, hot-dip galvanized-steel wire.

E. Rigid Anchors: Fabricate from steel bars 1-1/2 inches (38 mm) wide by 1/4 inch (6.35 mm) thick by 24 inches (610 mm) long, with ends turned up 2 inches (51 mm) or with cross pins unless otherwise indicated.
   1. Corrosion Protection: Hot-dip galvanized to comply with ASTM A 153/A 153M Epoxy coating 0.020 inch (0.51 mm) thick.

F. Adjustable Masonry-Veneer Anchors:
   1. General: Provide anchors that allow vertical adjustment but resist a 100-lbf (445-N) load in both tension and compression perpendicular to plane of wall without deforming or developing play in excess of 1/16 inch (1.5 mm).
   2. Fabricate sheet metal anchor sections and other sheet metal parts from 0.075-inch- (1.90-mm-) thick steel sheet, galvanized after fabrication.
   3. Fabricate wire ties from 0.187-inch- (4.76-mm-) diameter, hot-dip galvanized-steel wire unless otherwise indicated.
   5. Screw-Attached, Masonry-Veneer Anchors: Wire tie and a gasketed sheet metal anchor section, with pronged legs of length to match thickness of insulation or sheathing and raised rib-stiffened strap to provide a slot for inserting wire tie.

2.7 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene or urethane.
B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.
C. Bond-Breaker Strips: Asphalt-saturated felt complying with ASTM D 226/D 226M, Type I (No. 15 asphalt felt).
D. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity.
  1. Configuration: Provide the following:
     a. Strips, full depth of cavity and 10 inches (250 mm) high, with dovetail shaped notches 7 inches (175 mm) deep that prevent clogging with mortar droppings.

2.8 MASONRY CLEANERS
A. Proprietary Acidic Cleaner: Manufacturer’s standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.
  1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
     a. Diedrich Technologies, Inc.
     b. EaCo Chem, Inc.
     c. ProSoCo, Inc.

2.9 MORTAR AND GROUT MIXES
A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.
  1. Do not use calcium chloride in mortar or grout.
  2. Use portland cement-lime or masonry cement mortar unless otherwise indicated.
  3. For exterior masonry, use portland cement-lime or masonry cement mortar.
  4. For reinforced masonry, use portland cement-lime or masonry cement mortar.
  5. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.
B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.
C. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification. Provide the following types of mortar for applications stated unless another type is indicated.
  1. For masonry below grade or in contact with earth, use Type M.
  2. For reinforced masonry, use Type S.
  3. For exterior, above-grade, load-bearing and nonload-bearing walls and parapet walls; for interior load-bearing walls; for interior nonload-bearing partitions; and for other applications where another type is not indicated, use Type S.
  4. For interior nonload-bearing partitions, Type N.
  5. For all exterior brick veneer use Type N.
D. Grout for Unit Masonry: Comply with ASTM C 476.
  1. Proportion grout in accordance with ASTM C 476, paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 2000 psi (14 MPa).
2. Provide grout with a slump of 8 to 11 inches (200 to 280 mm) as measured according to ASTM C 143/C 143M.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

B. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures. Mix units from several pallets or cubes as they are placed.

3.2 TOLERANCES

A. Dimensions and Locations of Elements:
   1. For dimensions in cross section or elevation, do not vary by more than plus 1/2 inch (12 mm) or minus 1/4 inch (6 mm).
   2. For location of elements in plan, do not vary from that indicated by more than plus or minus 1/2 inch (12 mm).
   3. For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4 inch (6 mm) in a story height or 1/2 inch (12 mm) total.

B. Lines and Levels:
   1. For bed joints and top surfaces of bearing walls, do not vary from level by more than 1/4 inch in 10 feet (6 mm in 3 m), or 1/2-inch (12-mm) maximum.
   2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2-inch (12-mm) maximum.
   3. For vertical lines and surfaces, do not vary from plumb by more than 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet (9 mm in 6 m), or 1/2-inch (12-mm) maximum.
   4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2-inch (12-mm) maximum.
   5. For lines and surfaces, do not vary from straight by more than 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet (9 mm in 6 m), or 1/2-inch (12-mm) maximum.

C. Joints:
   1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm), with a maximum thickness limited to 1/2 inch (12 mm).
   2. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch (9 mm) or minus 1/4 inch (6 mm).
   3. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm).

3.3 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less-than-nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.

C. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.

D. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.

E. Fill cores in hollow CMUs with grout 24 inches (600 mm) under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.

3.4 MORTAR BEDDING AND JOINTING

A. Lay hollow brick and CMUs as follows:
   1. Bed face shells in mortar and make head joints of depth equal to bed joints.
   2. Bed webs in mortar in all courses of piers, columns, and pilasters.
   3. Bed webs in mortar in grouted masonry, including starting course on footings.
   4. Fully bed entire units, including areas under cells, at starting course on footings where cells are not grouted.

B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.

C. Lay Structural clay tile as follows:
   1. Lay vertical-cell units with full head joints unless otherwise indicated. Provide bed joints with full mortar coverage on face shells and webs.
   2. Lay horizontal-cell units with full bed joints unless otherwise indicated. Keep drainage channels, if any, free of mortar. Form head joints with sufficient mortar so excess will be squeezed out as units are placed in position. Butter both sides of units to be placed, or butter one side of unit already in place and one side of unit to be placed.
   3. Maintain joint thicknesses indicated except for minor variations required to maintain bond alignment. If not indicated, lay walls with 1/4 – 3/8-inch (6-10mm) thick joints.

D. Rake out mortar joints at glazed structural clay tile to a uniform depth of 1/4 inch (6 mm) and point with epoxy mortar to comply with epoxy-mortar manufacturer’s written instructions.

E. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

F. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

3.5 REINFORCED UNIT MASONRY INSTALLATION

A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.
   1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
   2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and that of other loads that may be placed on them during construction.

B. Placing Reinforcement: Comply with requirements in TMS 602/ACI 530.1/ASCE 6.

C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.
1. Comply with requirements in TMS 602/ACI 530.1/ASCE 6 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
2. Limit height of vertical grout pours to not more than 48 inches (1220 mm).

### 3.6 FIELD QUALITY CONTROL

A. Testing and Inspecting: The General Contractor will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.

B. Inspections: Level 1 special inspections according to the Michigan Building Code.
   1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
   2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
   3. Place grout only after inspectors have verified proportions of site-prepared grout.

C. Testing Prior to Construction: One set of tests.

D. Testing Frequency: One set of tests for each 5000 sq. ft. (464 sq. m) of wall area or portion thereof.

E. Clay Masonry Unit Test: For each type of unit provided, according to ASTM C 67 for compressive strength.

F. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C 140 for compressive strength.

G. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C 780.

H. Mortar Test (Property Specification): For each mix provided, according to ASTM C 780. Test mortar for mortar air content and compressive strength.

I. Grout Test (Compressive Strength): For each mix provided, according to ASTM C 1019.

### 3.7 REPAIRING, POINTING, AND CLEANING

A. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

B. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
   1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
   2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes.
   3. Protect adjacent surfaces from contact with cleaner.
   4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
   6. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.

### 3.8 MASONRY WASTE DISPOSAL

A. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.
   1. Do not dispose of masonry waste as fill within 18 inches (450 mm) of finished grade.
B. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as
described above or recycled, and other masonry waste, and legally dispose of off Owner's
property.

END OF SECTION 042000
1.1 SUMMARY
A. Section Includes:
   1. Structural steel.
   2. Grout.

1.2 DEFINITIONS
A. Structural Steel: Elements of the structural frame indicated on Drawings and as described in AISC 303, “Code of Standard Practice for Steel Buildings and Bridges.”

1.3 ACTION SUBMITTALS
A. Product Data: For each type of product.
   B. Shop Drawings: Show fabrication of structural-steel components.
      1. Include erection plans, all connection details, splices, camber, holes and other pertinent data.

1.4 INFORMATIONAL SUBMITTALS
A. Qualification Data: For installer and fabricator.
   B. Welding certificates.

1.5 QUALITY ASSURANCE
A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category STD, or is accredited by the IAS Fabricator Inspection Program for Structural Steel (AC172), or an equivalent quality assurance program.
   B. Installer Qualifications: A qualified installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector, Category CSE.
   D. Comply with applicable provisions of the following specifications and documents:
      1. AISC 303.
      2. AISC 360.
      3. RCSC’s “Specification for Structural Joints Using ASTM A 325 or A 490 Bolts.”

2.1 PERFORMANCE REQUIREMENTS
A. Connections: Provide details of simple shear connections required by the Contract Documents to be selected or completed by structural-steel fabricator to withstand loads indicated and comply with other information and restrictions indicated.
   1. Select and complete connections using schematic details indicated and AISC 360.
   2. Use Allowable Strength Design; data are given at service-load level.
   B. Construction: Combined system of moment frames and shear walls.
2.2 STRUCTURAL-STEEL MATERIALS

A. W-Shapes: ASTM A 992/A 992M.
B. Channels, Angles, M, S-Shapes: ASTM A 36/A 36M.
C. Plate and Bar: ASTM A 36/A 36M.
D. Cold-Formed Hollow Structural Sections: ASTM A 500/A 500M, Grade B, structural tubing.
E. Steel Pipe: ASTM A 53/A 53M, Type E or Type S, Grade B.
F. Welding Electrodes: Comply with AWS requirements.

2.3 BOLTS, CONNECTORS, AND ANCHORS

A. High-Strength Bolts, Nuts, and Washers: ASTM A 325 (ASTM A 325M), Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade C, (ASTM A 563M, Class 8S) heavy-hex carbon-steel nuts; and ASTM F 436 (ASTM F 436M), Type 1, hardened carbon-steel washers; all with plain finish.
   1. Direct-Tension Indicators: ASTM F 959, Type 325 (ASTM F 959M, Type 8.8), compressible-washer type with plain finish.
B. Headed Anchor Rods: ASTM F 1554, Grade 36 straight.
   1. Finish: Plain.
C. Threaded Rods: ASTM A 36/A 36M.
   1. Finish: Plain.

2.4 PRIMER

A. Primer: SSPC-Paint 25, Type I, zinc oxide, alkyd, linseed oil primer.
B. Primer: Fabricator’s standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer complying with MPI#79 and compatible with topcoat.

2.5 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107/C 1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.6 FABRICATION


2.7 SHOP CONNECTIONS

A. High-Strength Bolts: Shop install high-strength bolts according to RCSC’s "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
   1. Joint Type: Snug tightened,
B. Weld Connections: Comply with AWS D1.1/D1.1M and AWS D1.8/D1.8M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
2.8 SHOP PRIMING

A. Shop prime steel surfaces except the following:
   1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches (50 mm).
   2. Surfaces to be field welded.

B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:
   1. SSPC-SP 2, "Hand Tool Cleaning."
   2. SSPC-SP 3, "Power Tool Cleaning."
   3. SSPC-SP 7/NACE No. 4, "Brush-off Blast Cleaning."

C. Priming: Immediately after surface preparation, apply primer according to manufacturer’s written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils (0.038 mm). Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

2.9 SOURCE QUALITY CONTROL

A. Testing Agency: The Construction Manager will engage a qualified testing agency to perform shop tests and inspections.
   1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.

B. Bolted Connections: Inspect shop-bolted connections according to RCSC’s "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

C. Welded Connections: Visually inspect shop-welded connections according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency’s option:
   1. Liquid Penetrant Inspection: ASTM E 165.
   2. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
   4. Radiographic Inspection: ASTM E 94.

D. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify, with certified steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.
   1. Set plates for structural members on wedges, shims, or setting nuts as required.
   2. Weld plate washers to top of baseplate.
   3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
   4. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.

C. Maintain erection tolerances of structural steel within AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

D. Do not use thermal cutting during erection.

E. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

3.3 FIELD CONNECTIONS

A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
   1. Joint Type: Snug tightened.

B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
   1. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
   2. Remove backing bars or runoff tabs where indicated, back gouge, and grind steel smooth.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: The General Contractor will engage a qualified independent testing and inspecting agency to inspect field welds and high strength bolted connections.

B. Bolted Connections: Bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

C. Welded Connections: Field welds will be visually inspected according to AWS D1.1/D1.1M.
   1. In addition to visual inspection, test and inspect field welds according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
      a. Liquid Penetrant Inspection: ASTM E 165.
      b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
      c. Ultrasonic Inspection: ASTM E 164.
      d. Radiographic Inspection: ASTM E 94.

D. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

E. Repair coatings as follows:
1. Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A 780 and manufacturer’s written instructions. Brush or hand applied, spray cans not permitted.

2. Touchup Painting: After installation, promptly clean, prepare, and prime or reprie field connections, rust spots, and abraded surfaces of prime-painted joists and accessories and abutting structural steel.
   a. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power tool cleaning.
   b. Apply a compatible primer of same type as shop primer used on adjacent surfaces.

END OF SECTION 051200
SECTION 053100 - STEEL DECKING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Form deck.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of deck, accessory, and product indicated.
B. Shop Drawings:
   1. Include layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.

1.3 INFORMATIONAL SUBMITTALS

A. Welding certificates.
B. Product Certificates: For each type of steel deck.
C. Evaluation reports.
D. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.
B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."

2.2 FORM DECK

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Basis For Design: Nucor – Vulcraft – 1.3 C Non Composite Form Deck
2.3 ACCESSORIES

A. General: Provide manufacturer’s standard accessory materials for deck that comply with requirements indicated.

B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.

C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 12 (5.6-mm) minimum diameter.

D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.

E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi (230 MPa), not less than 0.0359-inch (0.91-mm) design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.

F. Repair Paint: Manufacturer’s standard rust-inhibitive primer of same color as primer.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 31, manufacturer’s written instructions, and requirements in this Section.

B. Place deck panels flat and square and fasten to supporting frame without warp or deflection.

C. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.

D. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.

E. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.

F. Mechanical fasteners may be used in lieu of welding to fasten deck. Locate mechanical fasteners and install according to deck manufacturer’s written instructions.

3.2 PROTECTION

A. Repair Painting: Wire brush and clean rust spots, welds, and abraded areas on both surfaces of prime-painted deck immediately after installation and apply repair paint.

END OF SECTION 053100
SECTION 055213 - PIPE AND TUBE RAILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Steel pipe railings.

1.2 ACTION SUBMITTALS

A. Product Data: For the following:
   1. Railing brackets.
   2. Grout, anchoring cement, and paint products.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

C. Delegated-Design Submittal: For railings, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.3 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For pipe and tube railings, for tests performed by a qualified testing agency, according to ASTM E 894 and ASTM E 935.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, registered in the State of Michigan, to design railings, including attachment to building construction.

B. Structural Performance: Railings, including attachment to building construction, shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
   1. Handrails and Top Rails of Guards:
      a. Uniform load of 50 lbf/ft. (0.73 kN/m) applied in any direction.
      b. Concentrated load of 200 lbf (0.89 kN) applied in any direction.
      c. Uniform and concentrated loads need not be assumed to act concurrently.
   2. Infill of Guards:
      a. Concentrated load of 50 lbf (0.22 kN) applied horizontally on an area of 1 sq. ft. (0.093 sq. m).
      b. Infill load and other loads need not be assumed to act concurrently.

2.2 METALS, GENERAL

A. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails unless otherwise indicated.
   1. Provide type of bracket with predrilled hole for exposed bolt anchorage and that provides 1-1/2-inch (38-mm) clearance from inside face of handrail to finished wall surface.
2.3 STEEL AND IRON

A. Pipe: ASTM A 53/A 53M, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.
   1. Provide galvanized finish for exterior installations and where indicated.
B. Plates, Shapes, and Bars: ASTM A 36/A 36M.

2.4 FASTENERS

A. General: Provide the following:
   1. Ungalvanized-Steel Railings: Plated steel fasteners complying with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 5 for zinc coating.
   2. Hot-Dip Galvanized Railings: Type 304 stainless-steel or hot-dip zinc-coated steel fasteners complying with ASTM A 153/A 153M or ASTM F 2329 for zinc coating.
B. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors capable of sustaining, without failure, a load equal to 6 times the load imposed when installed in unit masonry and 4 times the load imposed when installed in concrete, as determined by testing according to ASTM E 488/E 488M, conducted by a qualified independent testing agency.
   1. Material for Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 5, unless otherwise indicated.

2.5 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
B. Etching Cleaner for Galvanized Metal: Complying with MPI#25.
C. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
D. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
E. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.
F. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.
G. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.6 FABRICATION

A. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
B. Form work true to line and level with accurate angles and surfaces.
C. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove flux immediately.
4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.

D. Form changes in direction by inserting prefabricated elbow fittings.
E. Close exposed ends of railing members with prefabricated end fittings.
F. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated.
G. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.
   1. At brackets and fittings fastened to plaster or gypsum board partitions, provide crush-resistant fillers or other means to transfer loads through wall finishes to structural supports and prevent bracket or fitting rotation and crushing of substrate.

2.7 STEEL AND IRON FINISHES

A. Galvanized Railings:
   1. Hot-dip galvanize exterior steel railings, including hardware, after fabrication.
   2. Comply with ASTM A 123/A 123M for hot-dip galvanized railings.
B. Preparing Galvanized Railings for Shop Priming: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with etching cleaner.
C. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with SSPC-SP 6/NACE No. 3, “Commercial Blast Cleaning.”
D. Primer Application: Apply shop primer to prepared surfaces of railings unless otherwise indicated. Comply with requirements in SSPC-PA 1, "Shop, Field, and Maintenance Painting of Steel," for shop painting. Primer need not be applied to surfaces to be embedded in concrete or masonry.
   1. Do not apply primer to galvanized surfaces.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.
   1. Do not weld, cut, or abrade surfaces of railing components that are coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
   2. Set posts plumb within a tolerance of 1/16 inch in 3 feet (2 mm in 1 m).
   3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet (6 mm in 3.5 m).
B. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.
   1. Coat, with a heavy coat of bituminous paint, concealed surfaces of aluminum that are in contact with grout, concrete, masonry, wood, or dissimilar metals.
3.2 ANCHORING POSTS

A. Use metal sleeves preset and anchored into concrete for installing posts. After posts are inserted into sleeves, fill annular space between post and sleeve with nonshrink, nonmetallic grout or anchoring cement, mixed and placed to comply with anchoring material manufacturer’s written instructions.

B. Anchor posts to metal surfaces with oval flanges, angle type, or floor type as required by conditions, connected to posts and to metal supporting members.

3.3 ATTACHING RAILINGS

A. Attach railings to wall with wall brackets, except where end flanges are used. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.

B. Secure wall brackets and railing end flanges to building construction as follows:
   1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.

3.4 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting to comply with SSPC-PA 1 requirements for touching up shop-painted surfaces.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas, and repair galvanizing to comply with ASTM A 780/A 780M.

END OF SECTION 055213
SECTION 055313 - BAR GRATINGS

1.1 PERFORMANCE REQUIREMENTS

A. Floors Loads:

Floor Loads: 60 lbf/sq. ft. (3.00 kN/sq. m) or concentrated load of 300 lbf (1.4 kN).

1.2 GRATINGS

A. Steel Bar Gratings: Welded

1. Traffic Surface: Plain
2. Finish: Universal shop primer
3. Spacing: 19-W-4 type, 1 1/4" grating depth, 3/16” bar thickness.

1.3 GRATING FRAMES AND SUPPORTS

A. Metal: Same metal as grating.

B. indicated interior steel frames galvanized.

END OF SECTION 055313
PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Framing with dimension lumber.
   2. Wood blocking and nailers.
   3. Wood furring and grounds.
   4. Plywood backing panels.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product.

1.3 INFORMATIONAL SUBMITTALS

A. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.

B. Evaluation Reports: For the following, from ICC-ES:
   1. Wood-preservative-treated wood.
   2. Power-driven fasteners.
   3. Metal framing anchors.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Grade lumber by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
   1. Factory mark each piece of lumber with grade stamp of grading agency.
   2. Dress lumber, S4S, unless otherwise indicated.

B. Maximum Moisture Content of Lumber: 15 percent for 2-inch nominal (38-mm actual) thickness or less.

2.2 WOOD-PRESERVATIVE-TREATED MATERIAL

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction and Category UC3b for exterior construction.
   1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

D. Application: Treat items indicated on Drawings, and the following:
   1. Wood cants, nailers, curbs, equipment support bases, 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.

2.3 DIMENSION LUMBER FRAMING

A. Framing: No. 2 grade of any of the following species:
   1. Hem-fir (north); NLGA.
   2. Southern pine; SPIB.
   3. Douglas fir-larch; WCLIB or WWPA.
   4. Hem-fir; WCLIB or WWPA.

2.4 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
   1. Blocking.
   2. Nailers.
   3. Furring.

B. Dimension Lumber Items: Construction or No. 2 grade lumber of any species.

C. Concealed Boards: 15 percent maximum moisture content and any of the following species and grades:
   1. Mixed southern pine or southern pine; No. 2 grade; SPIB.
   2. Eastern softwoods; No. 2 Common grade; NeLMA.
   3. Northern species; No. 2 Common grade; NLGA.
   4. Western woods; Construction or No. 2 Common grade; WCLIB or WWPA.

2.5 PLYWOOD BACKING PANELS

A. Equipment Backing Panels: Plywood, DOC PS 1, Exposure 1, C-D Plugged, fire-retardant treated, in thickness indicated or, if not indicated, not less than 3/4-inch (19-mm) nominal thickness.

2.6 FASTENERS

A. General: Fasteners shall be of size and type indicated and shall comply with requirements specified in this article for material and manufacture.
   1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

B. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

2.7 METAL FRAMING ANCHORS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   1. Cleveland Steel Specialty Co.
   2. KC Metals Products, Inc.
   3. Phoenix Metal Products, Inc.
   4. Simpson Strong-Tie Co., Inc.
5. **USP Structural Connectors.**
   
   B. Allowable design loads, as published by manufacturer, shall meet or exceed those of products of manufacturers listed. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency. Framing anchors shall be punched for fasteners adequate to withstand same loads as framing anchors.

   C. **Galvanized-Steel Sheet:** Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 (Z180) coating designation.
      1. Use for interior locations unless otherwise indicated.

   D. **Hot-Dip, Heavy-Galvanized Steel Sheet:** ASTM A 653/A 653M; structural steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G185 (Z550) coating designation; and not less than 0.036 inch (0.9 mm) thick.
      1. Use for wood-preservative-treated lumber and where indicated.

### 2.8 MISCELLANEOUS MATERIALS

A. **Flexible Flashing:** Composite, self-adhesive, flashing product consisting of a pliable, rubberized-asphalt compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.025 inch (0.6 mm).

B. **Adhesives for Gluing Furring and Sleepers to Concrete or Masonry:** Formulation complying with ASTM D 3498 that is approved for use indicated by adhesive manufacturer.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION, GENERAL

A. **Framing Standard:** Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.

B. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry accurately to other construction. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.

C. Do not splice structural members between supports unless otherwise indicated.

D. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.

E. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.

F. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
   2. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's International Residential Code for One- and Two-Family Dwellings.
   3. ICC-ES evaluation report for fastener.

END OF SECTION 061000
PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Plastic-laminate cabinets.
   2. Plastic-laminate countertops.
   4. Miscellaneous framing and brackets.

1.2 DEFINITIONS

A. Interior architectural woodwork includes wood furring, blocking, shims, and hanging strips for installing woodwork items, unless concealed within other construction before woodwork installation.

1.3 SUBMITTALS

A. Product Data: For particleboard, plywood, high-pressure decorative laminate, adhesive for bonding plastic laminate, fire-retardant-treated materials, cabinet hardware and accessories, and finishing materials and processes.
B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
   1. Show details full size.
   2. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
   3. Show locations and sizes of cutouts and holes for plumbing fixtures and other items installed in architectural woodwork.
C. Samples for Initial Selection: Manufacturer’s color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available for each type of material indicated.
   1. Solid-surfacing materials.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed architectural woodwork similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
B. Fabricator Qualifications: A firm experienced in producing architectural woodwork similar to that indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
C. Quality Standard: Unless otherwise indicated, comply with AWI’s “Architectural Woodwork Quality Standards” for grades of interior architectural woodwork, construction, finishes, and other requirements.

1.5 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.
B. Field Measurements: Where woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
1. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being enclosed and indicate measurements on Shop Drawings.

2. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating woodwork without field measurements. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.6 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that interior architectural woodwork can be supported and installed as indicated.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Provide materials that comply with requirements of the AWI quality standard for each type of woodwork and quality grade specified, unless otherwise indicated.

B. Wood Products: Comply with the following:

4. Trim:
   a. Premium grade in accordance with AWI Section 300; maximum moisture content of 6 percent; White Birch, vertical or flat grain, for a painted finish.

C. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated, or if not indicated, as required by woodwork quality standard.

1. Manufacturer: Subject to compliance with requirements, provide the following:
   a. Wilsonart
      1. All cabinets (PL1) Brazilwood 7946-38
      2. Countertops (PL3) Carbon EV 4820-60
   a. Nevamar

1. Countertops (PL2) Crema WZ0049T

D. PVC Edge Banding: 1/8” (3mm) thickness

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Charter Industries
   b. TBD
   c. TBD
   d. TBD

D. Adhesive for Bonding Plastic Laminate: Unpigmented contact cement.

F. Solid-Surfacing Material: Homogeneous solid sheets of filled plastic resin complying with ISSFA-2

1. Manufacturers: Subject to compliance with requirements, provide the following:
   a. Corian Solid Surface (E. I. du Pont de Nemours and Company)
      1. Silver Birch (SSM1)

2.2 MISCELLANEOUS MATERIALS
2.3 CABINET HARDWARE AND ACCESSORIES

A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets, except for items specified in Division 8 Section "Door Hardware".

B. Hardware Standard: Comply with BHMA A156.9 for items indicated by referencing BHMA numbers or items referenced to this standard.

C. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, 170 degrees of opening, self-closing.

D. Wire Pulls: Back mounted, 4 inches long, 5/16 inches in diameter, polished chrome finish.

E. Catches: Magnetic catches, BHMA A156.9, B03141.

F. Adjustable Shelf Standards and Supports: BHMA A156.9, B04071; with shelf rests, B04081 and BHMA A156.9, B04102; with shelf brackets, B04112.

G. Shelf Rests: BHMA A156.9, B04013.

H. Drawer Slides: Side-mounted, full-extension, zinc-plated steel drawer slides with steel ball bearings, BHMA A156.9, B05091, and rated for the following loads:
   1. Box Drawer Slides: 75 lbf.

I. Door Locks: BHMA A156.11, E07121.

J. Drawer Locks: BHMA A156.11, E07041.

K. Grommets for Cable Passage through Countertops: 2-inch OD, molded-plastic grommets and matching plastic caps with slot for wire passage. Color to match laminate color.

L. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.

M. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

2.4 INSTALLATION MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln-dried to less than 15 percent moisture content.

B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

2.5 FABRICATION, GENERAL

A. Interior Woodwork Grade: Provide Premium grade interior woodwork complying with the referenced quality standard.

B. Wood Moisture Content: Comply with requirements of referenced quality standard for
wood moisture content in relation to ambient relative humidity during fabrication and in
installation areas.
C. Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges to radius
indicated for the following:
D. Complete fabrication, including assembly, finishing, and hardware application, to maximum
extent possible, before shipment to Project site. Disassemble components only as
necessary for shipment and installation. Where necessary for fitting at site, provide ample
allowance for scribing, trimming, and fitting.
1. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled.
   Install dowels, screws, bolted connectors, and other fastening devices that can be
   removed after trial fitting. Verify that various parts fit as intended and check
   measurements of assemblies against field measurements indicated on Shop Drawings
   before disassembling for shipment.
E. Shop cut openings, to maximum extent possible, to receive hardware, appliances, plumbing
   fixtures, electrical work, and similar items. Locate openings accurately and use templates
   or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of
cutouts to remove splinters and burrs.
1. Seal edges of openings in countertops with a coat of varnish.
F. Fabricate to AWI premium standards.

2.6 PLASTIC-LAMINATE CABINETS

A. Quality Standard: Comply with AWI Section 400 requirements for laminate cabinets.
B. Grade: Premium.
C. AWI Type of Cabinet Construction: Flush overlay.
D. Laminate Cladding for Exposed Surfaces: High-pressure decorative laminate complying
   with the following requirements:
   1. Horizontal Surfaces Other Than Tops: HGS.
   2. Vertical Surfaces: HGS.
   3. Edges: HGS.
E. Materials for Semiexposed Surfaces: Provide surface materials indicated below:
   1. Surfaces Other Than Drawer Bodies: High-pressure decorative laminate, Grade VGS.
   2. Drawer Sides and Backs: Solid-hardwood lumber.
   3. Drawer Bottoms: Hardwood plywood.
F. Colors, Patterns, and Finishes: Provide materials and products that result in colors and
   textures of exposed laminate surfaces complying with the following requirements:
   1. Provide Architect's selections from laminate manufacturer's full range of colors and
      finishes in the following categories:
      a. Solid colors.
      b. Solid colors with core same color as surface.
      c. Wood grains.
      d. Patterns.
   G. Provide dust panels of 1/4-inch plywood or tempered hardboard above compartments and
drawers, unless located directly under tops.

2.7 PLASTIC-LAMINATE COUNTERTOPS

A. Quality Standard: Comply with AWI Section 400 requirements for high-pressure
decorative laminate countertops.
B. Grade: Premium.
C. High-Pressure Decorative Laminate Grade: HGS.
D. Colors, Patterns, and Finishes: Provide materials and products that result in colors and
   textures of exposed laminate surfaces complying with the following requirements:
   1. Provide Architect's selections from manufacturer's full range of colors and finishes in
      the following categories:
      a. Solid colors.
      b. Solid colors with core same color as surface.
2.7 INTERIOR ARCHITECTURAL WOODWORK

- Wood grains.
- Patterns.
- Edge Treatment: Same as laminate cladding on horizontal surfaces.
- Core Material: Particleboard made with exterior glue.
- Core Material at Sinks: Particleboard made with exterior glue.

2.8 SOLID-SURFACING-MATERIAL COUNTERTOPS AND SILLS

- Solid-Surfacing-Material Thickness: ½ inch.
- Colors, Patterns, and Finishes: As selected from manufacturer’s full range. Matte finish, group 2 or B min.
- Fabricate tops in one piece with shop-applied backsplashes. Comply with solid-surfacing-material manufacturer's written recommendations for adhesives, sealers, fabrication, and finishing.

PART 3 - EXECUTION

3.1 PREPARATION

- Condition woodwork to average prevailing humidity conditions in installation areas before installation.
- Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including removal of packing.

3.2 INSTALLATION

- Quality Standard: Install woodwork to comply with AWI Section 1700 for the same grade specified in Part 2 of this Section for type of woodwork involved.
- Install woodwork level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb (including tops) to a tolerance of 1/8 inch in 96 inches.
- Scribe and cut woodwork to fit adjoining work, and refinish cut surfaces and repair damaged finish at cuts.
- Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing as required for complete installation.
- Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
  1. Install cabinets with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
  2. Fasten wall cabinets through back, near top and bottom, at ends and not more than 16 inches o.c. with
- Countertops: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.
  1. Install countertops with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
  2. Secure backsplashes to tops with concealed metal brackets at 16 inches o.c. and to walls with adhesive.
  3. Calk space between backsplash and wall with sealant specified in Division 7 Section "Joint Sealants."
- Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
  1. Install cabinets with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
  2. Fasten wall cabinets through back, near top and bottom, at ends and not more than 16 inches o.c. with
- Countertops: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.
  1. Install countertops with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
  2. Secure backsplashes to tops with concealed metal brackets at 16 inches o.c. and to walls with adhesive.
  3. Calk space between backsplash and wall with sealant specified in Division 7 Section "Joint Sealants."
- Install FRP Panels per Manufacturers recommendations.

3.3 ADJUSTING AND CLEANING
A. Repair damaged and defective woodwork, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.

B. Clean, lubricate, and adjust hardware.

C. Clean woodwork on exposed and semi-exposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION 064023
SECTION 078413 - PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Penetrations in fire-resistance-rated walls.
   2. Penetrations in horizontal assemblies.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.
B. Product Schedule: For each penetration firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing and inspecting agency.
   1. Engineering Judgments: Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping system, submit illustration, with modifications marked, approved by penetration firestopping system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

1.3 CLOSEOUT SUBMITTALS

A. Installer Certificates: From Installer indicating that penetration firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with its "Qualified Firestop Contractor Program Requirements."

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics:
   1. Perform penetration firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.
   2. Test per testing standards referenced in "Penetration Firestopping Systems" Article. Provide rated systems complying with the following requirements:
      a. Penetration firestopping systems shall bear classification marking of a qualified testing agency.
      1) UL in its "Fire Resistance Directory."
      2) Intertek Group in its "Directory of Listed Building Products."
      3) FM Global in its "Building Materials Approval Guide."

2.2 PENETRATION FIRESTOPPING SYSTEMS

A. Penetration Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.
1. Products: Subject to compliance with requirements, provide penetration firestopping systems that are produced by one of the following manufacturers:
   b. Grace Construction Products.
   c. Hilti, Inc.
   d. Johns Manville.
   e. Nelson Firestop Products.
   f. NUCO Inc.
   g. Passive Fire Protection Partners.
   h. RectorSeal Corporation.
   i. Specified Technologies Inc.
   j. 3M Fire Protection Products.
   l. USG Corporation.

B. Penetrations in Fire-Resistance-Rated Walls: Penetration firestopping systems with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg (2.49 Pa).
   1. F-Rating: Not less than the fire-resistance rating of constructions penetrated.

C. Penetrations in Horizontal Assemblies: Penetration firestopping systems with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg (2.49 Pa).
   1. F-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated.
   2. T-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.
   3. W-Rating: Provide penetration firestopping systems showing no evidence of water leakage when tested according to UL 1479.

D. Penetrations in Smoke Barriers: Penetration firestopping systems with ratings determined per UL 1479, based on testing at a positive pressure differential of 0.30-inch wg (74.7 Pa).
   1. L-Rating: Not exceeding 5.0 cfm/sq. ft. (0.025 cu. m/s per sq. m) of penetration opening at and no more than 50-cfm (0.024-cu. m/s) cumulative total for any 100 sq. ft. (9.3 sq. m) at both ambient and elevated temperatures.

E. Exposed Penetration Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, per ASTM E 84.

F. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping system manufacturer and approved by qualified testing and inspecting agency for conditions indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.

B. General: Install penetration firestopping systems to comply with manufacturer’s written installation instructions and published drawings for products and applications.

C. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings.
1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not forming permanent components of firestopping.

D. Install fill materials by proven techniques to produce the following results:
   1. Fill voids and cavities formed by openings, forming materials, accessories and penetrating items to achieve required fire-resistance ratings.
   2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
   3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.2 FIELD QUALITY CONTROL

A. Owner may engage a qualified testing agency to perform tests and inspections according to ASTM E 2174.

B. Where deficiencies are found or penetration firestopping system is damaged or removed because of testing, repair or replace penetration firestopping system to comply with requirements.

C. Proceed with enclosing penetration firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.

END OF SECTION 078413
1.1 SUMMARY

A. This Section includes joint sealants for the following applications, including those specified by reference to this Section and following applications:

1. Interior joints in the following vertical surfaces and horizontal nontraffic surfaces:
   a. Control and expansion joints on exposed interior surfaces of exterior walls.
   b. Perimeter joints of exterior openings where indicated.
   c. Tile control and expansion joints.
   d. Vertical joints on exposed surfaces of interior unit masonry walls and partitions.
   e. Vertical joints on exposed surfaces of interior ceramic tile.
   f. Perimeter joints between interior wall surfaces and frames of interior doors and windows.
   g. Joints between plumbing fixtures and adjoining walls, floors, and counters.
   h. Other joints as indicated.

2. Interior joints in the following horizontal traffic surfaces:
   b. Joints in tile flooring.
   c. Other joints as indicated.

B. See Division 8 Section “Glazing” for glazing sealants.

1.2 PERFORMANCE REQUIREMENTS

A. Provide elastomeric joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.

B. Provide joint sealants for interior applications that establish and maintain airtight and water-resistant continuous joint seals without staining or deteriorating joint substrates.

1.3 SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

B. Samples: For each type and color of joint sealant required, provide Samples with joint sealants in 1/2-inch- (13-mm-) wide joints formed between two 6-inch- (150-mm-) long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

1.4 QUALITY ASSURANCE

A. Preconstruction Field-Adhesion Testing: Before installing elastomeric sealants, field test their adhesion to Project joint substrates according to the method in ASTM C 1193 that is appropriate for the types of Project joints.

1.5 WARRANTY

A. Special Installer’s Warranty: Installer’s standard form in which Installer agrees to repair or replace elastomeric joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
   1. Warranty Period: Two years from date of Substantial Completion.

B. Special Manufacturer’s Warranty: Manufacturer’s standard form in which elastomeric sealant manufacturer agrees to furnish elastomeric joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.
1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide one of the products listed in other Part 2 articles.

2.2 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer, based on testing and field experience.

B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer’s full range.

2.3 ELASTOMERIC JOINT SEALANTS

A. Elastomeric Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.

B. Stain-Test-Response Characteristics: Where elastomeric sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.

C. Suitability for Immersion in Liquids: Where elastomeric sealants are indicated for Use I for joints that will be continuously immersed in liquids, provide products that have undergone testing according to ASTM C 1247 and qualify for the length of exposure indicated by reference to ASTM C 920 for Class 1 or 2. Liquid used for testing sealants is deionized water, unless otherwise indicated.

D. Suitability for Contact with Food: Where elastomeric sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.

E. Low-Modulus Neutral –Curing Polyurethane Sealant: Where joint sealants of this type are indicated, provide products complying with the following:

1. Available Products:
   a. Pecora Corporation; Dynatrol I-XL.
   b. Tremco; DyMonic.
   c. Tremco; Vulkem 921.

2. Type and Grade: S (single component) and NS (nonsag).


4. Use Related to Exposure: NT (nontraffic).

5. Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrates indicated, O.
   a. Coated glass, aluminum coated with a high-performance coating, color anodic aluminum, galvanized steel, brick, limestone, marble, granite, plastic, tile, wood.

F. Single-Component Mildew-Resistant Acid-Curing Silicone Sealant: Where joint sealants of this type are indicated, provide products formulated with fungicide that are intended for sealing interior ceramic tile joints and other nonporous substrates that are subject to in-service exposures of high humidity and temperature extremes, and that comply with the following:

1. Available Products:
   a. Dow Corning Corporation; 786 Mildew Resistant.
   b. GE Silicones; Sanitary SCS1700.
c. Tremco; Tremseal 200 White.
2. Type and Grade: S (single component) and NS (nonsag).
4. Use Related to Exposure: NT (nontraffic).
5. Uses Related to Joint Substrates: G, A, and, as applicable to joint substrates indicated, O.
   a. Coated glass, aluminum coated with a high-performance coating, color anodic aluminum, galvanized steel, marble, granite, plastic and tile.

G. Single-Component Pourable Urethane Sealant: Where joint sealants of this type are indicated, provide products complying with the following:
1. Available Products:
   a. Pecora Corporation; Urexpan NR-201.
   c. Tremco; Tremflex S/L.
   d. Tremco; Vulkem 45.
   e. Sonneborn Building Products, Div., ChemRex Inc.; SL 1.
2. Type and Grade: S (single component) and P (pourable).
4. Use Related to Exposure: T (traffic) and NT (nontraffic).
5. Uses Related to Joint Substrates: M, A, and, as applicable to joint substrates indicated, O.

2.4 LATEX JOINT SEALANTS

A. Latex Sealant: Comply with ASTM C 834, Type OP, Grade NF.
B. Available Products:
   1. Pecora Corporation; AC-20+.
   2. Sonneborn, Division of ChemRex Inc.; Sonolac.
   3. Tremco; Tremflex 834.

2.5 JOINT-SEALANT BACKING

A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), O (open-cell material), B (bicellular material with a surface skin) or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance:
C. Elastomeric Tubing Sealant Backings: Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D 1056, nonabsorbent to water and gas, and capable of remaining resilient at temperatures down to minus 26 deg F (minus 32 deg C). Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth, and to otherwise contribute to optimum sealant performance.
D. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.6 MISCELLANEOUS MATERIALS
A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants.
   1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant.
      a. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air.
   2. Remove laitance and form-release agents from concrete.
      a. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.

B. Joint Priming: Prime joint substrates, where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience.
   Apply primer to comply with joint-sealant manufacturer’s written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.2 INSTALLATION

A. General: All dissimilar materials are to be caulked.

B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
   1. Do not leave gaps between ends of sealant backings.
   2. Do not stretch, twist, puncture, or tear sealant backings.
   3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
   1. Place sealants so they directly contact and fully wet joint substrates.
   2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
   1. Remove excess sealant from surfaces adjacent to joints.
   2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
   3. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.

G. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

H. Arrange with manufacturer’s rep to conduct a pull test in field to determine adhesion of the sealant to substrate conditions found.

3.3 JOINT-SEALANT SCHEDULE

A. Joint-Sealant Application: Vertical control and expansion joints on exposed interior surfaces of exterior walls.
   2. Joint-Sealant Color: As selected by Architect from Manufacturers full color range.

B. Joint-Sealant Application: Interior perimeter joints of exterior openings.
   2. Joint-Sealant Color: As selected by Architect from Manufacturers full color range.

C. Joint-Sealant Application: Interior ceramic tile joints in horizontal traffic surfaces.
   1. Joint Sealant: Single-component, neutral curing, 100% silicone sealant. Same manufacturer as ceramic tile grout manufacturer.
   2. Joint-Sealant Color: As selected by Architect from Manufacturers full color range to match grout color.

D. Joint-Sealant Application: Interior joints between plumbing fixtures and adjoining walls, floors, and counters.
   2. Joint-Sealant Color: As selected by Architect from Manufacturers full color range.

E. Joint-Sealant Application: Vertical joints on exposed surfaces of interior unit masonry walls and partitions.
   2. Joint-Sealant Color: As selected by Architect from Manufacturers full color range.

F. Joint-Sealant Application: Perimeter joints between interior wall surfaces and frames of interior doors and windows.
   2. Joint-Sealant Color: As selected by Architect from Manufacturer’s full color range.

END OF SECTION 079200
1.1 SUMMARY

A. This Section includes hollow metal doors and frames.

1.2 SUBMITTALS

A. Product Data: For each product indicated. Include door designation, type, level and model, material description, label compliance, fire-resistance ratings, and finishes.
B. Shop Drawings: Include elevations, door edge details, frame profiles, metal thicknesses, preparations for hardware, and other details.
C. Door Schedule. Use same reference designations indicated on Drawings.

1.3 QUALITY ASSURANCE

A. Steel Door and Frame Standard: Comply with ANSI A 250.8, unless more stringent requirements are indicated.
B. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 252.
C. Fire-Rated, Borrowed-Lite Assemblies: Complying with NFPA 80 and listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction for fire-protection ratings indicated, based on testing according to NFPA 257 or UL 9.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Amweld International, LLC.
2. Ceco Door Products; an Assa Abloy Group Company.
3. Curries Company; an Assa Abloy Group Company.
4. Mesker Door, Inc.
5. Pioneer Industries Inc.
7. Steelcraft; an Ingersoll-Rand Company.

2.2 MATERIALS

A. Hot-Rolled Steel Sheets: ASTM A 569/A 569M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
B. Cold-Rolled Steel Sheets: ASTM A 366/A 366M, Commercial Steel (CS), or ASTM A 620/A 620M, Drawing Steel (DS), Type B; stretcher-leveled standard of flatness.
C. Metallic-Coated Steel Sheets: ASTM A 653/A 653M, Commercial Steel (CS), Type B, with an A40 (ZF120) zinc-iron-alloy (galvannealed) coating; stretcher-leveled standard of flatness.

2.3 DOORS

A. Interior Doors: Complying with ANSI 250.8 for level and model and ANSI A250.4 for physical-endurance level indicated.
1. Interior Doors (Extra-Heavy-Duty Doors) Level 3 and Physical Performance Level A, Model 1 (Full Flush) 0.053-inch-thick (16 gage).

2.4 FRAMES

A. General: ANSI A250.8; conceal fastenings, unless otherwise indicated.
B. Frame Steel Sheet Thickness:
   1. Interior Frames of minimum 0.053-inch-thick (16 gage) for level 3 steel doors and wood doors.
C. Sidelite and Transom Frames: Fabricated from same thickness material as adjacent door frame.
D. Construction: Full profile welded.
E. Door Silencers: Three silencers on single-door frames and two silencers on double-door frames.
F. Jamb Anchors:
   1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042 inch (1.0 mm) thick, with corrugated or perforated straps not less than 2 inches (51 mm) wide by 10 inches (254 mm) long; or wire anchors not less than 0.177 inch (4.5 mm) thick.
   2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch (1.0 mm) thick.
G. Inserts, Bolts, and Fasteners: Manufacturer’s standard units. Zinc-coat items that are to be built into exterior walls according to ASTM A 153/A 153M, Class C or D as applicable.
H. Grout: Where required in masonry construction, as specified in Division 4 “Unit Masonry.”

2.5 FABRICATION

A. General: Fabricate steel door and frame units to comply with ANSI A250.8 free from defects including warp and buckle. Where practical, fit and assemble units in manufacturer’s plant.
B. Interior Door and Panel Faces: Fabricate exposed faces of doors and panels, including stiles and rails of nonflush units, from cold-rolled steel sheet.
C. Core Construction: Manufacturer’s standard core construction that produces a door complying with SDI standards.
D. Clearances for Non-Fire-Rated Doors: Not more than 1/8 inch (3.2 mm) at jambs and heads, except not more than 1/4 inch (6.4 mm) between pairs of doors. Not more than 3/4 inch (19 mm) at bottom.
E. Clearances for Fire-Rated Doors: As required by NFPA 80.
F. Door-Edge Profile: Square edge, unless beveled edge is indicated.
G. Tolerances: Comply with SDI 117.
H. Prepare doors and frames to receive mortised and concealed hardware according to final door hardware schedule and templates provided by hardware supplier. Comply with applicable requirements in ANSI A250.6 and ANSI A115 Series specifications for door and frame preparation for hardware.
I. Frame Construction:
   1. Fabricate frames with mitered or coped and continuously welded corners and seamless face joints. Provide temporary spreader bars.
   2. Provide terminated stops, where indicated.
J. Reinforce doors and frames to receive surface-applied hardware. Drilling and tapping for surface-applied hardware may be done at Project site.
K. Locate hardware as indicated or, if not indicated, according to ANSI A250.8.
L. Glazing Stops: Manufacturer’s standard, formed from 0.032-inch- (0.8-mm-) thick steel sheet.
1. Provide nonremovable stops on secure side of interior doors for glass, louvers, and other panels in doors.
2. Provide screw-applied, removable, glazing stops on inside of glass, louvers, and other panels in doors.

M. Astragals: As required by NFPA 80 to provide fire ratings indicated.

2.6 FINISHES

A. Prime Finish: Manufacturer’s standard, factory-applied coat of rust-inhibiting primer complying with ANSI A250.10 for acceptance criteria.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Placing Frames: Comply with provisions in SDI 105, unless otherwise indicated. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is completed, remove temporary braces and spreaders, leaving surfaces smooth and undamaged.
1. Wall Anchors: Provide at least three anchors per jamb. For openings 90 inches (2286 mm) or more in height, install an additional anchor at hinge and strike jambs.
2. Fire-Rated Frames: Install according to NFPA 80.

B. Door Installation: Comply with ANSI A250.8. Shim as necessary to comply with SDI 122 and ANSI/DHI A115.1G.
1. Fire-Rated Doors: Install within clearances specified in NFPA 80.
2. Smoke Control Doors: Install to comply with NFPA 105.

C. Prime Coat Touchup: Immediately after installation, sand smooth any rusted or damaged areas of prime coat and apply touchup of compatible air-drying primer.

D. After installation, remove protective wrappings from doors and frames and touch up prime coat with compatible air-drying primer.

END OF SECTION 081113
SECTION 084123 - FIRE-RATED STEEL FRAMED SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:
   1. Fire rated framing systems for door and window frame installation in interior openings

B. Related Sections:
   2. Section 07 84 00 “Firestopping:” Firestops between work of this section and other fire resistive assemblies.
   3. Section 08 71 00 “Door Hardware:” Door hardware other than that provided by the work of this section
   4. Section 088813 “Fire-Resistant Glazing”

1.2 REFERENCES

A. American Architectural Manufacturers Association (AAMA)

B. American Society for Testing and Materials (ASTM):
   1. Fire safety related:
   2. Material related

C. American Welding Society (AWS)
   1. AWS D1.3 - Structural Welding Code - Sheet Steel; 2007

D. Builders Hardware Manufacturers Association, Inc.

E. National Fire Protection Association (NFPA):
3. NFPA 252: Fire Tests of Door Assemblies
4. NFPA 257: Fire Test of Window Assemblies
F. Underwriters Laboratories, Inc. (UL):
   1. UL 9: Fire Tests of Window Assemblies.
   2. UL 10 B: Fire Tests of Door Assemblies
   3. UL 10 C: Positive Pressure Fire Tests of Window & Door Assemblies
   4. UL 263: Fire tests of Building Construction and Materials
   4. UL-752 Ratings of Bullet-Resistant Materials
G. American National Standards Institute (ANSI):
I. American Society of Civil Engineers (ASCE)

1.3 DEFINITIONS

A. Manufacturer: A firm that produces primary glass, fabricated glass or framing as defined in referenced glazing publications.

1.4 SUBMITTALS

A. Product Data:
B. Shop Drawings:
   1. Include plans, elevations and details of product showing component dimensions; framing opening requirements, dimensions, tolerances, and attachment to structure
C. Samples. For following products:
   1. Glass sample-as provided by manufacturer
   2. Sample of frame
   3. Verification of sample of selected finish
D. Glazing Schedule: Use same designations indicated on drawings for glazed openings in preparing a schedule listing glass types and thicknesses for each size opening and location.
E. Warranties: Submit manufacturer’s warranty.
F. Certificates of compliance from glass and glazing materials manufacturers attesting that glass and glazing materials furnished for project comply with requirements.
   1. Separate certification will not be required for glazing materials bearing manufacturer's permanent label designating type and thickness of glass, provided labels represent a quality control program involving a recognized certification agency or independent testing laboratory acceptable to authority having jurisdiction
1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualifications according to
   1. International Accreditation Service for a Type A Third-Party Inspection Body (Field Services ICC-ES Third-Party Inspections Standard Operating Procedures, 00-BL-S0400 and S0401)
   2. International Accreditation Service for Testing Body-Building Materials and Systems
      a. Fire Testing
         1) ASTM Standards E 119
         2) CPSC Standards 16 CFR 1201
         3) NFPA Standards 251, 252, 257
         4) UL Standards 9, 10B, 10C, 1784, UL Subject 63
         5) BS 476; Part 22: 1987
         6) EN 1634-1
         7) CAN Standards S 101, S 104, S 106
   B. Fire-Rated Window Assemblies: Assemblies complying with NFPA 80 that are classified and labeled by UL, for fire ratings indicated, based on testing according to NFPA 257 and UL 9.
   C. Fire-Rated Wall Assemblies: Assemblies complying with ASTM E119 that are classified and labeled by UL, for fire ratings indicated, based on testing in accordance with UL 263, ASTM E119.
   D. Listings and Labels - Fire Rated Assemblies: Under current follow-up service by Underwriters Laboratories® maintaining a current listing or certification. Label assemblies accordance with limits of manufacturer’s listing.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver, store and handle under provisions specified by manufacturer.

1.7 PROJECT CONDITIONS

A. Obtain field measurements prior to fabrication of frame units. If field measurements will not be available in a timely manner coordinate planned measurements with the work of other sections.
   1. Note whether field or planned dimensions were used in the creation of the shop drawings.
   B. Coordinate the work of this section with others effected including but not limited to: other interior components and door hardware beyond that provided by this section.

1.8 WARRANTY

A. Provide standard five-year manufacturer warranty.

PART 2 – PRODUCTS

FIRE-RATED STEEL FRAMED SYSTEM 084123 - 3
2.1 MANUFACTURERS

A. Assembly: Subject to compliance with requirements, provide one of the following products:

1. “Fireframes® Heat Barrier Series” fire-rated steel frame system as manufactured and supplied by Technical Glass Products, 8107 Bracken Place SE, Snoqualmie, WA 98065 (800-426-0279) fax (800-451-9857) e-mail sales@fireglass.com web site http://www.fireglass.com
   a. Assembly Tested Glazing Material: Pilkington Pyrostop

2. GPX Architectural Series Framing as manufactured and distributed by SAFTI FIRST TM Fire Rated Glazing Solutions.1.Contact: 100 N Hill Drive, Suite 12, Brisbane, CA 94005; Telephone 888.653.3333; Fax 888.653.4444; email info@safti.com; Web site www.safti.com
   a. Assembly Tested Glazing Material: SuperLite II-XL or SuperLite II-XLM

3. CECO “E119 Fire Restive Frame Solution”
   a. Assembly Tested Glazing Material: Vetrotech Contraflam

2.2 PERFORMANCE REQUIREMENTS

A. Fire Rating Requirements: As indicated on drawings.

2.3 MATERIALS – STEEL FRAMES AND DOORS

A. Framing System 60 minutes
   1. Steel Frame — The steel framing members are made of two halves, nom. 1.9 in. wide (48.3 mm) with a nom. minimum depth of 1.38 in. (35 mm) with lengths cut according to glazing size.

2. Insulation — Insulate framing system against effects of fire, smoke, and heat transfer from either side. Insulate profiled steel tubing using a shell construction that incorporates Promatect-H intermediate interlayer. Firmly pack perimeter of framing system to rough opening with mineral wool fire stop insulation or appropriately rated intumescent sealant.

3. Steel Glazing Beads: Extruded steel beads with dimensions recommended by manufacturer to securely hold glazing material in place.

4. Fasteners: Type recommended by manufacturer.

5. Glazing Accessories: Set glass using calcium silicate, or setting blocks as recommended by manufacturer.

6. Glazing Gasket — Supplied with the steel framing members. Nom. 3/4 in. (19 mm) by 3/16 in. (4.5 mm) black applied to the steel framing members to cushion and seal the glazing material when installed.

B. Steel Door System 60 AND 90 minutes
   1. Manufacturer’s standard single and double leaf doors with manufacturer’s standard hardware.

2. Door hardware as specified in Section 087100 - “Hardware”

2.5 FABRICATION
A. Obtain reviewed shop drawings prior to fabrication.
B. Fabrication Dimensions: Fabricate fire-rated assembly to field dimensions.

2.6 FINISHES, GENERAL

A. Comply with NAAMM’s "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
B. Finish frames after assembly.
C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable. Noticeable variations in the same piece are not acceptable.

2.7 POWDERCOAT FINISHES

A. Finish after fabrication.

B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable. Noticeable variations in the same piece are not acceptable.

C. Interior and Exterior Steel Finishes (Note: this finish is suitable for exterior exposed portions of the wall systems, including extruded aluminum covers)
   1. Powder-Coat Finish: Polyester Super Durable powder coating which meets AAMA 2604 for chalking and fading. Apply manufacturer's standard powder coating finish system applied to factory-assembled frames before shipping, complying with manufacturer's recommended instructions for surface preparation including pretreatment, application, and minimum dry film thickness.
   2. Color and Gloss: As selected by Architect from manufacturer's full range.
   3. Acceptable Manufacturers: As approved by frame manufacturer

2.8 ACCESSORY MATERIALS

A. Bituminous Paint: Cold-applied, asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos; formulated for 30-mil thickness per coat.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Site Verification of Conditions: Examine substrates and members to which the work of this section attaches or adjoins prior to frame installation are acceptable for product installation in accordance with manufacturer's instructions. Provide openings plumb, square and within allowable tolerances. The manufacturer recommends 3/8 inch shim space at all walls
B. Notify Architect of any conditions which jeopardize the integrity of the proposed fire wall / door system.
C. Do not proceed until such conditions are corrected.

3.2 INSTALLATION

A. Per manufacturers written instructions.
B. Contractor to refer to drawings for location of specific rated assemblies.
   1. Provide assembly required to meet ratings required per drawings and to comply with code.

3.6 PROTECTION AND CLEANING

A. Protect glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.
   1. Do not clean with astringent cleaners. Use a clean “grit free” cloth and a small amount of mild soap and water or mild detergent.
   2. Do not use any of the following:
      a. Steam jets
      b. Abrasives
      c. Strong acidic or alkaline detergents, or surface-reactive agents
      d. Detergents not recommended in writing by the manufacturer
      e. Do not use any detergent above 77 degrees F
      f. Organic solvents including but not limited to those containing ester, ketones, alcohols, aromatic compounds, glycol ether, or halogenated hydrocarbons.
      g. Metal or hard parts of cleaning equipment must not touch the glass surface
B. Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove them immediately as recommended by glass manufacturer.
C. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended by glass manufacturer.

END OF SECTION
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. Specific Omissions: Hardware for the following is specified or indicated elsewhere, unless specifically listed in the hardware sets:

1. Cabinet Hardware.
2. Signs, except as noted.
3. Folding partitions, except cylinders where detailed.
4. Sliding aluminum doors
5. Chain link and wire mesh doors and gates
6. Access doors and panels
7. Overhead and Coiling doors

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/Construction Manager 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.
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 number of Hardware Schedules 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:

<table>
<thead>
<tr>
<th>CATEGORY</th>
<th>SPECIFIED</th>
<th>SCHEDULED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hinges</td>
<td>Manufacturer A</td>
<td>Manufacturer B</td>
</tr>
<tr>
<td>Lock sets</td>
<td>Manufacturer X</td>
<td>Manufacturer X</td>
</tr>
<tr>
<td>Kick Plates</td>
<td>Open</td>
<td>Manufacturer Z</td>
</tr>
</tbody>
</table>

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/Construction Manager, 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/Construction Manager 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 contractor or construction manager 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. Closers shall carry manufacturer’s 30-year warranty against manufacturing defects and workmanship.
      2. Locksets shall carry manufacturer’s 3-year warranty against manufacturing defects and workmanship.
      3. Exit Devices shall carry manufacturer’s 3-year warranty against manufacturing defects and workmanship.
      4. Continuous gear hinges shall carry manufacturer’s lifetime warranty to be free from defects in material and workmanship.
      5. 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. Hinges:
   1. Furnish hinges of class and size as listed in sets.
   2. Numbers used are Ives (IVE).
   3. Products of a BHMA member are acceptable.

B. 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 ¾” backset with a full ¾" 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.
   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.
   8. Provide strikes as required to match existing conditions and preparations at existing openings.

C. Exit Devices:
   1. Exit devices shall be touchpad style, fabricated of brass, bronze, stainless steel, or aluminum, plated to the standard architectural finishes to match the balance of the door hardware.
DOOR HARDWARE

2. All exit devices shall incorporate a fluid damper, which decelerates the touchpad on its return stroke and eliminates noise associated with exit device operation. Touchpad shall extend a minimum of one half of the door width. All latchbolts to be deadlatching type, with a self-lubricating coating to reduce wear.

3. End-cap will be sloped to deflect any impact from carts and they shall be flush with the external mechanism case. End caps that overlap and project above the mechanism case are unacceptable. End cap shall utilize a two-point attachment to the mounting bracket.

4. Touchpad shall match exit device finish, and shall be stainless steel for US26, US26D, US28, US32, and US32D finishes. Only compression springs will be used in devices, latches, and outside trims or controls.

5. Plastic templates shall be included with each exit device to facilitate a quick, easy and accurate installation.

6. Strikes shall be roller type and come complete with a locking plate to prevent movement.

7. All rim and vertical rod exit devices shall have passed a 5 million (5,000,000) cycle test based on ANSI A156.3, 1994, Grade 1 test standards and certified by an independent testing lab.

8. All mortise exit devices shall have passed a 10 million (10,000,000) cycle test based on ANSI A156.3, 1994, Grade 1 test standards and certified by an independent testing lab.

9. Provide cylinder dogging on panic exit hardware where noted in hardware sets.

10. Exit devices shall be UL listed panic exit hardware. All exit devices for fire rated openings shall be UL labeled fire exit hardware.

11. Lever trim for exit devices shall be vandal-resistant type, which will travel to a 90-degree down position when more than 35 pounds of torque are applied, and which can easily be re-set.

12. Von Duprin 98 and 35A Series. Series and function numbers as listed in sets.

13. Trim:
   a. As specified in sets.
   b. Levers to match lockset design where specified.

D. Closers:

1. Door closers shall have fully hydraulic, full rack and pinion action with a high strength cast iron cylinder. Cylinder body shall be 1 ½” in diameter, and double heat treated pinion shall be 11/16” in diameter with double D slab drive arm connection.

2. Hydraulic fluid shall be of a type requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to –30 degrees F.

3. Spring power shall be continuously adjustable over the full range of closer sizes, and allow for reduced opening force for the physically handicapped. Hydraulic regulation shall be by tamper-proof, non-critical valves. Closers shall have separate adjustment for latch speed, general speed, and backcheck.

4. All closers shall have solid forged steel main arms (and forged forearms for parallel arm closers).

5. All surface mounted mechanical closers shall be certified to exceed ten million (10,000,000) full load cycles by a recognized independent testing laboratory.

6. Closers will have Powder coating finish certified to exceed 100 hours salt spray testing by ETL, an independent testing laboratory used by BHMA for ANSI certification.
7. Refer to door and frame details and furnish accessories such as drop plates, panel adapters, spacers and supports as required to correctly install door closers. State degree of door swing in the hardware schedule.

8. LCN Series as listed in sets.

E. Overhead Holders and Stops:

1. Type, function and fasteners must be same as Glynn-Johnson specified. Size per manufacturer's selector chart. Plastic end caps, hold open mechanisms and shock blocks are not allowed. End caps must be finished same as balance of unit.


3. Type, function, and fasteners must be the same as Glynn-Johnson specified. Size per manufacturer's selector chart.
   a. Glynn-Johnson

F. Wall Stops:

1. Length to exceed projection of all other hardware. Provide with threaded studs and expansion shields for masonry wall construction.
   a. Ives WS443/WS447
   b. BHMA L12011 or L12021

G. Miscellaneous:

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

H. 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. Furnish full thread wood screws for attachment to solid wood doors and frames. "TEK" type screws are not acceptable.

2. Sex bolts will not be permitted on reinforced metal doors or wood 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. Furnish metal template to frame/door supplier for continuous hinge.

C. 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 Architect 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 and core for all hardware components capable of being locked.

D. Provide cylinder cores master and grand master keyed to existing Schlage FSIC key system according to Owner’s instructions. Provide change keys, master keys and grand master keys as required by Owner.

E. Provide cylinders with construction cores or keying for use during the construction period. When so directed, and in the presence of the Owner’s security department or representative, convert construction cores or keying to the final system.
   1. Supplier shall include the cost of this service in his proposal.

PART 3 - EXECUTION

3.1 Installation

A. General:

   1. Install hardware according to manufacturers 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. Provide blocking/reinforcement for all wall mounted Hardware.
   3. Reinforced hollow metal doors and frames and reinforced aluminum door and frames will be drilled and tapped for machine screws.
   5. Continuous gear hinges attached to hollow metal doors and frames and aluminum doors and frames: 12-24 x 1/2” #3 Phillips Keenform self-tapping. Use #13 or 3/16 drill for pilot.
   6. Continuous Gear Hinges require continuous mortar guards of foam or cardboard 1/2” thick x frame height, applied with construction adhesive.
   7. Install weather-strip gasket prior to parallel arm closer bracket, rim exit device or any stop mounted hardware. Gasket to provide a continuous seal around perimeter of door opening. Allow for gasket when installing finish hardware. Door closers will require special templating. Exit devices will require adjustment in backset.
B. Locations:

1. Dimensions are from finish floor to center line of items.
2. Include this list in Hardware Schedule.

<table>
<thead>
<tr>
<th>CATEGORY</th>
<th>DIMENSION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hinges</td>
<td>Door Manufacturer’s Standard</td>
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<tr>
<td>Levers</td>
<td>Door Manufacturer’s Standard</td>
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<tr>
<td>Exit Device Touchbar</td>
<td>Per Template</td>
</tr>
<tr>
<td>Wall Stops/ Holders</td>
<td>At Head</td>
</tr>
</tbody>
</table>

C. 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.

D. 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/Construction Manager 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/Construction Manager 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/Construction Manager, 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
003.1

<table>
<thead>
<tr>
<th>QTY</th>
<th>DESCRIPTION</th>
<th>CATALOG NUMBER</th>
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<td>(BY TECHNICAL GLASS</td>
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<td>PRODUCTS)</td>
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<td>VON</td>
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<td>1</td>
<td>SURFACE CLOSER</td>
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<td>689</td>
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<td>1</td>
<td>WALL STOP</td>
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003.2

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<td>STOREROOM LOCK</td>
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<td>WALL STOP</td>
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018.1 024.1 024.2 028.1

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End of Section
SECTION 088000 - GLAZING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:
   1. Glass for windows, doors, interior borrowed lites and storefront framing.
   2. Glazing sealants and accessories.

1.2 COORDINATION

A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

C. Delegated-Design Submittal: For glass indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

A. Preconstruction adhesion and compatibility test report.

1.5 QUALITY ASSURANCE

A. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.

1.6 PRECONSTRUCTION TESTING

A. Preconstruction Adhesion and Compatibility Testing: Test each glass product, tape sealant, gasket, glazing accessory, and glass-framing member for adhesion to and compatibility with elastomeric glazing sealants.
   1. Testing is not required if data are submitted based on previous testing of current sealant products and glazing materials matching those submitted.
1.7 WARRANTY

A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.

1. Warranty Period: 10 years from date of Substantial Completion.

B. Manufacturer's Special Warranty for Laminated Glass: Manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.

1. Warranty Period: Five years from date of Substantial Completion.

C. Manufacturer's Special Warranty for Insulating Glass: Manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Guardian Glass; SunGuard.
2. Vitro.

2.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, registered in the State of Michigan to design glazing.

B. Safety Glazing: Where safety glazing is required by the building codes, provide glazing that complies with 16 CFR 1201, Category II.
2.3 GLASS PRODUCTS, GENERAL

A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below unless more stringent requirements are indicated. See these publications for glazing terms not otherwise defined in this Section or in referenced standards.


B. Safety Glazing Labeling: Where safety glazing is required by the building codes, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction or manufacturer. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.

C. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.

D. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass that complies with performance requirements and is not less than the thickness indicated.

E. Strength: Where annealed float glass is indicated, provide annealed float glass, heat-strengthened float glass, or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where heat-strengthened float glass is indicated, provide heat-strengthened float glass or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where fully tempered float glass is indicated, provide fully tempered float glass.

2.4 GLASS PRODUCTS

A. Fully Tempered Float Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.

2.5 INSULATING GLASS

A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190.

2. Perimeter Spacer: Manufacturer's standard warm-edge spacer material and construction.

2.6 GLAZING SEALANTS

A. General:
1. Compatibility: Compatible with one another and with other materials they contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
2. Suitability: Comply with sealant and glass manufacturers’ written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
3. Sealant shall have a VOC content of 250 g/L or less.
4. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer’s full range.

B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 25, Use NT.

1. Available Products:  
   a. GE Silicones; Silglaze II SCS2800  
   b. Tremco; Tremsil 600  
   c. Dow Corning Corporation; 795

2.7 GLAZING TAPES

A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C 1281 and AAMA 800 for products indicated below:

1. AAMA 804.3 tape, where indicated.  
2. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.  
3. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:

1. AAMA 810.1, Type 1, for glazing applications in which tape acts as the primary sealant.  
2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.8 MISCELLANEOUS GLAZING MATERIALS

A. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

B. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

C. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
D. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

E. Cylindrical Glazing Sealant Backing: ASTM C1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

F. Perimeter Insulation for Fire-Resistive Glazing: Product that is approved by testing agency that listed and labeled fire-resistant glazing product with which it is used for application and fire-protection rating indicated.

PART 3 - EXECUTION

3.1 GLAZING, GENERAL

A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

B. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance.

C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.

D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

F. Provide spacers for glass lites where length plus width is larger than 50 inches (1270 mm).

G. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

3.2 TAPE GLAZING

A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.

B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.

C. Cover vertical framing joints by applying tapes to heads and sills first, then to jambs. Cover horizontal framing joints by applying tapes to jambs, then to heads and sills.
D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.

E. Apply heel bead of elastomeric sealant.

F. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

G. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.3 GASKET GLAZING (DRY)

A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.

B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.

C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

E. Install gaskets so they protrude past face of glazing stops.

3.4 SEALANT GLAZING (WET)

A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.

B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.

C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.5 CLEANING AND PROTECTION

A. Immediately after installation remove nonpermanent labels and clean surfaces.
B. Protect glass from contact with contaminating substances resulting from construction operations. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.

1. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer. Remove and replace glass that cannot be cleaned without damage to coatings.

C. Remove and replace glass that is damaged during construction period.

3.6 MONOLITHIC GLASS SCHEDULE

A. Glass Type GL-A: Clear fully tempered float glass at all interior non-fire rated location except as noted.

1. Minimum Thickness: 6 mm.
2. Safety glazing required.

END OF SECTION 088000
PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Fire-protection-rated glazing.
   2. Fire-resistance-rated glazing.

1.2 COORDINATION

A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.
B. Sustainable Design Submittals:
   1. Product Data: For sealants, indicating VOC content.
   2. Laboratory Test Reports: For sealants, indicating compliance with requirements for low-emitting materials.
C. Glass Samples: For each type of glass product; 12 inches (300 mm) square.
D. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

1.4 WARRANTY

A. Manufacturer’s Special Warranty on Laminated Glass: Manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer’s written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.
   1. Warranty Period: 10 years from date of Substantial Completion.
B. Manufacturer’s Special Warranty on Double Glazing Units with Clear Gel Fill: Manufacturer agrees to replace units that deteriorate within specified warranty period. Deterioration of double glazing units with clear gel fill is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning glass contrary to manufacturer’s written instructions. Evidence of failure is the leakage of gel fill from units, air bubbles within units, or obstruction of vision by contamination or deterioration of gel.
   1. Warranty Period: 10 years from date of Substantial Completion.
PART 2 - PRODUCTS

2.1 GLASS PRODUCTS, GENERAL

A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organization below unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
   1. GANA Publications: "Glazing Manual."

B. Safety Glazing Labeling: Permanently mark glazing with certification label of the Safety Glazing Certification Council or another certification agency acceptable to authorities having jurisdiction or the manufacturer. Label shall indicate manufacturer's name, type of glass, glass thickness, and safety glazing standard with which glass complies.

2.2 GLASS PRODUCTS

A. Float Glass: ASTM C 1036, Type I, Quality-Q3, Class I (clear) unless otherwise indicated.

B. Ultraclear Float Glass: ASTM C 1036, Type I, Quality-Q3, Class I (clear), with visible light transmission not less than 91 percent.

C. Tempered Float Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class I (clear) unless otherwise indicated, Quality-Q3.
   1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.

D. Laminated Glass: ASTM C 1172. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.
   1. Construction: Laminate glass with polyvinyl butyral interlayer unless fire-protection or fire-resistance rating is based on another product.
   2. Interlayer Thickness: Provide thickness as needed to comply with requirements.
   3. Interlayer Color: Clear unless otherwise indicated.

2.3 FIRE-PROTECTION-RATED GLAZING

A. Fire-Protection-Rated Glazing: Listed and labeled by a testing agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on positive-pressure testing according to NFPA 257 or UL 9, including the hose-stream test, and shall comply with NFPA 80.
   1. Fire-protection-rated glazing required to have a fire-protection rating of 20 minutes shall be exempt from the hose-stream test.

B. Fire-Protection-Rated Glazing Labeling: Permanently mark fire-protection-rated glazing with certification label of a testing agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name; test standard; whether glazing is permitted to be used in doors or openings; if permitted in openings, whether glazing has passed hose-stream test; whether glazing meets 450 deg F (250 deg C) temperature-rise limitation; and fire-resistance rating in minutes.

C. Fire-Protection-Rated Tempered Glass: 6-mm thickness; fire-protection-rated tempered glass; complying with 16 CFR 1201, Category II.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. SAFTI FIRST Fire Rated Glazing Solutions; SuperLite I
      b. Technical Glass Products; Fireglass®20.
      c. Vetrotech Saint-Gobain; SSG Pyroswiss US.
D. Laminated Ceramic Glazing: Laminated glass made from two plies of clear, ceramic glass; 8-mm total thickness; and complying with 16 CFR 1201, Category II.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. SAFTI FIRST Fire Rated Glazing Solutions; Pyran Platinum L.
      b. Technical Glass Products; FireLite Plus®.
      c. Vetrotech Saint-Gobain; Keralite Laminated.

2.4 FIRE-RESISTANCE-RATED GLAZING

A. Fire-Resistance-Rated Glazing Labeling: Permanently mark fire-resistance-rated glazing with certification label of a testing agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, test standard, that the glazing is approved for use in walls, and the fire-resistance rating in minutes.

B. Laminated Glass with Intumescent Interlayers: Laminated glass made from multiple plies of uncoated, ultraclear float glass; with intumescent interlayers; and complying with 16 CFR 1201, Category II.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Pilkington North America; Pyrostop.
      b. SAFTI FIRST Fire Rated Glazing Solutions; SuperLite II-XLM.
      c. Technical Glass Products; Pilkington Pyrostop®.
      d. Vetrotech Saint-Gobain; Contraflam.

C. Double Glazing Units with Clear Gel Fill: Double glazing units made from two lites of uncoated, fully tempered, ultraclear float glass; with a perimeter edge seal enclosing a cavity filled with optically clear, intumescent gel; and complying with 16 CFR 1201, Category II.
   1. Products: Subject to compliance with requirements, provide the following:
      a. SAFTI FIRST Fire Rated Glazing Solutions; SuperLite II-XL.

2.5 GLAZING ACCESSORIES

A. Provide glazing gaskets, glazing sealants, glazing tapes, setting blocks, spacers, edge blocks, and other glazing accessories that are compatible with glazing products and each other and are approved by testing agencies that listed and labeled fire-resistant glazing products with which products are used for applications and fire-protection ratings indicated.

B. Glazing Sealants for Fire-Rated Glazing Products: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 50, Use NT. Comply with sealant and glass manufacturers’ written instructions for selecting glazing sealants suitable for applications indicated.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Dow Corning Corporation.
      b. GE Construction Sealants; Momentive Performance Materials Inc.
      c. Tremco Incorporated.
   2. Sealant shall have a VOC content of 250 g/L or less.
   3. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.
PART 3 - EXECUTION

3.1 GLAZING

A. Use methods approved by testing agencies that listed and labeled fire-resistant glazing products.
B. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials unless more stringent requirements are indicated, including those in referenced glazing publications.
C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.
D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
G. Provide spacers for glass lites where length plus width is larger than 50 inches (1270 mm).
H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

3.2 CLEANING AND PROTECTION

A. Immediately after installation, remove nonpermanent labels and clean surfaces.
B. Protect glass from contact with contaminating substances resulting from construction operations. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.
   1. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer.
C. Remove and replace glass that is damaged during construction period.

3.3 FIRE-PROTECTION-RATED GLAZING SCHEDULE

A. Glass Type FPGL-1: 20-minute fire-protection-rated glazing without hose-stream test; fire-protection-rated tempered glass.

3.4 FIRE-RESISTANCE-RATED GLAZING SCHEDULE

A. Glass Type FRGL-1: 60-minute fire-resistance-rated glazing with 450 deg F (250 deg C) temperature-rise limitation; laminated glass with intumescent interlayers or double glazing units with clear gel fill.

END OF SECTION 088813
PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Non-load-bearing steel framing systems for interior gypsum board assemblies.
   2. Suspension systems for interior gypsum ceilings and soffits.

1.2 SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: Provide materials and construction identical to those tested according to ASTM E 119.

B. STC-Rated Assemblies: Provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413.

2.2 FRAMING SYSTEMS

A. Steel Studs and Runners: ASTM C 645. Use steel studs and runners of actual thickness indicated.
   1. Minimum Base-Metal Thickness: 20 gauge (0.033 inch (0.84 mm)).
   2. Depth: As indicated on Drawings.

B. Slip-Type Head Joints: Where indicated, provide the following in thickness not less than indicated for studs and in width to accommodate depth of studs:
   1. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes due to deflection of structure above.
      a. Products: Subject to compliance with requirements, provide one of the following:
         1) Dietrich Metal Framing; SLP-TRK Slotted Deflection Track.
         2) MBA Building Supplies; FlatSteel Deflection Track or Slotted Deflecto Track.
         3) Steel Network Inc. (The); VertiClip SLD or VertiTrack VTD Series.
         4) Superior Metal Trim; Superior Flex Track System (SFT).
         5) Telling Industries; Vertical Slip Track or Vertical Slip Track II.

C. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
   1. Minimum Base-Metal Thickness: 0.018 inch (0.45 mm).

D. Cold-Rolled Channel Bridging: Steel, 0.053-inch (1.34-mm) minimum base-metal thickness, with minimum 1/2-inch- (13-mm-) wide flanges.
   1. Depth: 1-1/2 inches (38 mm).
   2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches (38 by 38 mm), 0.068-inch- (1.72-mm-) thick, galvanized steel.

E. Hat-Shaped, Rigid Furring Channels: ASTM C 645.
   1. Minimum Base-Metal Thickness: 0.033 inch (0.84 mm).
   2. Depth: 7/8 inch (22.2 mm) and 1-1/2 inches (38.1 mm).
F. Cold-Rolled Furring Channels: 0.053-inch (1.34-mm) uncoated-steel thickness, with minimum 1/2-inch- (13-mm) wide flanges.
   1. Depth: 3/4 inch (19 mm).
   2. Furring Brackets: Adjustable, corrugated-edge type of steel sheet with minimum uncoated-steel thickness of 0.033 inch (0.8 mm).
   3. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch- (1.59-mm-) diameter wire, or double strand of 0.048-inch- (1.21-mm-) diameter wire.

G. Z-Shaped Furring: With slotted or non-slotted web, face flange of 1-1/4 inches (31.8 mm), wall attachment flange of 7/8 inch (22 mm), minimum uncoated-metal thickness of 0.018 inch (0.45 mm), and depth required for thickness indicated.

2.3 SUSPENSION SYSTEMS

A. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch- (1.59-mm-) diameter wire, or double strand of 0.048-inch- (1.21-mm-) diameter wire.
B. Hanger Attachments to Concrete:
   1. Anchors: Capable of sustaining a load equal to 5 times that imposed as determined by ASTM E 488.
      a. Type: Post-installed, chemical anchor or post-installed, expansion anchor.
   2. Powder-Actuated Fasteners: Capable of sustaining a load equal to 10 times that imposed as determined by ASTM E 1190.
C. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.16 inch (4.12 mm) in diameter.
D. Carrying Channels: Cold-rolled, commercial-steel sheet with a base-metal thickness of 0.053 inch (1.34 mm) and minimum 1/2-inch- (13-mm-) wide flanges.
   1. Depth: 2 inches (51 mm).
E. Furring Channels (Furring Members):
   1. Cold-Rolled Channels: 0.053-inch (1.34-mm) uncoated-steel thickness, with minimum 1/2-inch- (13 mm) wide flanges, 3/4 inch (19 mm) deep.
   2. Steel Studs and Runners: ASTM C 645. Use either steel studs and runners or dimpled steel studs and runners of equivalent minimum base-metal thickness.
      a. Minimum Base-Metal Thickness: 0.018 inch (0.45 mm).
      b. Depth: 2-1/2 inches (64 mm).
   3. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch (22 mm) deep.
      a. Minimum Base-Metal Thickness: 0.033 inch (0.84 mm).
   4. Resilient Furring Channels: 1/2-inch- (13-mm-) deep members designed to reduce sound transmission.

2.4 AUXILIARY MATERIALS

A. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.
B. Isolation Strip at Exterior Walls: Provide asphalt saturated organic felt.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Installation Standard: ASTM C 754.
   1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.
B. Install framing and accessories plumb, square, and true to line, with connections securely fastened.
C. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.
D. Install bracing at terminations in assemblies.
E. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.2 INSTALLING FRAMED ASSEMBLIES

A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.
C. Install studs so flanges within framing system point in same direction.
D. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.

1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.

2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
   a. Install two studs at each jamb unless otherwise indicated.
   b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch (13-mm) clearance from jamb stud to allow for installation of control joint in finished assembly.
   c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.

3. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.

4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.
   a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.

E. Direct Furring:
   1. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches (610 mm) o.c.

F. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch (3 mm) from the plane formed by faces of adjacent framing.

3.3 INSTALLING SUSPENSION SYSTEMS

A. Install suspension system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.
C. Suspend hangers from building structure as follows:
   1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.

2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.

3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.

4. Do not attach hangers to steel roof deck.

5. Do not connect or suspend steel framing from ducts, pipes, or conduit.

D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.

E. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet (3 mm in 3.6 m) measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

END OF SECTION 092216
SECTION 092900 - GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Interior gypsum board.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

2.2 GYPSUM BOARD, GENERAL

A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.3 INTERIOR GYPSUM BOARD

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. CertainTeed Corp.
   2. Georgia-Pacific Gypsum LLC.
   4. USG Corporation.

B. Gypsum Board: ASTM C 1396/C 1396M.
   1. Thickness: 5/8 inch (15.9 mm).
   2. Long Edges: Tapered.

C. Gypsum Board, Type X: ASTM C 1396/C 1396M.
   1. Thickness: 5/8 inch (15.9 mm).
   2. Long Edges: Tapered.

D. Gypsum Ceiling Board: ASTM C 1396/C 1396M.
   1. Thickness: 5/8 inch (15.9 mm).
   2. Long Edges: Tapered.

E. Abuse Resistant Gypsum Board, Type X: ASTM C 1396/C 1396M.
   1. Thickness: 5/8 inch (15.9 mm).
   2. Long Edges: Tapered.
2.4 TRIM ACCESSORIES
   A. Interior Trim: ASTM C 1047.
      1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.

2.5 JOINT TREATMENT MATERIALS
   A. General: Comply with ASTM C 475/C 475M.
   B. Joint Tape:
      1. Interior Gypsum Board: Paper.
   C. Joint Compound for Interior Gypsum Board: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.

2.6 AUXILIARY MATERIALS
   A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer’s written instructions.
   B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
   C. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
      1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick.
   D. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing).
   E. Acoustical Joint Sealant: ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings as demonstrated by testing according to ASTM E 90.
      1. Products: Subject to compliance with requirements, provide one of the following:
         a. Accumetric LLC; BOSS 824 Acoustical Sound Sealant.
         b. Grabber Construction Products; Acoustical Sealant GSC.
         d. USG Corporation; SHEETROCK Acoustical Sealant.

PART 3 - EXECUTION

3.1 EXAMINATION
   A. Examine areas and substrates including welded hollow-metal frames and framing, with Installer present, for compliance with requirements and other conditions affecting performance.
   B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
   C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL
   A. Comply with ASTM C 840.
   B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
   C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch (1.5 mm) of open space between panels. Do not force into place.
3.3 APPLYING INTERIOR GYPSUM BOARD

A. Install interior gypsum board in the following locations:
   1. Wallboard Type: Vertical surfaces unless otherwise indicated.
   2. Type X: Where required for fire-resistance-rated assembly.
   3. Ceiling Type: Ceiling surfaces.
   4. Type C: Where required for specific fire-resistance-rated assembly indicated.

B. Single-Layer Application:
   1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
   2. On partitions/walls, apply gypsum panels horizontally (perpendicular to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
      a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
      b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.
   3. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
   4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

C. Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's written recommendations and temporarily brace or fasten gypsum panels until fastening adhesive has set.

3.4 INSTALLING TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

B. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect for visual effect.
C. Interior Trim: Install in the following locations:
   1. Cornerbead: Use at outside corners unless otherwise indicated.
   2. LC-Bead: Use at exposed panel edges.

3.5 FINISHING GYPSUM BOARD

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
B. Prefill open joints or beveled edges, and damaged surface areas.
C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.
D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
   1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
   2. Level 5: At panel surfaces that will be exposed to view.
      a. Primer and its application to surfaces are specified in Section 099123 "Interior Painting."

3.6 PROTECTION

A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.
B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
C. Remove and replace panels that are wet, moisture damaged, and mold damaged.

END OF SECTION 092900
SECTION 093013 - CERAMIC TILING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Porcelain tile.
   2. Waterproof and crack isolation membrane for thinset applications.
   3. Metal edge strips.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.
B. Samples:
   1. Each type and composition of tile and for each color and finish required.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed for each type, composition, color, pattern, and size indicated.

1.5 QUALITY ASSURANCE

A. Installer Qualifications:
   1. Installer has done work of similar projects that can be verified upon request.
   2. Installer uses best practices as outlined in the TCNA (Tile Council of North America) handbook.

PART 2 - PRODUCTS

2.1 PRODUCTS, GENERAL

A. ANSI Ceramic Tile Standard: Provide Standard-grade tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.
B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced...
by TCNA installation methods specified in tile installation schedules, and other requirements specified.

2.2 TILE PRODUCTS

A. Ceramic Tile Type 1: Porcelain Field tile (walls)
   1. Manufacturers: Subject to compliance with requirements, provide products by the following:
      a. Crossville (CT1)
   2. Series: Moonstruck
   3. Certification: Tile certified by the Porcelain Tile Certification Agency.
   4. Face Size: nominal 12 by 24 inches.
   5. Face Size Variation: pressed (rectified)
   6. Thickness: (10.5 mm).
   7. Face: Plain with square edges.
   8. Dynamic Coefficient of Friction: Not less than 0.42.
   9. Tile Color: Juno
   10. Tile Finish: Light Polished
   11. Grout Color: Tec Power Grout 909 Sterling

B. Ceramic Tile Type 2: Porcelain Field tile (floors).
   1. Manufacturers: Subject to compliance with requirements, provide products by the following:
      a. American Olean (CT2)
   2. Series: Theoretical
   3. Certification: Tile certified by the Porcelain Tile Certification Agency.
   4. Face Size: nominal 12 by 24 inches.
   5. Thickness: 5/16”
   6. Face: Plain with square edges.
   7. Tile Color: Imaginative Gray
   8. Tile Finish: Matte
   9. Grout Color: Tec Power Grout 929 Charcoal Gray

C. Ceramic Tile Type 3: Porcelain Field tile (Accent Wall Tile)
   1. Manufacturers: Subject to compliance with requirements, provide products by the following:
      a. STN Ceramica (CT3)
   2. Series: Articwood
   3. Certification: Tile certified by the Porcelain Tile Certification Agency.
   4. Face Size: nominal 8 by 24 inches.
   5. Thickness: 5/16”
   6. Face: Plain with pressed edges.
   7. Tile Color: Amber
   8. Tile Finish: Matte
   9. Grout Color: Tec Power Grout 945 Light Buff
2.3 WATERPROOF AND CRACK ISOLATION MEMBRANE

A. General: Manufacturer’s standard product that complies with ANSI A118.10 and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.

B. Fluid-Applied Membrane: Liquid-latex rubber or elastomeric polymer.
1. Basis-of-Design Product: Subject to compliance with requirements, provide LATICRETE International, Inc.; Laticrete Hydro Ban.

2.4 SETTING MATERIALS

A. Modified Dry-Set Mortar (Thinset): ANSI A118.4.
1. Basis-of-Design Product: Subject to compliance with requirements, provide LATICRETE International, Inc; Laticrete 254 Platinum; or a comparable product by one of the following:
   a. ARDEX Americas.
   b. Bonsal American, an Oldcastle company.
   c. Bostik, Inc. Reflex Mortar
   d. H.B. Fuller Construction Products Inc. / TEC Ultimate Large Tile Mortar
   e. MAPEI Corporation.
2. Provide prepackaged, dry-mortar mix to which only water must be added at Project site.
3. For wall applications, provide nonsagging mortar.

2.5 GROUT MATERIALS

A. Sand-Portland Cement Grout: ANSI A108.10, consisting of white or gray cement and white or colored aggregate as required to produce color indicated.

B. High-Performance Tile Grout: ANSI A118.7.
1. Basis-of-Design Product: Subject to compliance with requirements, provide LATICRETE International, Inc.; PermaColor Grout or a comparable product by one of the following:
   a. ARDEX Americas.
   b. Bonsal American, an Oldcastle company.
   c. Bostik, Inc. Hydroment Vivid
   d. H.B. Fuller Construction Products Inc. / TEC Power Grout
   e. MAPEI Corporation.
2. Polymer Type: Dry, redispersible form, prepackaged with other dry ingredients.
3. Polymer Type: Liquid-latex form for addition to prepackaged dry-grout mix.

2.6 MISCELLANEOUS MATERIALS

A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.

B. Metal Edge Strips and Reducers: At all areas where ceramic floor tile abuts dissimilar flooring material.
1. Basis-of-Design Product: Subject to compliance with requirements, provide Schluter Systems, Inc; Reno-U or Schiene; or an Architect-approved equal.
2. Material: 304 stainless steel
3. Anodized Aluminum cove-shaped Profile for Floor/Wall Transitions
   a. Basis-of-design Product: Subject to compliance with requirements, provide Schluter Systems, Inc; Dilex-AHK; or an Architect-approved equal.
   b. Material finish: AE -Satin Anodized Aluminum

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
   1. Verify that substrates for setting tile are firm; dry; clean; free of coatings that are incompatible with tile-setting materials, including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
   2. Verify that concrete substrates for tile floors installed with thinset mortar comply with surface finish requirements in ANSI A108.01 for installations indicated.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with thinset mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.

B. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

3.3 CERAMIC TILE INSTALLATION

A. Comply with TCNA’s ”Handbook for Ceramic, Glass, and Stone Tile Installation” for TCNA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 series "Specifications for Installation of Ceramic Tile" that are referenced in TCNA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.
   1. For the following installations, follow procedures in the ANSI A108 series of tile installation standards for providing 95 percent mortar coverage:
      a. Tile floors in wet areas.
      b. Tile floors consisting of tiles 8 by 8 inches (200 by 200 mm) or larger.
      c. Tile floors consisting of rib-backed tiles.

B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in
items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

D. Provide manufacturer’s standard trim shapes where necessary to eliminate exposed tile edges.

E. Where accent tile differs in thickness from field tile, vary setting bed thickness so that tiles are flush.

F. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.

G. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:
   1. Porcelain Tile: 3/8 inch (9.5 mm).

H. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.
   1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.
   2. Prepare joints and apply sealants to comply with requirements in Section 079200 “Joint Sealants”.

I. Metal Edge Strips: Install where exposed edge of tile flooring meets carpet or other flooring that finishes flush with or below top of tile and no threshold is indicated.

J. Install tile backing panels and treat joints according to ANSI A108.11 and manufacturer’s written instructions for type of application indicated. Use modified dry-set mortar for bonding material unless otherwise directed in manufacturer’s written instructions.

K. Install waterproofing to comply with ANSI A108.13 and manufacturer’s written instructions to produce waterproof membrane of uniform thickness that is bonded securely to substrate.

L. Install crack isolation membrane to comply with ANSI A108.17 and manufacturer’s written instructions to produce membrane of uniform thickness that is bonded securely to substrate.

END OF SECTION 093013
SECTION 095100 - SUSPENDED CEILING SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY
A. Section includes panels and exposed suspension systems for ceilings, including:
   1. Acoustical Panel Ceilings
   2. Metal Panel Ceilings
   3. Linear Metal Ceilings

1.2 PREINSTALLATION MEETINGS
A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS
A. Product Data: For each type of product.
B. Samples: For each exposed product and for each color and texture specified.

1.4 INFORMATIONAL SUBMITTALS
A. Product test reports.
B. Evaluation reports.
C. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS
A. Maintenance data.

1.6 QUALITY ASSURANCE
A. Testing Agency Qualifications: Qualified according to NVLAP.
B. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
   1. Build mockup of typical ceiling area as shown on Drawings.
   2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
1.7 ATTIC STOCK
   A. Provide 3% attic stock for SAT-1 and accompanying metal suspension system only.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS
   A. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
      1. Flame-Spread Index: Comply with ASTM E 1264 for Class A materials.
      2. Smoke-Developed Index: 450 or less.

2.2 ACOUSTICAL PANEL CEILINGS, GENERAL
   A. Low-Emitting Materials: Acoustical panel ceilings shall comply with the testing and product requirements of the California Department of Health Services’ “Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers.”
   B. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 50 percent for mineral fiber ceiling tile.
   C. Glass-Fiber-Based Panels: Made with binder containing no urea formaldehyde.
   E. Metal Suspension System Standard: Comply with ASTM C 635.
   F. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.

2.3 ACOUSTICAL PANEL CEILINGS
   A. SAT-1
      1. Basis of Design: Subject to compliance with requirements, provide USG: Radar;
      2. Item Number 2210
      3. Classification. Provide panels complying with ASTM E1264 for type and form as follows:
         a. Type III, Form 2
         b. Pattern C, E
      4. Color: White
      5. LR: Not less than 0.84
      6. NRC: Not less than 0.55
      7. CAC: 35
8. Edge/Joint Detail: SLT
9. Thickness: 5/8 inch
10. Modular Size: 24 inches by 24 inches
11. Interior Suspension Grid:

2.4 METAL PANEL CEILINGS

A. MPC-1
1. Basis of Design: USG Interiors- Celebration Snap-In Metal Panels / Painted Metal Finish to be selected manufacturer standard color selection
2. Lay-In Panel Edge: Square
3. No perforation
4. Flat Panel Size: 12” x 48” (1 x 4)
5. Layout: As indicated on drawings.
6. Interior Suspension Grid: Donn DX 15/16” Suspension System

2.5 LINEAR METAL CEILING ASSEMBLY

A. LMC-1
1. Basis of Design: USG Ceilings Plus – Barz – Unperforated – Anodized finish as selected from manufacturer range of standard Anodized options.
2. Layout: As indicated on drawings.
3. Interior Suspension Grid: Product Standard

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install acoustical panel ceilings to comply with ASTM C 636/C 636M and seismic design requirements indicated, according to manufacturer's written instructions and CISCA’s "Ceiling Systems Handbook."

B. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

1. Arrange directionally patterned acoustical panels as indicated on reflected ceiling plans.
2. Install wall panels by attaching the panels per the manufacturer's instructions, #LA-297443-411, and in accordance with the authorities having jurisdiction.
3. Measure each wall area and establish layout of acoustical units to balance border widths at opposite edges of each wall. Coordinate panel layout with mechanical and electrical fixtures.

C. Ceilings to be installed per manufacturer's written instruction.
Vertically installed, unframed baffles provide sound absorption and design flexibility.

FEATURES AND BENEFITS
- Reduces excess noise to help create a more productive work environment in open spaces
- Frameless panels with fully painted edges enable two-sided sound absorption
- Create a multitude of contemporary looks with three different edge treatments: straight, wave, and zig zag
- Highly engineered Akutex™ FT surface in white finish has nearly perfect light diffusion (+99%)
- Multiple attachment options available; baffles are demountable
- Available in 22 standard colors

ATTRIBUTES
- SAG RESISTANT
- FIRE RATING: CLASS A
- MOLD/MILDEW RESISTANT
- WASHABLE LR 0.85

SOLO FREEDOM
Ecophon Solo Freedom enables endless design possibilities. Design almost any shape based on a 1200 x 1200, 2400 x 1200, or 3000 x 1200 panel. Quick-ship options available for select Solo Cloud and Baffle shapes.

CERTIFICATIONS & PRODUCT DECLARATIONS
- EPD AVAILABLE
- HPD AVAILABLE

LEED® v4
- RECYCLED CONTENT 54%
  - PRE: 0%
  - POST: 54%
  - PERCENTAGE: 54%
- AQ: Optimize Energy Performance
- EQ: Interior Lighting
- MR: PBT Source Reduction (Healthcare)
- EQ: Acoustic Performance
- EQ: Daylight
- MR: Sourcing Raw Materials
- MR: Environmental Product Declarations (EPDs)
- MR: Construction and Demolition Waste Management Planning
- MR: Material Ingredients (HPDs)

LEED® is a registered trademark of the U.S. Green Building Council.
ECOPHON® SOLO™ BAFFLES

COLORS

Dark Diamond  Silk Slate  Silver Stone  Cloudy Day  Golden Field  Highland Fog  Moonlight Sky  Morning Drizzle

Ocean Storm  Ruby Rock  Silent Steam  Sunset Heat  Volcanic Ash  Scallop Shells  Peach Rose  Gogi Berry

Sage Garden  Eucalyptus Leaf  Summer Forest  White  Fresh Clover  Wet Sand

CONFIGURATION SUGGESTIONS

STAGGER THEM
Stagger baffles at varying intervals to create movement with unique angular or wave-like expressions.

MAKE WAVES
Achieve unique, angular, or flowing visuals across the ceiling plane by hanging standard wave and zig-zag baffles at varying intervals, creating a feeling of movement across the space.

GO VERTICAL
Break into a new visual plane — The Baffle Wall Fixing Accessory allows you to hang baffles on walls. Create stacked or staggered formations for unconventional visual effect on vertical surfaces.
### SOLO BAFFLE ANCHOR
For direct attachment applications.

<table>
<thead>
<tr>
<th>Dimensions (IN.)</th>
<th>AVG Sabins/Unit</th>
<th>Pieces/Carton</th>
<th>LBS./Carton</th>
</tr>
</thead>
<tbody>
<tr>
<td>3544 10110 EZC 5 x 46 x 1-1/2</td>
<td>1.6</td>
<td>10</td>
<td>52</td>
</tr>
<tr>
<td>3544 10111 EZC 5 x 94 x 1-1/2</td>
<td>3.3</td>
<td>10</td>
<td>52</td>
</tr>
<tr>
<td>3544 10112 EZC 10 x 46 x 1-1/2</td>
<td>3.3</td>
<td>10</td>
<td>52</td>
</tr>
<tr>
<td>3544 10113 EZC 10 x 94 x 1-1/2</td>
<td>6.7</td>
<td>6</td>
<td>52</td>
</tr>
<tr>
<td>3544 10114 EZC 16 x 94 x 1-1/2</td>
<td>10.7</td>
<td>4</td>
<td>52</td>
</tr>
<tr>
<td>3544 10115 EZC 22 x 46 x 1-1/2</td>
<td>7.2</td>
<td>4</td>
<td>52</td>
</tr>
<tr>
<td>3544 10116 EZC 22 x 94 x 1-1/2</td>
<td>14.7</td>
<td>4</td>
<td>52</td>
</tr>
<tr>
<td>3544 10117 EZC 28 x 46 x 1-1/2</td>
<td>9.2</td>
<td>2</td>
<td>52</td>
</tr>
<tr>
<td>3544 10118 EZC 28 x 94 x 1-1/2</td>
<td>18.7</td>
<td>2</td>
<td>52</td>
</tr>
</tbody>
</table>

### SOLO BAFFLE HOOK
For adjustable hanging applications from plenum or suspended ceilings.

<table>
<thead>
<tr>
<th>Dimensions (IN.)</th>
<th>AVG Sabins/Unit</th>
<th>Pieces/Carton</th>
<th>LBS./Carton</th>
</tr>
</thead>
<tbody>
<tr>
<td>3544 10119 EZC 5 x 46 x 1-1/2</td>
<td>1.6</td>
<td>10</td>
<td>52</td>
</tr>
<tr>
<td>3544 10120 EZC 5 x 94 x 1-1/2</td>
<td>3.3</td>
<td>10</td>
<td>52</td>
</tr>
<tr>
<td>3544 10121 EZC 10 x 46 x 1-1/2</td>
<td>3.3</td>
<td>10</td>
<td>52</td>
</tr>
<tr>
<td>3544 10122 EZC 10 x 94 x 1-1/2</td>
<td>6.7</td>
<td>6</td>
<td>52</td>
</tr>
<tr>
<td>3544 10123 EZC 16 x 94 x 1-1/2</td>
<td>10.7</td>
<td>4</td>
<td>52</td>
</tr>
<tr>
<td>3544 10124 EZC 22 x 46 x 1-1/2</td>
<td>7.2</td>
<td>4</td>
<td>52</td>
</tr>
<tr>
<td>3544 10125 EZC 22 x 94 x 1-1/2</td>
<td>14.7</td>
<td>4</td>
<td>52</td>
</tr>
<tr>
<td>3544 10126 EZC 28 x 46 x 1-1/2</td>
<td>9.2</td>
<td>2</td>
<td>52</td>
</tr>
<tr>
<td>3544 10127 EZC 28 x 94 x 1-1/2</td>
<td>18.7</td>
<td>2</td>
<td>52</td>
</tr>
</tbody>
</table>

### RECTANGLE

<table>
<thead>
<tr>
<th>Dimensions (MM (~ IN.))</th>
<th>AVG Sabins/Unit</th>
<th>Pieces/Carton</th>
<th>LBS./Carton</th>
</tr>
</thead>
<tbody>
<tr>
<td>3544 2101 200 x 1200 x 40 (~ 8 x 48 x 1-1/2)</td>
<td>3.2</td>
<td>10</td>
<td>23</td>
</tr>
<tr>
<td>3544 2100 300 x 1200 x 40 (~ 12 x 48 x 1-1/2)</td>
<td>3.5</td>
<td>10</td>
<td>34</td>
</tr>
<tr>
<td>3544 2104 600 x 1200 x 40 (~ 24 x 48 x 1-1/2)</td>
<td>7.1</td>
<td>5</td>
<td>34</td>
</tr>
<tr>
<td>3544 7570 200 x 1800 x 40 (~ 8 x 72 x 1-1/2)</td>
<td>5.4</td>
<td>8</td>
<td>36</td>
</tr>
<tr>
<td>3544 6739 300 x 1800 x 40 (~ 12 x 72 x 1-1/2)</td>
<td>5.9</td>
<td>8</td>
<td>50</td>
</tr>
<tr>
<td>3544 7849 600 x 1800 x 40 (~ 24 x 72 x 1-1/2)</td>
<td>8.1</td>
<td>4</td>
<td>50</td>
</tr>
</tbody>
</table>

### WAVE

<table>
<thead>
<tr>
<th>Dimensions (MM (~ IN.))</th>
<th>AVG Sabins/Unit</th>
<th>Pieces/Carton</th>
<th>LBS./Carton</th>
</tr>
</thead>
<tbody>
<tr>
<td>3544 8101 300 x 1800 x 40 (~ 12 x 72 x 1-1/2)</td>
<td>5.9</td>
<td>4</td>
<td>30</td>
</tr>
<tr>
<td>3544 8100 600 x 1800 x 40 (~ 24 x 72 x 1-1/2)</td>
<td>7.8</td>
<td>4</td>
<td>50</td>
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</tbody>
</table>

### ZIG ZAG

<table>
<thead>
<tr>
<th>Dimensions (MM (~ IN.))</th>
<th>AVG Sabins/Unit</th>
<th>Pieces/Carton</th>
<th>LBS./Carton</th>
</tr>
</thead>
<tbody>
<tr>
<td>3544 8001 300 x 1800 x 40 (~ 12 x 72 x 1-1/2)</td>
<td>5.7</td>
<td>4</td>
<td>30</td>
</tr>
<tr>
<td>3544 8000 600 x 1800 x 40 (~ 24 x 72 x 1-1/2)</td>
<td>7.8</td>
<td>4</td>
<td>51</td>
</tr>
</tbody>
</table>

### CAN'T FIND A SIZE?
Contact your local Sales Representative or call 800-233-8990.

---

*8 of Hooks Anchors per panel:
2 per panel when panel is up to 1600mm in length
3 per panel when panel is 1601mm or longer
**ACCESSORIES**

<table>
<thead>
<tr>
<th>SOLO® BAFFLE</th>
<th>PRODUCT NAME</th>
<th>PIECES/CARTON</th>
<th>USE</th>
</tr>
</thead>
<tbody>
<tr>
<td>2630 0691</td>
<td>Connect Edge Sealant White*</td>
<td>1</td>
<td>For re-sealing cut edges (typically 100-150 ft/container); 1 liter container</td>
</tr>
<tr>
<td>2630 1201</td>
<td>Connect Baffle Clip</td>
<td>100</td>
<td>For attaching Solo Baffle Hook panels to acoustical ceiling grid</td>
</tr>
<tr>
<td>2631 1271</td>
<td>Connect Baffle Anchor</td>
<td>10</td>
<td>Comes pre-installed in Solo Baffle Anchor panels (can be ordered separately for custom installations)</td>
</tr>
<tr>
<td>2631 1272</td>
<td>Connect Baffle Hook</td>
<td>10</td>
<td>Comes pre-installed in Solo Baffle Hook panels (can be ordered separately for custom installations)</td>
</tr>
<tr>
<td>2631 1768</td>
<td>Connect Guiding Pin</td>
<td>100</td>
<td>For use between Solo Baffle Anchor products to maintain visual gap between panels</td>
</tr>
<tr>
<td>2631 1770</td>
<td>Connect Profile Connector</td>
<td>50</td>
<td>For use when running multiple lengths of Connect Baffle Profile end-to-end</td>
</tr>
<tr>
<td>2630 0362</td>
<td>Connect Baffle Profile</td>
<td>20</td>
<td>For attaching Solo Baffle Anchor products to the structure</td>
</tr>
<tr>
<td>2647 2174</td>
<td>Connect Adjustable Wire Hanger</td>
<td>24</td>
<td>For hanging attachment of Solo panels to structure (6’-6” in length)</td>
</tr>
<tr>
<td>2647 2180</td>
<td>Connect Adjustable Wire Hanger</td>
<td>24</td>
<td>For hanging attachment of Solo panels to structure (16’-4” in length)</td>
</tr>
<tr>
<td>2630 0047</td>
<td>Baffle Wall Fixing</td>
<td>24</td>
<td>For attaching Solo Baffles directly to the wall (compatible with Solo Baffle Anchor only)</td>
</tr>
</tbody>
</table>

*Connect Edge Sealant is available in all standard colors. Please contact your local Sales Representative or call 800-233-8990.

**PHYSICAL DATA**

- **MATERIAL**
  Fiberglass

- **ASTM E1264 CLASSIFICATION**
  Type XII, Form 2, Pattern G

- **FIRE CLASS (ASTM E1264)**
  All are Class A per ASTM E84 & CAN S102 Flame Spread: 25 or less Smoke Developed: 50 or less

- **MAINTENANCE**
  Wipe with a soft cloth or vacuum with brush attachment. Cleanable with mild detergent.

- **INSTALLATION CONSIDERATION**
  Calculations based on 600 mm spacing at NRC frequencies.

- **MOLD/MILDEW RESISTANCE**
  Fiberglass substrate is inherently resistant to the growth of mold and mildew.

- **WARRANTY**
  10-year Ecophon Warranty increases to 15 years when installed with CertainTeed suspension systems. Full warranty information can be found at certainteed.com/architectural.

**ACOUSTICAL PERFORMANCE**

<table>
<thead>
<tr>
<th>CONFIGURATION</th>
<th>FREQUENCY (HZ) AVE. SABINS/UNIT</th>
<th>AVE. SABINS/UNIT @ NRC FREQUENCIES</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>125</td>
<td>250</td>
</tr>
<tr>
<td>1200 Baffle / 200</td>
<td>1.08</td>
<td>2.15</td>
</tr>
<tr>
<td>1200 Baffle / 300</td>
<td>2.15</td>
<td>2.15</td>
</tr>
<tr>
<td>1200 Baffle / 400</td>
<td>4.73</td>
<td>2.15</td>
</tr>
<tr>
<td>1800 Baffle / 200</td>
<td>1.08</td>
<td>4.31</td>
</tr>
<tr>
<td>1800 Baffle / 300</td>
<td>2.15</td>
<td>4.31</td>
</tr>
<tr>
<td>1800 Baffle / 400</td>
<td>4.31</td>
<td>4.31</td>
</tr>
<tr>
<td>Zip-Zag Baffle / 200-300</td>
<td>1.08</td>
<td>4.31</td>
</tr>
<tr>
<td>Zip-Zag Baffle / 300-600</td>
<td>3.23</td>
<td>5.38</td>
</tr>
<tr>
<td>Wave Baffle /200-300</td>
<td>2.15</td>
<td>4.31</td>
</tr>
<tr>
<td>Wave Baffle /300-600</td>
<td>3.23</td>
<td>5.38</td>
</tr>
</tbody>
</table>
TECTUM® Blades and Baffles
Vertical Linear Panels – Custom

Acoustical vertical panels help control reverberation and add a design element to your interior spaces.

KEY SELECTION ATTRIBUTES

- Tectum Blades and Baffles are available in 1", 1-1/2", and 2" thicknesses; widths from 23-3/4" to 48" and heights from 11-3/4" to 23-3/4"
- CleanAssure™ family of products – includes disinfectable panels, suspension systems, and trim (standard colors only)
- 18 to 14 gauge steel channel up to 9’0” long is available for 1”, 1-1/2”, and 2” blades to allow groupings of blades and/or channels that create linear visuals longer than 48”
- Mold- and mildew-resistant surface
- PVC insert is available on 1”, 1-1/2”, and 2” thick blades and baffles for attachment to aircraft cables or hanger wire
- USDA-Certified Biobased Product 98% (preferred for government projects)

COLORS
Due to printing limitations, shade may vary from actual product.

- White (TWH)
- Natural* (TNA)
- Custom Colors Available

EDGE DETAILS

- Square Edges
- Beveled Edges

* Tectum® Blades and Baffles are directional – face finish and back finish will exhibit a different appearance due to application of the binder during manufacturing. Factory-painted finishes may exhibit slight differences in finish face to back. 360 degree factory or field-painted finishes are recommended.

CAD/Revit® drawings at:
armstrongceilings.com/cadrevit

armstrongceilings.com/capabilities
See more photos at:
armstrongceilings.com/photogallery

TechLine 877 276-7876
armstrongceilings.com/tectumbaffles
TECTUM® Blades and Baffles
Vertical Linear Panels – Custom
course texture

VISUAL SELECTION

<table>
<thead>
<tr>
<th>Panel Thickness</th>
<th>Dimensions</th>
<th>Colors</th>
</tr>
</thead>
<tbody>
<tr>
<td>TECTUM® Blades and Baffles</td>
<td>1&quot; 11-3/4 x 48 x 1&quot;</td>
<td>TNA, TWH, Custom</td>
</tr>
<tr>
<td>1&quot; 23-3/4 x 48 x 1&quot;</td>
<td>TNA, TWH, Custom</td>
<td></td>
</tr>
<tr>
<td>1-1/2&quot; 11-3/4 x 48 x 1-1/2&quot;</td>
<td>TNA, TWH, Custom</td>
<td></td>
</tr>
<tr>
<td>1-1/2&quot; 23-3/4 x 48 x 1-1/2&quot;</td>
<td>TNA, TWH, Custom</td>
<td></td>
</tr>
<tr>
<td>2&quot; 11-3/4 x 48 x 2&quot;</td>
<td>TNA, TWH, Custom</td>
<td></td>
</tr>
<tr>
<td>2&quot; 23-3/4 x 48 x 2&quot;</td>
<td>TNA, TWH, Custom</td>
<td></td>
</tr>
</tbody>
</table>

TNA = Natural (unpainted), TWH = White
For special sizes, and colors, call TechLine at 1 877 276-7876.

PERFORMANCE SELECTION

<table>
<thead>
<tr>
<th>Class</th>
<th>Light Reflect</th>
<th>Anti-Mold/Mildew</th>
<th>Humi-Guard</th>
<th>Sound Dots</th>
<th>Certified Low VOC Emissions</th>
<th>Dissectable Panels</th>
<th>Hard Scratches</th>
<th>30-Year Warranty</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Up to 0.75</td>
<td>TNA, TWH, Custom</td>
<td>A</td>
<td>1&quot;</td>
<td>1-1/2&quot;</td>
<td>2&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

DURABILITY

ACOUSTICAL INFORMATION

<table>
<thead>
<tr>
<th>Panel Thickness</th>
<th>Sound Absorption (Sabin/50)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1&quot;</td>
<td>0.40</td>
</tr>
<tr>
<td>1-1/2&quot;</td>
<td>0.50</td>
</tr>
<tr>
<td>2&quot;</td>
<td>0.60</td>
</tr>
</tbody>
</table>

Tectum® Blades and Baffles custom panels installed with custom steel mounting channel

PHYSICAL DATA

Material
FSC® Certified
Cementitious Wood Fiber; FSC® certified. For more information about FSC® certified fire-retardant products, or to view our FSC® certification letter, contact TechLine at 1 877 276-7876.
Surface Finish
Factory-applied latex paint with Silicate surface coating for abuse resistance. Natural is unpainted.
Fire Performance
Class A per IBC. Flame Spread Index 25 or less and Smoke Developed Index 50 or less when tested in accordance with ASTM E84.
CANDUCL S102 surface burning characteristics. Flame Spread Index of 25 or less and Smoke Developed Index of 50 or less.

VOC Emissions
GREENGUARD Gold Certified
Humidity/Sag Resistance
HumiGuard® Plus performance panels are recommended for areas subject to high humidity, up to, but not including, standing water and outdoor applications.

Anti-Mold/Mildew
Ceiling tiles with BioBlock® performance resist the growth of mold and mildew on the tile surface.

Installation Considerations
Use caution and wear appropriate hand, eye, and dust mask protection when cutting and installing Tectum® panels. All hanging components must be ordered separately.

Primary (Embodied) Energy
See all LCA information on our EPDs.

Application Considerations
Color variation among panels is common due to the natural characteristics of the wood on White and Natural panels.
Wood fibers may appear orange on Natural colored panels due to the characteristics of the wood.

Design Support
Project management assistance is available by calling TechLine at 1 877 276-7876.

Warranty
30-Year Warranty. Details at armstrongceilings.com/warranty

Weight
1" - 1.65 lbs/5F
1-1/2" - 2.53 lbs/5F
2" - 3.33 lbs/5F

LEED® is a registered trademark of the U.S. Green Building Council, Declare® and Living Building Challenge® (LBC) are registered trademarks of the International Living Future Institute®; WELL™ and Well Building Standard are trademarks of the International WELL Building Institute; FSC® is a registered trademark of FSC Forest Stewardship Council, A.C., licensed to the Forest Stewardship Council (US) Inc. All other trademarks and registered trademarks used herein are the property of Armstrong Licensing LLC and/or its affiliates   © 2021 Armstron Licensing LLC
Suspended box-shaped baffles hung in perfectly spaced rows create these high-performing baffles. The box shape feature not only looks more substantial, it also increases the NRC rating by capturing sound within. Select the same shaped baffles or mix them up for added dimension.
BOX BAFFLES SPECIFICATIONS

**DIMENSIONS**
- **RANDOM**: 39.4" x 94.5" x 8" [1000mm x 2400mm x 200mm]
- **MIXED**: 39.4" x 94.5" x 8" [1000mm x 2400mm x 200mm]
- **UNIFORMED LOW**: 39.4" x 94.5" x 2" [1000mm x 2400mm x 100mm]
- **UNIFORMED HIGH**: 39.4" x 94.5" x 8" [1000mm x 2400mm x 100mm]

**COLORS**
Available in all twenty Zintra 1/2" Sheet colors. See page 11.

**FINISHES**
- Square Tube 1" x 1" - Anodized black or anodized silver.

**NRC RATING**
0.95. See pages 8-9.

**NOTES**
- Only available in Zintra 1/2" Sheets.
- 5’ Adjustable cable kits included. Longer cables available for an additional fee.
- Multi-color and Digital Print available for an additional fee.
- For additional details and drawings request specification sheet from your distributor.
END OF SECTION 095113
SECTION 096513 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Thermoplastic-rubber base.
   2. Rubber molding accessories.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.
B. Samples: For each exposed product and for each color and texture specified.

1.3 ATTIC STOCK

A. Provide the Owner with 3% attic stock.

PART 2 - PRODUCTS

2.1 THERMOPLASTIC-RUBBER BASE

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Burke Flooring
   2. Roppe
   3. Johnsonite by Tarkett
   4. VPI Corp.
B. Product Standard: ASTM F1861, Type TP (rubber, thermoplastic).
C. Style: Cove
D. Thickness: 0.125 inch
E. Height: 4 inches, refer to Room Finish Schedule for locations.
F. Lengths: Coils in manufacturer’s standard length.
G. Outside Corners: Preformed.
H. Inside Corners: Job formed.
I. Colors: to be selected from manufacturer’s standard range.

2.2 RUBBER MOLDING ACCESSORY

A. Manufacturers: Subject to compliance with requirements, provide products by the following Basis of Design product or an architect-approved equal:
   1. Roppe 123 Charcoal
B. Description: Rubber reducer strips.
C. Profile and Dimensions:
   1. Reducer strip
   2. Dimension: 1/4” x 1 1/2” x full length of door or opening.
D. Locations: Provide transition strips where carpet abuts exposed concrete or terrazzo.
E. Colors: to be selected from manufacturer's standard range.

2.3 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based or blended hydraulic-cement-based formulation provided or approved by resilient-product manufacturer for applications indicated.
B. Adhesives: Water-resistant type recommended by resilient-product manufacturer for resilient products and substrate conditions indicated.

PART 3 - EXECUTION

3.1 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
B. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
C. Do not install resilient products until materials are the same temperature as space where they are to be installed.
D. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

3.2 RESILIENT BASE INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient base.
B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.
D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
E. Do not stretch resilient base during installation.
F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material. Do not install wall base on existing brick.
G. Preformed Corners: Install preformed corners before installing straight pieces.
H. Job-Formed Corners:
   1. Inside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches in length.
      a. Miter or cope corners to minimize open joints.

3.3 RESILIENT ACCESSORY INSTALLATION

A. Comply with manufacturer’s written instructions for installing resilient accessories.
B. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor
covering that would otherwise be exposed. Do not stretch accessory during installation.

3.4 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.
B. Cover resilient products subject to wear and foot traffic until Substantial Completion.

END OF SECTION 096513
SECTION 096813 - TILE CARPETING

PART 1 - GENERAL

1.1 SUMMARY
   A. Section Includes:
      1. Modular carpet tile.

1.2 PREINSTALLATION MEETINGS
   A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS
   A. Product Data: For each type of product.
      B. Samples: For each exposed product and for each color and texture required.

1.4 INFORMATIONAL SUBMITTALS
   A. Product test reports.
      B. Sample warranty.

1.5 CLOSEOUT SUBMITTALS
   A. Maintenance data.

1.6 QUALITY ASSURANCE
   A. Installer Qualifications: An experienced installer who is certified and approved by the carpet manufacturer.

1.7 ATTIC STOCK
   A. Provide 3% attic stock. Locate stock where directed by the Owner.

PART 2 - PRODUCTS

2.1 CARPET TILE (CPTI)
   A. Provide carpet from:
      1. Manufacturer: Mannington Commercial
         a. Style: Colorcast
b. Color: Port (14259)
c. Size: Modular 18 x 36 inches
d. Backing System: Infinity 2 Modular
e. Installation Method: Horizontal Brick Ashlar

2.2 INSTALLATION ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer.
B. Adhesives: Water-resistant, mildew-resistant, nonstaining, pressure-sensitive type to suit products and subfloor conditions indicated, that comply with flammability requirements for installed carpet tile, and are recommended by carpet tile manufacturer for releasable installation.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Concrete Slabs:
   a. Perform moisture tests recommended in writing by adhesive and carpet tile manufacturers. Proceed with installation only after substrates pass testing.

3.2 PREPARATION

A. General: Comply with the Carpet and Rug Institute’s CRI 104 and with carpet tile manufacturer’s written installation instructions for preparing substrates indicated to receive carpet tile.
B. Use trowelable leveling and patching compounds, according to manufacturer’s written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch (3 mm) wide or wider, and protrusions more than 1/32 inch (0.8 mm) unless more stringent requirements are required by manufacturer’s written instructions.
C. Concrete Substrates: Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by adhesive and carpet tile manufacturers.
D. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

3.3 INSTALLATION

A. General: Comply with the Carpet and Rug Institute’s CRI 104, Section 10, “Carpet Tile,” and with carpet tile manufacturer’s written installation instructions.
B. Installation Method: Glue down; install every tile with full-spread, releasable, pressure-sensitive adhesive
C. Maintain dye-lot integrity. Do not mix dye lots in same area.
D. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings.

E. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on carpet tile as marked on subfloor. Use nonpermanent, nonstaining marking device.

G. Install pattern parallel to walls and borders.

H. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

END OF SECTION 096813
SECTION 097200 - WALL COVERINGS

PART 1 - GENERAL

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

1.2 SUMMARY
   A. Section Includes:
      1. Vinyl wall covering.

1.3 PREINSTALLATION MEETINGS
   A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS
   A. Product Data: For each type of product.
      1. Include data on physical characteristics, durability, fade resistance, and fire-test-response characteristics.
   B. Shop Drawings: Show location and extent of each wall-covering type. Indicate pattern placement seams and termination points.
   C. Samples: For each type of wall covering and for each color, pattern, texture, and finish specified, full width by 36 inch long in size.
      a. Show complete pattern repeat.
      b. Mark top and face of fabric.

1.5 INFORMATIONAL SUBMITTALS
   A. Product Test Reports: For each wall covering, for tests performed by a qualified testing agency.

1.6 CLOSEOUT SUBMITTALS
   A. Maintenance Data: For wall coverings to include in maintenance manuals.
1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same production run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Wall-Covering Materials: For each type, color, texture, and finish, full width by length to equal to 5 percent of amount installed.

1.8 QUALITY ASSURANCE

A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and to set quality standards for installation.

1. Build mockups for each type of wall covering on each substrate required. Comply with requirements in ASTM F1141 for appearance shading characteristics.

2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install wall coverings until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work above ceilings is complete, and HVAC system is operating and maintaining ambient temperature and humidity conditions at levels intended for occupants after Project completion during the remainder of the construction period.

1. Wood-Veneer Wall Coverings: Condition spaces for not less than 48 hours before installation.

B. Lighting: Do not install wall covering until lighting that matches conditions intended for occupants after Project completion is provided on the surfaces to receive wall covering.

C. Ventilation: Provide continuous ventilation during installation and for not less than the time recommended by wall-covering manufacturer for full drying or curing.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: As determined by testing identical wall coverings applied with identical adhesives to substrates in accordance with test
method indicated below by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
   a. Flame-Spread Index: 25 or less.
   b. Smoke-Developed Index: 45 or less.

2.2 VINYL WALL COVERING

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

   1. MDC Interior Solutions
      a. Vycon Angles Max/ Y47607AM Charcoal (WC1)

B. Description: Provide vinyl products in rolls from same production run and complying with the following:

   1. Wallcovering Association’s W-101 for Type II, Medium Duty.
   2. ASTM F793/F793M for wall coverings.
      a. Category: II, Decorative with Medium Serviceability

C. Total Weight: 20 oz., excluding coatings.

D. Width: 52 inches.

E. Backing: Osnaburg fabric.

   1. Fiber Content: 10% recycled content (varied blend of pre-consumer and remanufactured materials)

F. Repeat: 24” Vertical, 52” horizontal/ Pattern Match Reversible pattern match

G. Mildew Resistance: Rating of zero or 1 when tested in accordance with ASTM G21.
PART 1 - GENERAL

1.1 SUMMARY

A. Section includes surface preparation and the application of paint systems on the following interior substrates:
   1. Concrete masonry units (CMU).
   2. Steel.
   3. Wood.

1.2 SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions.
B. Samples: For each type of paint system and in each color and gloss of topcoat.

1.3 MAINTENANCE MATERIALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Paint: 5 percent, but not less than 1 gal. (3.8 L) of each material and color applied.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide one of the products listed in other Part 2 articles for the paint category indicated.
B. Manufacturer’s Names: Shortened versions (shown in parentheses) of the following manufacturers’ names are used in other Part 2 articles:
   1. USED ON WALLS- (P1) Summit Gray SW7669/ Eggshell - Sherwin Williams
   2. USED ON WALLS- (P2) Coventry Gray HC-169/ Eggshell- Benjamin Moore & Co.
   3. USED ON INTERIOR DOORS - (P3) Nuthatch SW6088/ Satin- Sherwin Williams
   4. USED FOR ACCENTS - (P4) Teal 2055-10/ Eggshell -Benjamin Moore & Co.
   5. USED FOR ACCENTS - (P5) Powder Blue SW2863/ Eggshell - Sherwin Williams
   6. USED FOR ACCENTS- (P6) Nugget SW6697/ Eggshell - Sherwin Williams
   7. USED FOR ACCENTS- (P7) Adobe SW0040/ Eggshell - Sherwin Williams
   8. USED FOR ACCENTS- (P8) Indigo SW6531/ Eggshell - Sherwin Williams
   9. USED FOR ACCENTS, INTERIOR DOOR FRAMES, & CEILINGS - (P9) Graphite 1603 – Benjamin Moore
   10. USED FOR ACCENTS & CEILINGS – (P10) High Reflective White SW7757 – Sherwin Williams

2.2 PAINT, GENERAL

A. Material Compatibility:
1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.

2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

B. Colors: As selected by Architect from manufacturer’s full range.

2.3 BLOCK FILLERS

A. Block Filler, Latex, Interior/Exterior:
   1. Manufacturer: Benjamin Moore & Co.
   3. Equal products as manufactured by the following are also acceptable.
      a. PPG Architectural.
      b. Sherwin-Williams.

B. Block Filler, Epoxy, Interior/Exterior:
   1. Manufacturer: Benjamin Moore & Co./Coretech High Performance
   3. Equal products as manufactured by the following are also acceptable.
      a. AkzoNobel
      b. PPG Architectural
      c. Pratt & Lambert
      d. Sherwin-Williams

2.4 PRIMERS/SEALERS

A. Primer Sealer, Latex, Interior:
   1. Manufacturer: Benjamin Moore & Co.
   3. Equal products as manufactured by the following are also acceptable.
      a. PPG Architectural.
      b. Pratt & Lambert.
      c. Sherwin-Williams.

B. Primer Sealer, Alkyd, Interior:
   1. Manufacturer: Benjamin Moore & Co.
   2. Product: Fresh Start Multi-Purpose Oil Based Primer. No. 024.
   3. Equal products as manufactured by the following are also acceptable.
      a. PPG Architectural.
      b. Pratt & Lambert.
      c. Sherwin-Williams.

2.5 METAL PRIMERS

A. Primer, Alkyd, Anti-Corrosive, for Metal:
   1. Manufacturer: Benjamin Moore & Co.
   2. Product: Super Spec HP Alkyd Metal Primer No. P06.
   3. Equal products as manufactured by the following are also acceptable.
      a. PPG Architectural.
      b. Pratt & Lambert.
      c. Sherwin-Williams.
2.6 WATER-BASED PAINTS

A. Latex, Interior, Semi-Gloss:
   1. Manufacturer: Benjamin Moore & Co.
   3. Equal products as manufactured by the following are also acceptable.
      a. PPG Architectural.
      b. Pratt & Lambert.
      c. Sherwin-Williams.

B. Latex, Interior, Eggshell:
   1. Manufacturer: Benjamin Moore & Co.
   3. Equal products as manufactured by the following are also acceptable.
      a. PPG Architectural.
      b. Pratt & Lambert.
      c. Sherwin-Williams.

C. Water-Based Epoxy, Interior, Semi-Gloss:
   1. Manufacturer: Benjamin Moore & Co./Coretech High Performance.
   3. Equal products as manufactured by the following are also acceptable.
      a. AkzoNobel
      b. PPG Architectural.
      c. Pratt & Lambert.
      d. Sherwin-Williams.

2.7 SOLVENT-BASED PAINTS

A. Alkyd, Interior, Semi-Gloss:
   1. Manufacturer: Benjamin Moore & Co.
   3. Equal products as manufactured by the following are also acceptable.
      a. PPG Architectural.
      b. Pratt & Lambert.
      c. Sherwin-Williams.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
   1. Concrete: 12 percent.
   2. Masonry: 12 percent.
   3. Wood: 15 percent.
   4. Gypsum Board: 12 percent.

C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

D. Proceed with coating application only after unsatisfactory conditions have been corrected.
   1. Application of coating indicates acceptance of surfaces and conditions.
3.2 PREPARATION

A. Comply with manufacturer’s written instructions and recommendations.
B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
   1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
   1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

3.3 APPLICATION

A. Apply paints according to manufacturer’s written instructions.
B. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

3.4 CLEANING AND PROTECTION

A. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
B. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.5 INTERIOR PAINTING SCHEDULE

A. CMU Substrates:
   1. Latex System:
      a. Block Filler: Block filler, latex, interior/exterior.
   2. Water-Based Epoxy System:
      a. Block Filler: Block-filler, epoxy, interior/exterior.
      c. Topcoat: Water based epoxy, interior, semi-gloss.
B. Steel Substrates:
   1. Alkyd System (Use at all metal applications.):
      a. Prime Coat: Primer, alkyd, anti-corrosive, for metal.
C. Wood Substrates: Including wood trim and wood-based panel products.
   1. Latex over Alkyd Primer System:
D. Gypsum Board Substrates:
   1. Latex System (Use at all gypsum board applications except ceilings.):
2. Latex System (for ceilings):
   c. Topcoat: Latex, interior, eggshell.

E. Cementitious Wood Fiber Panels:
1. Latex System:
   c. Topcoat: Latex, interior, eggshell.

END OF SECTION 099123
SECTION 102113.17 - PHENOLIC-CORE TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Phenolic-core toilet compartments configured as toilet enclosures.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.
B. Shop Drawings: For toilet compartments. Include plans, elevations, sections, details, and attachment details.
C. Samples for each type of toilet compartment material indicated.

1.3 INFORMATIONAL SUBMITTALS

A. Product certificates.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance data.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
   1. Flame-Spread Index: 75 or less.
   2. Smoke-Developed Index: 450 or less.
B. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities and ICC A117.1 for toilet compartments designated as accessible.

2.2 PHENOLIC-CORE TOILET COMPARTMENTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Accurate Partitions Corporation.
3. Ampco, Inc.
5. Bradley Corporation; Mills Partitions.
6. Flush Metal Partition Corp.
8. Global Steel Products Corp.
9. Knickerbocker Partition Corporation
10. Metpar Corp.
12. Tex-Lam Manufacturing, Inc.
13. Weis-Robart Partitions, Inc.

B. Toilet-Enclosure Style: Overhead braced and floor anchored.

C. Door, Panel and Pilaster Construction: Solid phenolic-core panel material with melamine facing on both sides fused to substrate during panel manufacture (not separately laminated), and with eased and polished edges. Provide minimum 3/4-inch-(19-mm-) thick doors and pilasters and minimum 1/2-inch-(13-mm-) thick panels.

D. Pilaster Shoes and Sleeves Caps: Formed from stainless steel sheet, not less than 0.031-inch (0.79-mm) nominal thickness and 3 inches (76 mm) high, finished to match hardware.

E. Brackets (Fittings):
   1. Full-Height (Continuous) Type: Manufacturer’s standard design; aluminum.

F. Phenolic-Panel Finish:
   1. Facing Sheet Finish: One color and pattern in each room.
   2. Color and Pattern: As selected by Architect from manufacturer’s full range with manufacturer’s standard dark color core.
   3. Edge Color: Manufacturer’s standard.

2.3 HARDWARE AND ACCESSORIES

A. Hardware and Accessories: Manufacturer’s heavy-duty stainless steel operating hardware and accessories.
   1. Provide units that comply with regulatory requirements for accessibility at compartments designated as accessible.

B. Overhead Bracing: Manufacturer’s standard continuous, extruded-aluminum head rail with antigrip profile and in manufacturer’s standard finish.

C. Anchorages and Fasteners: Manufacturer’s standard exposed fasteners of stainless steel, finished to match the items they are securing, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use stainless steel, hot-dip galvanized-steel, or other rust-resistant, protective-coated steel compatible with related materials.

2.4 FABRICATION

A. Fabrication, General: Fabricate toilet compartment components to sizes indicated. Coordinate requirements and provide cutouts for through-partition toilet accessories where required for attachment of toilet accessories.
B. Overhead-Braced Units: Provide manufacturer’s standard corrosion-resistant supports, leveling mechanism, and anchors at pilasters to suit floor conditions. Provide shoes at pilasters to conceal supports and leveling mechanism.

C. Floor-Anchored Units: Provide manufacturer’s standard corrosion-resistant anchoring assemblies with leveling adjustment nuts at pilasters for structural connection to floor. Provide shoes at pilasters to conceal anchorage.

D. Door Size and Swings: Unless otherwise indicated, provide 24-inch- (610-mm-) wide in-swinging doors for standard toilet compartments and 36-inch- (914-mm-) wide out-swinging doors with a minimum 32-inch- (813-mm-) wide clear opening for compartments designated as accessible.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Comply with manufacturer’s written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer’s recommended anchoring devices.

1. Maximum Clearances:
   a. Pilasters and Panels: 1/2 inch (13 mm).
   b. Panels and Walls: 1 inch (25 mm).

2. Full-Height (Continuous) Brackets: Secure panels to walls and to pilasters with full-height brackets.
   a. Locate bracket fasteners so holes for wall anchors occur in masonry or tile joints.
   b. Align brackets at pilasters with brackets at walls.

3.2 ADJUSTING

A. Hardware Adjustment: Adjust and lubricate hardware according to hardware manufacturer’s written instructions for proper operation. Set hinges on in-swinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors to return doors to fully closed position.

END OF SECTION 102113.17
PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Public-use washroom accessories.
   2. Hand dryers.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

A. Sample warranties.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.5 WARRANTY

A. Manufacturer's Special Warranty for Mirrors: Manufacturer agrees to repair or replace mirrors that fail in materials or workmanship within specified warranty period.
   1. Warranty Period: 15 years from date of Substantial Completion.

B. Manufacturer's Special Warranty for Hand Dryers: Manufacturer agrees to repair or replace hand dryers that fail in materials or workmanship within specified warranty period.
   1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Structural Performance: Design accessories and fasteners to comply with the following requirements:
   1. Grab Bars: Installed units are able to resist 250 lbf concentrated load applied in any direction and at any point.
2.2 MANUFACTURERS

A. Basis-of-Design Products: The design for toilet and bath accessories described in Part 2 are based on products as manufactured by American Specialties, Inc. Subject to compliance with requirements, provide the named product or comparable product by one of the following:
   1. Toilet and Bath Accessories:
      a. A & J Washroom Accessories, Inc.
      b. Bobrick Washroom Equipment, Inc.
      c. Bradley Corporation.
      d. General Accessory Manufacturing Co. (GAMCO).
      e. Tubular Specialties Manufacturing, Inc.

2.3 MATERIALS

A. Stainless Steel: ASTM A 666, Type 304, No. 4 finish (satin), 0.0312-inch (0.8-mm) minimum nominal thickness, unless otherwise indicated.
B. Steel Sheet: ASTM A 366/A 366M, 0.0359-inch (0.9-mm) minimum nominal thickness.
C. Galvanized Steel Sheet: ASTM A 653/A 653M, G60 (Z180).
D. Chromium Plating: ASTM B 456, Service Condition Number SC 2 (moderate service).
G. Fasteners: Screws, bolts, and other devices of same material as accessory unit, tamper and theft resistant when exposed, and of galvanized steel when concealed.
H. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner’s representative.

2.4 PUBLIC-USE WASHROOM ACCESSORIES

A. Toilet Tissue (Roll) Dispenser.
   1. Owner furnished and installed.
B. Paper Towel (Folded) Dispenser
   1. Owner furnished and installed.
C. Liquid Soap Dispenser (at wall mounted lavatories):
   1. Owner furnished and installed.
D. Grab Bar:
   3. Material: Stainless steel, 0.05 inch (1.3 mm) thick.
      a. Finish: Smooth, No. 4 finish (satin) on ends and slip-resistant texture in grip area.
   4. Outside Diameter: 1-1/2 inches (38 mm).
   5. Configuration and Length: As indicated on Drawings.
E. Mirrors
   1. Frame: Stainless-steel angle, 0.05 inch (1.3 mm) thick.
      a. One-piece, galvanized steel, wall-hanger device with spring-action locking mechanism to hold mirror unit in position with no exposed screws or bolts.
b. Wall bracket of galvanized steel, equipped with concealed locking devices requiring a special tool to remove.
3. Size: As indicated on Drawings.

2.5 FABRICATION

A. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner’s representative.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install accessories according to manufacturers’ written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
1. Remove temporary labels and protective coatings.
B. Grab Bars: Install to comply with specified structural-performance requirements.

END OF SECTION 102800
SECTION 104413 - FIRE PROTECTION CABINETS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes fire-protection cabinets for portable fire extinguishers.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.
   B. Shop Drawings: For fire-protection cabinets.

1.3 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.4 COORDINATION

A. Coordinate size of fire-protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.
   B. Coordinate sizes and locations of fire-protection cabinets with wall depths.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Rated Fire-Protection Cabinets: Listed and labeled to comply with requirements in ASTM E 814 for fire-resistance rating of walls where they are installed.

2.2 FIRE-PROTECTION CABINET

A. Cabinet Type: Suitable for fire extinguisher.
   1. Products: Subject to compliance with requirements, provide one of the following:
      b. Kidde Residential and Commercial Division, Subsidiary of Kidde plc.
      c. Larsen’s Manufacturing Company.
      d. Modern Metal Products, Division of Technico Inc.
      e. Potter Roemer LLC.
   B. Cabinet Construction: Nonrated.
   C. Cabinet Material: Cold-rolled steel sheet.
   D. Recessed Cabinet:
      1. Exposed Flat Trim: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).
   E. Semi-Recessed Cabinet (used only where wall depth does not allow a fully recessed cabinet.
      1. Exposed Flat Trim: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).
      a. Rolled-Edge Trim: 2-1/2 inch backbend depth.
   F. Cabinet Trim Material: Steel sheet.
   G. Door Material: Steel sheet.
H. Door Style: Fully glazed panel with frame.
I. Door Glazing: Tempered float glass (clear).
J. Door Hardware: Manufacturer’s standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.
K. Materials:
   1. Cold-Rolled Steel: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.
      a. Finish: Baked enamel or powder coat.
      b. Color: As selected by Architect from full range of industry colors and color densities.
   2. Tempered Float Glass: ASTM C 1048, Kind FT, Condition A, Type I, Quality q3, 3 mm thick, Class 1 (clear).

2.3 ACCESSORIES

A. Mounting Brackets: Manufacturer’s standard steel, designed to secure extinguisher, of sizes required for types and capacities of extinguishers indicted, with plated or backed-enamel finish.
B. Identification: Provide lettering to comply with authorities having jurisdiction for letter style, color, size, spacing, and location. Locate as indicated by Architects.
   1. Identify fire extinguisher in cabinet with the words “FIRE EXTINGUISHER” applied to door.
      b. Lettering Color: Red.
      c. Orientation: Horizontal.

2.4 FABRICATION

A. Fire-Protection Cabinets: Provide manufacturer’s standard box (tub) with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Prepare recesses for recessed fire-protection cabinets as required by type and size of cabinet and trim style.
B. Install fire-protection cabinets in locations and at mounting heights indicated or, if not indicated, at heights acceptable to authorities having jurisdiction.
C. Fire-Protection Cabinets: Fasten cabinets to structure, square and plumb.
D. Adjust fire-protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.

END OF SECTION 104413
PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:
   1. Metal Lockers
   2. Locker Benches

1.2 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of locker and bench.
B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other Work.
   1. Show locker fillers, trim, base, sloping tops, and accessories. Include locker-numbering sequence.
   2. Indicate clear opening width and height for metal instrument lockers.
C. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available for units with factory-applied color finishes.
D. Samples for Verification: Manufacturer's painted finish samples on the same metal substrate to be used for the Work.
E. Maintenance Data: For adjusting, repairing, and replacing locker doors and latching mechanisms to include in maintenance manuals specified in Division 1.

1.3 QUALITY ASSURANCE

A. Source Limitations: Obtain locker units and accessories through one source from a single manufacturer.
B. Accessibility Requirements: Where accessible lockers are required, comply with the following:
   1. Single Tier: Provide 1 shelf located no higher than 48 inches (1219 mm) above the floor and 1 shelf located at bottom of locker no lower than 15 inches (381 mm) above the floor for forward or side reach.
   2. Double Tier: Only bottom locker to be designated accessible. Provide one shelf located no lower than 15 inches (381 mm) above the floor for forward or side reach.
   3. Provide hardware that does not require tight grasping, pinching, or twisting of the wrist, and that operates with a force of not more than 5 lbf (22.2 N), and located not more than 48” (1219mm) above finished floor.
   4. Provide accessibility label.
   5. Provide accessible locker benches in addition to standard benches where required.
   6. Refer to Drawings for locations of accessible lockers and benches.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver lockers until spaces to receive them are clean, dry, and ready for locker installation.
B. Protect lockers from damage during delivery, handling, storage, and installation.

1.5 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of metal lockers that fail in materials or workmanship, excluding finish, within specified warranty period.
   1. Warranty Period for Knocked-Down Lockers: Two years from date of Substantial Completion.
2.1 PERFORMANCE REQUIREMENTS

A. Accessibility Requirements: For lockers required to be accessible, comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board’s ADA-ABA Accessibility Guidelines, ICC A117.1 and the Michigan Building Code.

1. Provide the required quantities of accessible lockers to comply with guidelines and code requirements.
2. Final location of the accessible lockers will be as directed by the Architect.
3. Provide ADA compliant benches where shown on the drawings.

2.2 METAL LOCKERS

A. Basis of Design Manufacturer: Subject to compliance with specified requirements, provide metal lockers by Penco Products, Inc., or equivalent products by one of the following:

1. Manufacturers:
   a. ASI Storage Solutions; ASI Group
   b. General Storage Systems Ltd.
   c. Hadrian Manufacturing Inc.
   d. Lyon Workspace Products, LLC
   e. Republic Storage Systems, LLC

2.3 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 366/ASTM A1008, matte finish, suitable for exposed applications, and stretcher leveled or roller leveled to stretcher-leveled flatness.

B. Galvanized Steel Sheet: ASTM A 653/ASTM A879, commercial quality, G60 (90G90G) coating designation; mill phosphatized; suitable for exposed applications, and stretcher leveled or roller leveled to stretcher-leveled flatness.

C. Fasteners: Zinc- or nickel-plated steel, slotless-type exposed bolt heads, and self-locking nuts or lock washers for nuts on moving parts.

2.4 LOCKER TYPE ‘A’ -

A. Basis of Design Product: Penco Vanguard.

1. Single Tier
2. 15”w x 18” d.
3. 60”h.

B. Body: Form backs, tops, bottoms, sides, and intermediate partitions from steel sheet; flanged for double thickness at back vertical corners. Comply with the following:

2. Side-Material Sheet Thickness: 0.0239 inch (24 gage).
3. Exposed Ends: Form exposed ends of nonrecessed lockers from minimum 0.0598 inch (16 gage) thick steel sheet.
4. Bottoms: 0.0598 inch (16 gage).
5. Provide Legs with base cover

C. Frames: Form channel frames from minimum 0.0598-inch (16 gage) thick steel sheet; lapped and welded at corners. Form continuous integral door strike on vertical frame members. Provide resilient bumpers to cushion door closing.

1. Latch Hooks: Form from minimum 0.1046-inch (12 gage) thick steel; welded or riveted
to door frames.

2. Cross Frames: Form intermediate channel cross frames between tiers from minimum 0.0598-inch-thick steel sheet. Weld to vertical frame members.

D. Doors: One-piece steel sheet, formed into channel shape at vertical edges and flanged at right angles at top and bottom edges. Fabricate to prevent springing when opening or closing, and to swing 180 degrees. Comply with the following:
   1. Sheet Thickness: 0.0598 inch (16 gage) minimum.
   2. Reinforcement: Brace or reinforce inner face of doors more than 15 inches wide.
   3. Ventilation: Manufacturer’s standard arrangement of stamped horizontal louvers on door face.
   6. Provide holes for attachment of number plates.

E. Shelves: Provide top shelf fabricated from minimum 0.0239-inch (24 gage) thick, formed steel sheet; flanged on all edges.

F. Hinges: Steel, full loop, five or seven knuckle; tight pin; minimum 2 inches high. Weld to inside of door frame and attach to door with at least two factory-installed fasteners that are completely concealed and tamper resistant when door is closed.
   1. Provide three hinges for each door.

G. Recessed Handle and Latch: Manufacturer’s standard housing, formed from 0.0359-inch (20 gage) thick nickel-plated steel or stainless steel, with integral door pull, recessed for latch lifter and locking devices; nonprotruding latch lifter; and automatic, prelocking, pry-resistant latch, as follows:
   1. Provide three-point latching for each door.
      a. Provide strike and eye for padlock.

H. Interior Equipment: Furnish each locker with the following items, unless otherwise indicated:
   1. Hooks: Manufacturer’s standard zinc-plated, ball-pointed steel. Provide one double-prong ceiling hook, and not fewer than two single-prong wall hooks. Attach hooks with at least two fasteners.
   I. Fabricate lockers to receive the following locking devices, installed on lockers using security-type fasteners:
      1. Combination Padlocks: Key-controlled, three-number dialing combination locks; capable of five combination changes.

2.7 FABRICATION - GENERAL

A. Unit Principle: Fabricate each locker with an individual door and frame, individual top, bottom, back, and shelves, and common intermediate uprights separating compartments.

B. Fabricate lockers square, rigid, and without warp, with metal faces flat and free of dents or distortion. Make exposed metal edges free of sharp edges and burrs, and safe to touch.
   1. Form locker-body panels, doors, shelves and accessories from one-piece steel sheet, unless otherwise indicated.

C. Continuously Sloping Tops: Fabricate with Manufacturer’s standard sloping tops, fabricated from minimum 0.0598-inch (16 gage) thick steel sheet, for installation over lockers with separate flat tops. Fabricate tops in lengths as long as practicable, without visible fasteners at splice locations, finished to match lockers. Provide fasteners, filler plates, supports, and closures, as follows:
   2. Sloped top corner fillers, mitered.

D. Recess Trim: Manufacturer’s standard; fabricated from minimum 0.0478-inch (18 gage) thick steel sheet, minimum 2-1/2-inch face width, and finished to match lockers. Fabricate trim in lengths as long as practicable.

E. Filler Panels: Manufacturer’s standard; fabricated from minimum 0.0359-inch (20 gage) thick steel sheet in an unequal leg angle shape, and finished to match lockers. Provide slip joint
filler angle formed to receive filler panel. Provide filler panels at all gaps or openings between lockers and adjacent locker banks or walls.

F. Number Plates: Manufacturer’s standard etched, embossed, or stamped, aluminum number plates with numerals at least 3/8 inch high. Attach plates to each locker door, near top, centered, with at least two aluminum rivets.
1. Numbering Sequence to be provided by Architect.

2.8 FINISHES, GENERAL

A. Finish all steel surfaces and accessories, except prefinished stainless-steel and chrome-plated surfaces.
B. Comply with NAAMM’s "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
D. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.9 STEEL SHEET FINISHES

A. Surface Preparation: Clean surfaces of dirt, oil, grease, mill scale, rust, and other contaminants that could impair paint bond. Use manufacturer’s standard methods.
B. Enamel Finish: Immediately after cleaning and pretreating, apply manufacturer’s standard powder coat or baked-enamel finish. Comply with paint manufacturer’s written instructions for applying and baking to achieve a minimum dry film thickness of 1.4 mils on doors and frames, and 1.1 mils elsewhere.
1. Color: As selected by Architect from Manufacturer’s full range.

2.10 LOCKER BENCHES

A. Bench Tops: Manufacturer’s standard one-piece units, with rounded corners and edges.
1. Size: Minimum 9-1/2 inches wide by 1-1/4 inches thick (241 mm wide by 32 mm thick)
   except provide 24-inch- (610-mm-) wide tops where accessible benches are indicated.
2. Laminated clear hardwood with one coat of clear sealer on all surfaces and one coat of clear lacquer on top and sides.
3. Provide back support on all accessible benches.
B. Fixed-Bench Pedestals: Manufacturer’s standard supports, with predrilled fastener holes for attaching bench top and anchoring to floor, complete with fasteners and anchors appropriate for substrate indicated.
1. Stainless Steel: ASTM A 666, Type 304.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine locker bases for suitable conditions where metal lockers are to be installed.
1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION
SECTION 22 05 00
PLUMBING REQUIREMENTS

PART 1 GENERAL

1.1 RELATED SPECIFICATIONS AND DOCUMENTS

A. Drawings and related specifications for this project including General and Supplementary Conditions, Division 1, General Requirements, Instructions to Bidders, Addenda’s, etc. apply to and are considered a part of Division 22 - Mechanical Work.

B. Information in this division is intended to clarify or make additions to the requirements set forth in the General Conditions, Supplementary Conditions, and Division I of these specifications. Any conflict between this Division 22 and other sections or divisions of the specifications or drawings shall be brought to the attention of the Architect/Engineer in writing as a request for addendum prior to the bid opening.

C. Furnish all equipment, materials, articles, items, operations or methods listed, mentioned or scheduled on drawings, these specifications, manufacturer's installation instructions and include all labor, materials, equipment and incidentals necessary for their complete installation and operation.

D. All information contained in this section applies to all sections within Division 22 as if it was part of each section.

1.2 DRAWINGS AND SPECIFICATIONS

A. The drawings and these specifications are intended to supplement each other and any material or labor called for in one shall be furnished even if not specifically mentioned in both. Any material or labor which is neither shown on the drawings nor listed in this specification, but is normally incurred or required for completion of work shall be furnished. If there is a discrepancy between the drawings and specifications, the more stringent of the two shall be followed.

B. Drawings are diagrammatic and are intended to show approximate location and general arrangement of systems and equipment. No attempt has been made to show every ell, tee, etc. Drawings shall not be scaled for location of systems, equipment, etc. All dimensions whether given on drawings or scaled shall be verified in field and coordinated with all other trades and existing field conditions. Some plumbing, piping, equipment, etc. locations may require changes in location due to field conditions and coordination with other trades will be made with no additional cost to the Owner. Failure to check will be no reason for additional compensation.

C. These drawings and the associated specifications are intended to provide complete furnishing, installation and operational plumbing systems as specified under Division 22 and as called for on the drawings. If these drawings and associated specifications have information omitted that would not allow a completely operational system as is the intent of the Engineer, the bidder shall notify the Engineer a minimum one week prior to the bid date to allow for addenda. Once bids have been received, the Contractor shall be responsible for material, labor, etc., to furnish and install a completely operational plumbing system as is the intent of these drawings and associated specification.

D. The installation of all systems, equipment, etc., is subject to clarification with submitted shop drawings and field coordination requirements. Equipment outlines
shown on drawings or dimensioned on drawings are limiting dimensions. Any equipment that reduces the indicated clearances or exceeds specified or scheduled equipment dimensions shall not be used.

E. The Architect/Engineer and Owner reserve the right to make minor changes in the location of equipment, piping, ductwork, etc. at the time of rough-in without additional cost to the Owner.

F. The Mechanical Trades Contractor shall have completed for his portion of work, at least one installation of size and type comparable to this project and has been in satisfactory operation for at least two complete years. The Mechanical Trades Contractor shall also have a developed service department capable of negotiating service contracts with the Owner for systems herein specified.

1.3 AUTOCAD BACKGROUND FILES

A. The Contractor shall include in their bid any cost for requesting AutoCAD backgrounds for their use from the Architect or Engineer. The cost will be $150.00 for the first plan, and $50.00 for each additional plan that may be requested for AutoCAD use. A waiver of responsibility for the Architect and Engineer related to Contractor use of the CAD files shall be signed by the Contractor.

1.4 MANUFACTURER’S SPECIFICATIONS AND CAPACITIES

A. Some equipment, plumbing fixtures, materials, etc. that are scheduled on the drawings or listed in any addenda may not be specified in this specification. The manufacturer’s specification and capacities shall be considered included and part of this specification whether it is specified in this specification or noted or scheduled on the drawings. The contractor shall remove and replace any “substituted” equipment or material, which has been installed or is on site, which in the opinion of the Architect/Engineer does not meet the scheduled equipment or materials, manufacturer’s capacities or specification at no additional cost to the Owner.

1.5 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspace, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in pipe shafts.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

F. The following are industry abbreviations for plastic materials:
   2. CPVC: Chlorinated polyvinyl chloride plastic.
3. PE: Polyethylene plastic.
4. PVC: Polyvinyl chloride plastic.

G. The following are industry abbreviations for rubber materials:
   1. EPDM: Ethylene-propylene-diene terpolymer rubber.
   2. NBR: Acrylonitrile-butadiene rubber.

1.6 LOCAL CONDITIONS

A. Before submitting proposals, each contractor shall examine these specifications and associated drawings, addenda, etc. and shall examine the site of the project. The bidder shall fully investigate the site of this project, investigate coordination of his work with all other trades and existing conditions and completely satisfy himself as to the conditions to which the work is to be performed before submitting his/her bid. No allowances or considerations will be given at a later date for alleged misunderstanding as to the requirements of the work, materials to be furnished, or conditions required by the nature of this project site and coordination by the neglect on the bidder’s part to make such an examination and coordination.

B. Drawings show approximate location of existing services. The mechanical and electrical trades shall check with local utility companies or municipal agencies for exact location of services which they expect to encounter. The Mechanical Trades Contractor shall be responsible for hiring a company such as “Miss Dig” to stake out and locate all utilities in areas of excavation before commencing any work. The Mechanical Trades Contractor shall verify all elevations and locations of existing underground lines which are to be connected into or routed over or under. This verification shall be done prior to beginning work at this project.

1.7 QUALITY ASSURANCE

A. All work shall be performed in accordance with all local and state codes, laws and regulations applicable to the work for this project. The contractor shall be responsible for all permits and costs for inspections, etc., and for checking with each utility company supplying service to this project and shall determine from them all, any changes in boxes, meters, valves, service, etc., and shall include all cost for inspections, revisions to services, etc. in his bid as required by local agencies, utilities, etc. No extra payment will be made for such items after the contractor submits his bid.

B. In addition to all applicable Federal, State and local codes, the standards and codes listed below shall apply to all mechanical work. The reference to codes and standards shall be referenced to the latest edition or revision.

1. American Gas Association (AGA)
2. American National Standard Institute (ANSI)
3. American Society of Mechanical Engineers (ASME)
4. American Society for Testing materials (ASTM)
5. American Water Works Association (AWWA)
6. American Welding Society
7. ANSI code of Pressure Piping and Unified Pressure Vessels
8. Cast Iron Soil Pipe Institute
9. National Electrical Manufacturer’s Association (NEMA)
10. Standards of the Hydraulic Institute
11. Underwriters’ Laboratories (UL)
12. Williams-Steiger Occupational Safety & Health Act (OSHA)
C. In the event of conflict between drawings, codes, standards or specifications, the most stringent requirement shall apply

1.8 SUBMITTALS AND SHOP DRAWINGS

A. Submit electronic sets of complete shop drawings for all plumbing equipment and materials associated with Division 22 and associated drawings to the Architect/Engineer for review before fabrication of work or ordering of equipment. Shop drawings shall be submitted at the earliest possible time.

B. Shop drawings shall be first reviewed by the contractor. Inaccurate shop drawings shall be corrected by the contractor to meet specifications and schedules for this project. The contractor shall then initial the shop drawings as having been reviewed before submitting to the Architect/Engineer. Shop drawings shall have, in addition to the mechanical information, the electrical requirements for minimum circuit amperes and maximum fuse size ratings of the equipment.

C. Drawings which are rejected must be corrected and returned for Architect/Engineer review before ordering.

D. Furnish to the job site copies or prints of shop drawings that have been reviewed by the Engineer as soon as possible.

E. Include a copy of each shop drawing in the Operation and Maintenance Manual.

F. The checking and reviewing of shop drawings by the Architect/Engineer shall be construed as assisting the contractor and the Architect/Engineer’s action does not relieve the contractor from the responsibility for errors or omissions which may exist thereon. The contractor shall be held responsible for errors or omissions that are discovered after approval process and must be made good by the contractor.

1.9 PERMITS, INSPECTIONS AND TESTS

A. The Mechanical Trades Contractor shall take out all permits and arrange for necessary inspections and shall pay all assessments, fees and costs, etc., and make all tests as required by applicable codes. At the completion of the project, the Mechanical Trades Contractor shall furnish certificates of inspection and approval and secure final occupancy permit. Record copies shall be included in the Operation and Maintenance manuals.

1.10 RECORD DRAWINGS

A. Maintain an up-to-date set of “record” drawings showing actual equipment, plumbing piping, etc. installation locations. Exact dimensions from column lines for all concealed work and tie-ins with elevations noted shall be included.

B. Include a set of reproducible drawings and a set of prints in each Operation and Maintenance Manual.

C. The Engineer reserves the right to request and be furnished any additional information he deems necessary to be shown on the record drawings.

1.11 OWNER’S INSTRUCTIONS
A. Upon completion of the project, the contractor shall be responsible for instructing the Owner’s operating staff, in the presence of the Architect/Engineer’s representative, in the proper operation and maintenance of the mechanical systems and equipment. Include a statement signed by the Owner that instructions have been given for proper operation and maintenance of the mechanical systems and equipment.

1.12 GUARANTEES

A. Furnish a written guarantee, to the Architect/Engineer, that will make the contractor responsible at his own expense for any imperfections in material and/or workmanship which may develop under ordinary use within a period of one (1) year from final Owner’s acceptance of the work.

B. Furnish all written guarantees from equipment and/or material manufacturers which shall include the operating and performance conditions and capabilities upon which they are based.

1.13 PORTABLE AND DETACHABLE PARTS

A. Retain all portable and detachable parts of installation such as keys, spare accessories, operating manuals, etc. include in the Operation and Maintenance Manual.

1.14 OPERATION AND MAINTENANCE MANUALS

A. Furnish to the Architect/Engineer two (2) copies of an approved bound (3 ring binder) book with tabs for sections covering each item of equipment. These notebooks shall include shop drawings, maintenance manuals, operating manuals and parts lists to instruct the Owner on proper operation and use as well as maintenance for each piece of equipment. These books shall also include contractors’, subcontractors’ and manufacturers’ names, telephone numbers and addresses.

B. The manuals must be approved by the Architect/Engineer before final payment to the contractor. The Engineer reserves the right to request and be furnished any additional information that he deems necessary to be included in the manuals.

1.15 RESPONSIBILITIES FOR USE OF SUBSTITUTE MATERIALS

A. Contractor shall notify Architect/Engineer in writing at least ten (10) calendar days before bids are due for approval to use materials and/or equipment other than that which has been specified or scheduled. If substitute materials and/or equipment are approved and used, it will be this contractor’s responsibility to guarantee that the items will function as the specified equipment or materials, will in no way alter the design of the structure or system, and will not require any additional mechanical work such as piping, plumbing, etc. Any additional cost required by substitute materials will be the responsibility of the contractor.

B. It will be the contractor’s responsibility, at his own expense, to remove or replace any non-approved equipment or material or any approved equipment or materials not originally specified or scheduled if equipment and materials do not meet with the satisfaction of the Architect/Engineer.

C. It shall be the Contractor’s (Mechanical Trades) responsibility to coordinate and pay for any Electrical Contractor costs due to any changes in substitute materials and/or equipment’s power requirements, which differ from that shown on the design documents.
D. No consideration will be given to requests for substitute materials because of delivery problems unless the contractor can prove that orders were placed as soon as possible after contract was awarded and that delays were not caused by submittal of unscheduled or unspecified (substituted) materials to the Architect/Engineer.

1.16 COST BREAKDOWN AND EQUIPMENT LIST

A. The successful bidder shall be responsible for submitting a cost breakdown to the Architect/Engineer and Owner within ten (10) calendar days after date of request of the breakdown. During progress of the work, if changes occur which cause additional cost, the price on such items shall be broken down in accordance with the items listed in the breakdown.

B. The bidders shall be responsible for submitting a complete list of all equipment manufacturers, makes, models, etc. that will be used for this project with their proposal. The equipment list shall be typed on the contractor's letterhead and shall be signed by the authorized officer.

1.17 MATERIALS AND EQUIPMENT

A. Materials and equipment furnished under this project shall have a minimum warrantee of one (1) year. All materials and equipment shall be new, of first class quality and shall be furnished, delivered, erected, installed and finished in every detail and shall be so selected and arranged as to fit into the building space. All material or equipment that is not specified but necessary for this project shall be subject to the approval of the Architect/Engineer.

C. Any materials or equipment not specified or scheduled but similar to that which has had prior approval shall be listed as a substitution and noted on the proposal form as such.

D. The contractor shall include all miscellaneous materials and labor required to completely install and operate the plumbing systems as is intended by these drawings and specification.

1.18 SCHEDULE, COORDINATION AND INSTALLATION OF WORK

A. The contractor shall carry on work in such a manner as to meet the dates as scheduled by the General Contractor and shall work overtime at no expense to the Owner as required to comply with the schedule. This contractor shall schedule all work with Owner and Architect/Engineer and schedule shut down of systems with Owner.

B. Examine the site and all drawings and specifications and coordinate work with all other trades before commencing work for this project. Arrange work essentially as shown with the exact layout to be made on the job to suit actual conditions. Precise locations of equipment and materials shall be coordinated and shall be the responsibility of this contractor. Should any conflicts in location occur, and necessary deviations from drawings are required as determined by the Architect/Engineer, the contractor shall make necessary adjustments without additional cost to the Owner.

C. All equipment, plumbing piping, etc. shall be located and/or routed to allow for the most convenient access for servicing.
D. Arrange for necessary access doors, panels, etc. to allow servicing of equipment, piping, valves, etc. Perform any cutting and patching as required, made necessary by failure to make proper arrangements.

E. Indicated equipment connections, sizes and locations shall be verified and connected according to manufacturer's shop drawings and installation instructions. Thoroughly investigate the space provided for equipment and connections before ordering equipment. All equipment shall be selected to fit into the space allowed, including connections with adequate space allowed for operation and maintenance.

F. All work shall be installed in a neat and workmanlike manner, using skilled personnel thoroughly qualified in the trade or duties that they are to perform. Rough work will be rejected.

G. Coordinate all equipment deliveries and schedules to allow timely installation. Contractor shall separate equipment into sections and reassemble in building if required by the installation at no extra cost to the Owner.

H. Furnish a superintendent approved by the Architect/Engineer to oversee and coordinate the work to be performed with all other trades.

I. Coordinate location of pipes, plumbing, etc. with other building components such as structural components (beams, joists, columns, etc.), electrical components (lighting, conduits, etc.) and architectural components (walls, ceilings, floors, pipe chases, roof, etc.).

J. Before starting work, Contractor shall verify that available space for proposed pipes, equipment etc. is adequate for the intended purpose and will result in a first class installation. Regardless of drawings, responsibility for first class operating systems rests with the Contractor.

K. Arrange for chases, slots, openings, etc. and other building components to allow for plumbing systems installation. Coordinate cutting and patching of these components to accommodate installation. This contractor shall be responsible for accurately locating for the general trades all chases, shafts, etc. and shall be responsible for all cutting and patching if these chases were not accurate or not coordinated in time with the general trades. Coordinate installation of all sleeves in walls, floors or other structural or architectural components.

L. Sequence, coordinate and integrate installation of equipment and materials for efficient work flow during the project. Particular attention should be spent on larger pieces of equipment.

M. Install equipment and materials with provisions for necessary access for service and maintenance. Allow space for removal of all parts that may require replacement or servicing.

N. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

O. Coordinate requirements for access panels and doors for mechanical items requiring access that are concealed behind finished surfaces. When access panels are required, valves and equipment components requiring access shall be located to minimize the number of panels.
P. Examine the work as it progresses and alert the Architect/Engineer in writing of any instances or obstructions that will prevent this contractor from performing his/her work.

Q. The Mechanical Trade shall be responsible for all coordination of all site utilities, the gas company, etc. including coordination of all new and existing natural gas loads.

1.19 DELIVERY, STORAGE, AND HANDLING
A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.20 COOPERATION WITH ARCHITECT/ENGINEER AND OTHERS
A. Coordinate all aspects of the plumbing system installation with all other trades, existing conditions, etc.

B. If the bidder believes that changes in design are required to meet intended design capacities and operation or material and/or equipment is obviously omitted from these specifications and drawings, the bidder shall contact the Architect/Engineer in writing at least ten (10) days before bid date. The acceptance of a bid by the Owner shall be binding and shall indicate that the bidder does not require any changes in design nor additional costs in order to meet the design and performance of the mechanical system as indicated in these specifications and drawings.

1.21 WORK INVOLVING OTHER TRADES
A. Equipment or materials specified in Division 22 may have to be installed by other trades (such as electrical trades or architectural trades) due to code requirements or union jurisdictional requirements. Where this occurs, this contractor shall include all costs required by other trades to complete the work and hire the respective trade to perform this work.

1.22 PERFORMANCE DATA AND ACCESSIBILITY
A. All performance data specified in this specification or scheduled on drawings shall be considered actual performance of the equipment after installation. The supplier and installer shall be responsible for suitable allowances to adjust equipment to design capacities when actual operating and installation conditions differ from drawings.

B. All equipment and materials shall be installed to allow access for servicing and maintenance. Coordinate final location of such equipment and materials that are concealed with required access doors on panels. Allow ample space for replacement or servicing.

1.23 CUTTING AND PATCHING
A. Unless noted otherwise, the Mechanical Trades shall be responsible for all cutting, patching and associated work required under Division 22. This work shall be performed by trades normally performing this type of work except drilling of holes shall be done by the contractor requiring same. This includes replacing areas of cutting required by
this work with proper reinforcing, termite shielding, materials, finishing, etc. to restore the areas to their original condition, and filling all openings around ducts, piping, etc. with approved fire retardant materials. Regardless, all drilling of holes shall be the responsibility of the Contractor requiring same.

B. If noted on drawings that the General Trades will be responsible for all cutting and patching, it will be the Mechanical Trades responsibility to notify all General Trades during bidding of all areas requiring cutting and patching. Regardless, all drilling of holes shall be the responsibility of the contractor requiring same.

1.24 WORK IN EXISTING BUILDINGS

A. Coordinate and schedule all work in existing building with Owner and Architect/Engineer. Systems shall be kept in operation at all times if at all possible. If a system shut-down is required, the contractor shall schedule with the Owner, the time and length of shut-down. A system shall not be shut down without written permission from the Owner.

B. All existing equipment, plumbing, piping, etc. that is to be removed shall remain the property of the Owner. The contractor shall remove and locate this material that remains the property of the Owner to a location determined by the Owner somewhere on site. If the Owner does not want to maintain possession of the removed material, the contractor shall be responsible for removing material from the site and disposing of this material as necessary to meet all codes and requirements and shall pay all costs as required for any disposal fees, inspections, permits, etc.

C. All existing piping, equipment, etc. whether shown on drawings or not that is to be removed and/or abandoned and does not remain property of the Owner shall be removed from site.

D. Any existing plumbing, piping, valves, mechanical equipment, etc. serving the existing building which are shown or not shown on drawings and are required for systems operation shall remain in use. If these systems require relocation to allow installation of new systems, the contractor shall be responsible for relocating to an Owner and Architect/Engineer approved location. The contractor shall pay all cost for this work and include such cost in his/her bid. (As specified previously, contractor shall be responsible for examining site and include all cost for work required to complete this project.)

E. When active services, etc. are encountered in this project, the contractor shall furnish and install bracing, support, etc. as required to protect and keep these services active. (As specified previously, these drawings are diagrammatical. The contractor shall be responsible for verification of all existing services, piping, equipment, etc.).

1.25 ACCESS TO EQUIPMENT, VALVES, ETC.

A. Coordinate access panels with type of construction and furnish access panels in areas that are non-accessible. Access panels shall be furnished by this contractor and installed by the General Contractor. The access panels shall be all approved, UL labeled and fired rated and shall be located and sized to allow access to equipment, valves, etc.

B. Where access panels are required, valves, equipment etc. shall be located as to require the least number of access panels.
1.26 EQUIPMENT CONNECTIONS
A. Connections to equipment, plumbing fixtures, etc. shall be made in accordance with shop drawings, rough-in dimensions furnished by the manufacturer, codes, etc. and may vary with connections shown on drawings. The contractor shall be responsible for making connections and number of connectors as per shop drawings, codes, etc. at no additional cost to the Owner.

1.27 ELECTRICAL CONNECTIONS
A. The Electrical Trades shall be responsible for furnishing and installing all electrical equipment, wiring, etc. required for operation of mechanical equipment unless otherwise noted on the drawings. The Mechanical Trades shall furnish detailed information and wiring diagrams to the Electrical Trades for all equipment specified and/or scheduled for this project. In the event that the Mechanical Trades furnishes an “approved equal” or “alternate” that require changes in the original electrical design, the Mechanical Trades shall pay all costs to the Electrical Trades as required to make satisfactory adjustments. All electrical work shall be done in accordance with the latest edition of the National Electric Code.

1.28 MOTORS, MOTOR STARTERS AND DISCONNECTS
A. Unless otherwise noted on drawings, motors shall be of constant speed 1750 rpm, new NEMA Design B, 40°C rise, horse power rated, open drip-proof except TEFC in dirty atmosphere, induction type motor with service factor of 1.15 and be of sufficient capacity to continuously operate the apparatus to which it is connected under all conditions of operation without exceeding nameplate ratings.
B. Motors shall be premium efficiency as calculated using IEEE test method 112B.
C. Motors ½ Hp. or larger shall be three phase; motors under ½ Hp. shall be 115 volt, 60 cycle, single phase. Before ordering the motors, the contractor shall verify correct motor voltage with the Electrical Trades and field conditions.
D. The Mechanical Trades shall furnish, for equipment under Division 22, all special switches, disconnects, starters, alternators, etc. as specified or scheduled to be factory furnished and/or factory installed with the equipment including wiring diagrams, etc. whether it is to be factory installed or field wired. All other motor starters, disconnects, etc. not noted as factory furnished shall be furnished and installed by the Electrical Trades.
E. Starters that are to be factory furnished with equipment shall be of the combination type and shall be as specified under Electrical Trades Division. Furnish overload protection for each phase.
F. All wiring methods and materials shall meet NEMA, National Electric Code and State of Michigan Code requirements.
G. All displays on control panels shall be on face of the panels.

1.29 EXCAVATION AND BACKFILLING
A. Furnish all excavation, backfilling and removal of excess dirt to accomplish installation of Division 22 mechanical work unless otherwise noted on drawings.
B. All excavation shall be by open cut from the surface. Contractor shall determine whether excavation shall be by machine or by hand except where existing utilities may be located where excavation shall be by hand. Contractor shall be responsible for all damage to existing facilities and services. Excavation shall be to a depth of at least 6" to allow granular bedding below pipe or duct.

C. If for any reason the work is suspended, the contractor shall properly protect the excavation and leave the areas unobstructed.

D. Trench width shall allow sufficient width at centerline of pipe to allow at all times a first class construction/installation method but in no case should be less than 12" larger than the nominal pipe or duct size. This shall especially be true in areas that joints must be connected. Joint holes may have to be made with overhanging sides to make installation safe for workmen.

E. The excavation shall be at all times finished and backfilled to the required grade after completion and approval of work. Not more than 100 feet of trench shall be excavated and open unless written approval is given by the Architect/Engineer.

F. The subgrade shall be 4" to 6" below the pipe of granular bedding graded and tamped by hand or mechanical means to the exact elevation required at the bottom of the pipe. Granular materials shall be approved fine aggregate meeting MDOT #2NS specifications. This material shall pass a ½" sieve but will be retained on a #4 sieve. If poor soil conditions exist which will not give proper support to the pipe, duct or structure, furnish granular fill as required to remedy this situation and give proper support.

G. Furnish and install properly sloped sheet piled, shored and braced in areas that the soil requires this to maintain a proper excavation and prevent any movement of earth which could in any way damage the work under construction. When removing the sheeting and bracing, special care should be taken to prevent any caving of the sides of the excavation and injury to the completed work or adjacent property.

H. Take all necessary action to keep trenches and other excavation areas free from water at all times. Use such methods as pumping, ditching, well pointing, etc. to prevent water in trench or excavation. Dewatering of trench shall have constant supervision.

I. Backfill excavation and trenches with approved granular material around sides of pipe and at least 12 inches above the top of the pipe laid not more than in 6 inch layers that are thoroughly tamped to 95% of its maximum density. There shall be no backfilling by any mechanical means until the granular material has been firmly tamped around the entire pipe to 12 inches above the pipe. All material used for backfilling shall be approved by the Architect/Engineer. Wherever trenching crosses walks or roadways or isolated inside of building, backfill top 6'-0" of trench with sand or bank run gravel in layers not to exceed 6 inches in depth and carefully compact by hand or machine. Do not backfill with frozen materials.

J. No piping shall be covered until it has been tested, inspected and approved. Upon completion of backfilling, grade shall be restored in indicated elevation and left in reasonable condition for finish grade by others unless otherwise noted on drawings.

K. Before final acceptance of work, all disturbed streets, drives, curbs, walks, parking areas, etc. shall be paved, graveled or other to as near their original condition as possible. All unused excavated material shall be removed from site if directed by the Architect/Engineer.

1.30 BASES AND SUPPORTS
A. This contractor shall be responsible for furnishing all equipment pads and supports for equipment and materials required by Division 22 unless otherwise noted on drawings.

B. All floor mounted mechanical equipment shall have a reinforced concrete pad furnished unless otherwise noted on drawings. The concrete pads shall be tied to the building floor with expansion bolts located maximum of 4'-0" on centers with a minimum of four (4) bolts, set before pouring and concealed within the pad. The Mechanical Trades shall verify exact pad or support size with the equipment manufacturer and shall size pad with adequate area to allow sufficient room for equipment mounting hardware, etc. Concrete pads shall have a 45 degree bevel at the top edge. The contractor shall verify exact location of concrete pads.

C. Furnish all steel, hanging material, rods, etc. for suspending equipment off floor unless otherwise noted on drawings for equipment to be furnished under Division 22. This includes all structural steel for supporting between beams.

D. All support structure shall be of strength to safely withstand all stresses and loads to which they will be subjected and shall distribute load properly over the building area. Supports shall be designed to avoid undue strain to equipment and to avoid interference with piping, pipe connections, service and maintenance clearances, etc.

E. Where equipment is to be floor mounted and requires legs, this contractor shall furnish and install structural steel members or steel pipe and fittings for legs. Fasten and brace to equipment and furnish flange at base to allow bolting to floor.

F. Where equipment is to be ceiling or wall mounted, furnish necessary platform, structural steel, hardware, etc. as is most suitable for support of this equipment.

G. All supports shall be approved by the Architect/Engineer.

H. All piping, plumbing, etc. shall be suspended from structural steel members utilizing rods and approved hanger devices. Do not use metal deck for support. Beam clamps such as the Grinnell Fig. 260 or approved equal shall be used. Sheet metal “straps” shall not be used in place of rods.

I. The mechanical trades shall be responsible for furnishing and setting in place all plumbing equipment, plumbing, and piping roof curbs. The general trade shall be responsible for the roof work and associated flashing. The mechanical trade shall furnish and install treated wood base blocking as required to level curb and to match roof insulation thickness. Curb shall be as specified, or if not specified should be similar to Pate or Thy-curb with heavy gauge galvanized steel, insulated and with wood nailer. Height of curb scheduled or specified shall be height required to top of curb above finished roof. If height is not specified or noted, a minimum 12” high above finished roof will be required. (pipe support units shall be at height required).

1.31 SLEEVES, PLATES AND COLLARS

A. Furnish all sleeves, plates and collars for plumbing piping, etc. passing through walls, floor ceilings, foundations, etc. Coordinate with the General Contractor the exact location and size of required openings. No pipe shall pass through a wall, floor ceiling, etc. without a sleeve. This contractor shall be responsible for sleeve locations and securing sleeves before concrete is formed.

B. Sleeves for steel pipe shall be standard weight black steel pipe. For walls, foundations and ceilings, sleeve shall be kept flush with finished surfaces. For floors, the sleeve
shall be set flush with bottom of concrete construction and be extended up ¼" above concrete floor. Sleeves shall be set in place before construction of walls, floors, ceilings, etc.

C. Sleeves for copper pipe shall be type "M" hard copper tubing installed typical to that of steel pipe sleeves.

D. Sleeves for piping shall be sized to allow insulation to run continuous through sleeve whenever possible and to allow not less than ¼” all around bare pipe or insulation.

E. Where insulated piping passes through walls or floor sleeves, furnish 22 gauge galvanized band around insulation of same length as the sleeve length. Band shall fit snugly over insulation and be held in place by steel metal collars all around insulation to cover openings.

F. All penetration voids shall be sealed smoke tight with non-combustible materials similar to 3M or Hilti firestop systems to maintain the integrity of the fire rated structure. In a non-rated assembly, seal all voids with non-hardening sealant.

G. Where bare piping 2" and smaller pass through wall or floors, furnish polished chrome plated brass escutcheons, split type. Bare piping 2½" and larger that pass through walls or floor, furnish 22 gauge galvanized steel metal collars so as to cover opening.

H. Where piping penetrates an outside wall, below grade, utilize a mechanical sleeve, similar to Link-Seal, with stainless steel nuts and bolts on fasteners.

1.32 RIGGING AND HOISTING

A. Perform all required rigging, hoisting, transportation, moving, etc. of all equipment, materials, etc. to be furnished and/or installed under Division 22 whether furnished by this contractor or by the Owner or other trades.

1.33 STORAGE FACILITY

A. Furnish and maintain a weatherproof storage facility on the site of adequate size to store miscellaneous equipment and/or materials to prevent exposure to the weather. Location of shed shall be determined by the Owner and Architect/Engineer. The Owner reserves the right to deny storage of materials or equipment in any existing or new buildings.

1.34 PROTECTION FROM DAMAGE

A. The contractor shall be responsible for all materials, equipment, etc. and all work installed by himself and shall protect it from damage until final acceptance of this project by the Owner.

B. Furnish all coverings and protection from dirt, dust, rain, storm, heat, traffic, wear, etc. and all possible injury including that by other workmen. Any equipment, workmanship, materials, etc. damaged prior to final acceptance by the Owner of this project shall be properly repaired at no expense to the Owner.

C. Protect all plumbing fixtures and other equipment from damage by covering or coating. Any dented, scratched, rusted or marred surface finishes will not be accepted.
D. Protect all equipment, materials, etc. from freezing.

1.35 COMMON PIPE MATERIALS AND INSTALLATION INSTRUCTIONS

A. Refer to individual Division 22 piping Sections for pipe, tube, and fitting materials and joining methods.

B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

C. Refer to individual Division 22 piping Sections for special joining materials not listed below.

1. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
   a. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch (3.2-mm) maximum thickness unless thickness or specific material is indicated.
      1) Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
      2) Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
   b. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.

2. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

3. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.


5. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAg1, silver alloy for refrigerant piping, unless otherwise indicated.

6. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

7. Solvent Cements for Joining Plastic Piping:
   a. ABS Piping: ASTM D 2235.
   b. CPVC Piping: ASTM F 493.
   c. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.
   d. PVC to ABS Piping Transition: ASTM D 3138.

8. Fiberglass Pipe Adhesive: As furnished or recommended by pipe manufacturer.

1.36 PIPE HANGERS AND SUPPORTS

A. Hangers and saddles shall be Modern Pipe Support Corp., Grinnel/Anvil, Autogrip, or M-CO. Inserts shall be of the type to receive a machine bolt head or nut after installation, permit horizontal adjustment, and shall be flush with the surface. For copper pipe with steel hangers, clean and wrap pipe with two layers of plastic insulating tape at point of contact. Roller supports shall be adjustable type with
insulated standoff. Rods shall be used for suspended installation. Sheet metal “straps” shall not be used in place of rods.

B. Hangers for piping with vapor barrier sealed insulation shall be multipurpose pipe saddles fitting over the insulation. Wire or perforated strap iron will not be permitted for pipe supports. Do not support hangers from roof deck. Furnish and install all support steel as required to suspend from structural steel joist or beams. Hangers shall be clevis or split ring type with vertical adjustment and beam clamp similar to Grinnell/Anvil Fig. 260, with maximum spacing per ASHRAE Standards:

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<th>Pipe Size</th>
<th>Steel Pipe</th>
<th>Copper Pipe</th>
<th>PVC Pipe</th>
<th>Rod Size</th>
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C. Conform to ASME B31.9, ASTM F708, MSS SP58, MSS SP69 and MSS SP89.

D. Hangers for Pipe Sizes ½ to 1½ Inch: Malleable iron, adjustable swivel, split ring.

E. Hangers for Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.


G. Hangers for Hot Pipe Sizes 5 Inches and Over: Adjustable steel yoke, cast iron roll, double hanger.

H. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.

I. Wall Support for Pipe Sizes up thru 3 Inches: Cast iron hook.

J. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.

K. Vertical Support: Steel riser unistrut clamps at high, mid, and low locations.

L. Floor Support for Cold Pipe all sizes and Hot Pipe Sizes up thru 4 Inches: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

M. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

N. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.
O. Inserts: Malleable iron case of steel shell and expander plug for threaded connection with lateral adjustments, top slot for reinforcing rods, lugs for attaching to forms, size inserts to suit threaded hanger rods.

1.37 PLUMBING, PIPING, AND EQUIPMENT SUPPORT

A. Attachments of mechanical equipment to structural members are the responsibility of the installing trade. Structural members shall not be field cut, welded or otherwise modified without approval of the Architect/Engineer. Attachment to steel joist shall be made at panel points. When routing piping or ductwork perpendicular to joist, a support shall be provided at every steel joist; when parallel to joist, a support shall be provided at no more than 6’ on centers or two panel bays. Structural members shall not be overloaded as a result of attachments. Attachment/equipment loading for all trades resulting in total load greater than an equivalent uniform 5 psf for any member shall be submitted to the Architect/Engineer for review. Mechanical Trades may contact the project Structural Engineer as required for panel point location assistance and welder certification requirements. Electrical Trades are still responsible for design, layout, and fabrication and installation of electrical supports and support attachment methods. Mechanical Trades shall submit attachment methods to the Structural Engineer for review.

B. Install products in accordance with manufacturer’s instructions.

C. Do not fasten supports to pipes, ducts, mechanical equipment, and conduit.

D. Do not use spring steel clips and clamps.

E. Do not use powder-actuated anchors.

F. Do not drill or cut structural members without permission from Architect/Engineer.

G. Fabricate supports from structural steel or steel channel. Rigidly weld members or use hexagon head bolts to present neat appearance with adequate strength and rigidity. Use spring lock washers under all nuts.

1.38 PIPING SYSTEMS SHUT OFF VALVES

A. Shut off valves shall be installed at all branch lines off main piping, or where mains divide/separate to serve different areas, to allow isolation of all branch piping and systems they serve such as toilet rooms, areas or wings of the building, etc.

1.39 CLEANING AND FINISHING

A. During construction period, remove all debris, rubbish, tools, equipment, unused materials, etc. as required or requested by the Architect/Engineer. All cost for cleanup and removal will be the responsibility of the contractor.

B. Upon completion of the project and before final acceptance by the Owner, the entire installation shall be thoroughly cleaned, all rubbish and unused material removed to the satisfaction of the Architect/Engineer. All dust and dirt shall be removed from all equipment, piping, ductwork, etc.

C. Thoroughly clean all floor drains, cleanouts, and plumbing fixtures. Clean all trays and strainers.
D. Finish paint all equipment, materials, piping, etc. as noted on drawings or listed in this specification. Match Owner’s existing color scheme. Any Division 22 equipment which has been scratched or damaged shall be finished equal to the original finish.

1.40 EQUIPMENT/SYSTEMS START-UP

A. Furnish and schedule manufacturer’s start-up service for all equipment and systems. These start-up services shall be performed in the presence of, and to the satisfaction of the Owner and Architect/Engineer.

1.41 EQUIPMENT/SYSTEMS SIGN-OFF

A. The Mechanical Trades shall furnish written sign-offs on all systems stating that the equipment and systems have been checked, tested, started and that their operation has been verified correct through the entire range of operation that can be expected through the seasons.

1.42 SUBSTANTIAL COMPLETION

A. Contractor shall submit a letter to the Architect/Engineer advising that all work has been completed in accordance with plans and specifications and the project is ready for a final walk-thru.

END OF SECTION

MAI: 2021-1520
SECTION 22 05 10
PLUMBING SYSTEMS TESTING, CLEANING, WATER TREATMENT & STARTUP

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Testing of piping systems.
B. Cleaning of piping systems.
C. Chemical treatment.
D. Substantial completion check list and sign-off forms.

1.2 RELATED SECTIONS

A. All drawings and specification sections apply to work in this section. Furnish all items, articles, materials, equipment, operations or methods that are mentioned, listed or scheduled on drawings or are in this specification including all labor, equipment, materials and miscellaneous incidentals necessary and/or required for the completion of this project. The work covered under this section of the specifications is in no way complete within itself, but is supplementary to the entire specification and drawings.

1.3 SCOPE OF WORK

A. The work covered by this specification consists of furnishing all labor, equipment, material, chemicals or methods that are mentioned, listed or scheduled on drawings or are in this specification. This includes all labor, equipment, materials and miscellaneous incidentals necessary and/or required for the cleaning, flushing, testing and chemical treatment of the piping systems for this project. The work covered under this section of the specification is in no way complete within itself, but is supplementary to the entire specification and drawings.

B. The substantial completion forms shall be required to be signed and submitted to the Architect/Engineer for approval prior to any insulation of piping systems or installation of ceiling tiles. The person that signs the substantial completion forms shall witness the testing, flushing and chemical treatment of the systems. The signature person’s company shall be responsible for all cost incurred with future work by the Architect/Engineer or Owner due to inadequate testing, cleaning, operation or chemical treatment of the piping systems.

1.4 SUBMITTALS

A. Submit electronic copies of the completed and signed substantial completion forms included in this section. Submit to the Architect/Engineer as system flushing, testing, and chemical treatment occurs. The Mechanical Trade shall maintain one set of substantial completion forms and submit them to the Architect/Engineer prior to the Architect/Engineer final project walk-through.

B. Submit electronic copies of all equipment, chemicals and product data being furnished to this project for approval.
C. Submit electronic copies of manufacturer’s installation instructions, including placement of equipment in systems, piping configuration, and connection requirements.

D. Submit certificate of compliance from authority having jurisdiction, indicating approval of systems that require review by local and state authorities.

1.5 PROJECT RECORD DOCUMENTS

A. Record actual installation locations of piping and equipment including sampling points and location of chemical injectors.

1.6 REGULATORY REQUIREMENTS

A. Conform to applicable code for addition of non-potable chemicals to building mechanical systems, and for public sewage systems.

B. Products requiring electrical connection and listed and classified by UL as suitable for the purpose specified and indicated.

1.7 MAINTENANCE SERVICE

A. Furnish service and maintenance of treatment systems and system water for one year from date of substantial completion.

B. Provide monthly technical service visits to perform field inspections and make water analysis on site. Detail findings in writing on proper practices, chemical treating requirements, and corrective actions needed. Submit two copies of field service report to Owner after each visit.

C. Provide laboratory and technical assistance services during this maintenance period.

D. Provide training course for Owner’s personnel, instructing them on installation, care, maintenance, testing, and operation of the water treatment systems. Arrange course at startup of systems.

E. Provide on-site inspections of equipment during scheduled or emergency shutdown to properly evaluate success of water treatment program, and make recommendations in writing based on these inspections.

1.8 MAINTENANCE MATERIALS

A. Provide sufficient chemicals for treatment and testing during warranty period.

PART 2 PRODUCTS

2.1 WATER METER

A. Displacement type cold water meter with sealed, tamper-proof magnetic drive, impulse contact register, single pole, double throw dry contact switch.

PART 3 - EXECUTION

3.1 SANITARY AND STORM PIPING SYSTEMS
A. Testing
1. Conduct a water, air or peppermint test on the entire system in accordance with the State Plumbing Code. Test underground sanitary, storm and vent piping with at least a 10 foot head of water.

3.2 DOMESTIC COLD WATER, HOT WATER & HOT WATER RETURN PIPING SYSTEMS

A. Testing
1. Before any fixtures are connected, hydrostatically test piping system at 1.5 times the maximum system pressure, but not less than 100 psig in excess of working pressure for (4) hours. This pressure to be on piping only, not equipment.

B. Cleaning, flushing and disinfection.
1. All domestic water piping and equipment shall be completely flushed out and disinfected before placing system in service. Disinfection procedure and results shall be in accordance with all applicable codes and State Department of Public Health. (Piping shall be flushed until water is clear).
2. Ensure pH of water to be used as treatment is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or Acid (hydrochloric).
3. Inject disinfectant, free chlorine in liquid, powder, tablet or gas form, throughout system to obtain 50 to 80 mg/L (50 ppm) minimum residual.
4. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.
5. Maintain disinfectant in system for 2 hours.
6. If final disinfectant residual tests less than 25 mg/L, repeat test.
7. Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L or 0.5 ppm maximum.
8. Take samples no sooner than 24 hours after flushing, from 10 percent of outlets and water entry, and analyze in accordance with AWWA-C51.
9. Verify that all tests and results are in accordance with local and state health codes and regulations.

3.3 NATURAL GAS PIPING SYSTEMS

A. The natural gas piping systems shall be tested based on recommendations by the gas company.

3.4 SYSTEM COMPLETION CHECKLIST

A. The checklist which follows this specification section is to be considered part of the specifications.

B. The checklist is to be completed by the Installing Contractor and the prime Mechanical Contractor for each item as directed.

END OF SECTION

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By signing this form, the Contractor is certifying that he has personally witnessed completion of that item, and it is complete and complies with all respects to the drawings and specifications. All items are to be signed off on and submitted to MacMillan Associates Inc. before a final project walk-thru by the Engineer is requested. If the Engineer discovers items incomplete and/or not in accordance with this checklist, the drawings, or the specifications, the Contractor will be backcharged for the Engineer’s time and expenses.

SC-3
PART 1 GENERAL

1.1 SECTION INCLUDES

A. Nameplates.
B. Tags.
C. Stencils.
D. Pipe Markers.

1.2 REFERENCES: Material and/or equipment specified in this section shall meet or exceed one or more of the property requirements or installation requirements of the following specifications/publications as applicable to the specific product or end use:

A. ANSI or equal standards for the Identification of Piping Systems.

1.3 SUBMITTALS

A. Submit list of working, symbols, letter size, and color coding for mechanical identification.
B. Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer’s name and model number.
C. Product Data: Provide manufacturers catalog literature for each product required.
D. Manufacturer’s Installation Instructions: Indicate special procedures, and installation.

PART 2 PRODUCTS

2.1 NAMEPLATES

A. Description: Laminated three-layer plastic with engraved black letters on light contrasting background color. Furnish and install on all mechanical equipment.

2.2 TAGS

A. Metal Tags: Brass with stamped letters; tag size minimum 1½ inch diameter with smooth edges.
B. Chart: Typewritten letter size list in anodized aluminum frame.

2.3 STENCILS

A. Stencils: With clean cut symbols and letters of following size:
   1. ¾ to 1¼ inch Outside Diameter of Insulation or Pipe: 8 inch long color field, ½ inch high letters.
   2. 1½ to 2 inch Outside Diameter of Insulation or Pipe: 8 inch long color field, ¾ inch high letters.
3. 2½ to 6 inch Outside Diameter of Insulation or Pipe: 12 inch long color field, 1¼ inch high letters.
4. 8 to 10 inch Outside Diameter of Insulation or Pipe: 24 inch long color field, 2½ inch high letters.

B. Stencil Paint shall be semi-gloss enamel, colors conforming to ASME A13.1.

2.4 PIPE MARKERS

A. Color: Match existing or conform to ANSI/OSHA standards.

B. 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.

C. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

2.5 CEILING TACKS

A. Description: Steel with ¾ inch diameter color coded head.

B. Color code as follows:
   1. Green - Plumbing valves

PART 3 EXECUTION

3.1 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

B. Prepare surfaces as required by manufacturer's installations for stencil painting.

3.2 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.

D. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.

E. Identify each piece of equipment with plastic nameplates. Small devices, such as in-line pumps, may be identified with tags.

F. Identify valves in main and branch piping with tags.

G. Identify piping, concealed or exposed, with plastic tape pipe markers or stenciled painting. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 10 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.

H. Provide ceiling tacks to locate valves above T-bar type panel ceilings. Locate in corner of panel closest to equipment.

END OF SECTION

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PART 1 GENERAL

1.1 SECTION INCLUDES

A. General information for piping systems, plumbing fixtures, backflow preventers, water heaters, etc., and general installation information.

1.2 FIELD MEASUREMENTS

A. Field verify all equipment and fixture locations.

B. Confirm that mill work is constructed with adequate provisions for the installation of countertop plumbing fixtures.

C. Confirm all mounting heights and locations of plumbing fixtures to meet all barrier free and American Disabilities Act codes and regulations.

1.3 EQUIPMENT, FIXTURE & MISCELLANEOUS SPECIFICATIONS

A. All equipment, plumbing fixtures, specialties, etc. that have been scheduled on drawings shall have the manufacturer's specification automatically included as part of this specification. All "approved substitute" or "voluntary alternate" equipment fixtures, etc. shall meet the capacities, quality, etc. of the scheduled items specification and capacities.

PART 2 PRODUCTS

2.1 PIPE AND PIPE FITTINGS

A. See Section 22 10 00 for Plumbing Piping.

2.2 MATERIALS AND FINISH

A. Fixtures shall be of best quality vitreous china, acid resisting enameled cast iron or stainless steel, free from discoloration, chips, dents, warps, flaws, cracks, scratches, etc. or other blemishes. All vitreous china and enamel shall be white unless otherwise noted. Fixtures shall have manufacturer’s guarantee label or trademark indicating first quality.

B. All exposed pipe, fittings, traps, wastes, faucets, valves, handles, escutcheons, bolts, screws and accessories shall be polished chrome plated brass unless noted otherwise. Exposed traps shall be chrome plated brass, adjustable with cleanout plug and escutcheon.

2.3 PLUMBING FIXTURES - GENERAL

A. Furnish all fixtures as shown and scheduled on drawings.

B. Unless noted as "no substitutions", similar fixtures by the following manufacturers with equal or better qualities will be accepted as equal for:
1. Drainage Specialties - Josam, Sioux Chief, Smith, Wade, Watts, Zurn
4. Flush Valves - Delany, Delta, Sloan (Royal), Zurn, American Standard.
6. Toilet Seats - Bemis, Centoco, Church, Olsonite, Kohler.
7. Mixing Valves and Accessories - Powers, Symmons, Watts, Zurn, Reliance, Conbraco Appollo.
   a. See 2.22 (this section) for emergency showers and eyewash stations.

C. Provide all chair carriers, mounting hardware, etc. as required by the plumbing fixtures and wall construction. Where fixtures are located on walls, furnish and install suitable steel shapes well anchored in place and supported from floor as necessary to support fixtures. Each fixture shall be supported solidly and shall be sufficiently strong to withstand severe usage.

D. Where plumbing fixtures occur in walls with pipe spaces in back of same, the supports for fixtures shall consist of chair carriers built into the wall with bolt projecting through face of wall for attachments of fixture brackets.

2.4 BACKFLOW PREVENTER
A. Furnish and install type and quantity as shown on drawings or required by code. The Mechanical Trades shall furnish certification of all backflow preventers.

B. Reduced Pressure Backflow Preventers: ANSI/ASSE 1013 and AWWA C506; bronze body with bronze and plastic internal parts and stainless steel springs; two independently operating, spring loaded check valves; diaphragm type differential pressure relief valve located between check valves; third check valve which opens under back pressure in case of diaphragm failure; non-threaded vent outlet; assembled with two gate valves, strainer and four test cocks.

C. Double Check Valve Assemblies: ANSI/ASSE 1012 and AWWA C506; Bronze body with corrosion resistant internal parts and stainless steel springs; two independently operating check valves with intermediate atmospheric vent.

2.5 WATER HAMMER ARRESTORS
A. Furnish and install on systems as required by local and state plumbing codes, latest edition.

B. ANSI A112.26.1; sized in accordance with PDI WH-201, precharged suitable for operation in temperature range -100 to 300 degrees F and maximum 250 psig working pressure.
2.6 DOMESTIC WATER HEATER

A. Refer to drawings and furnish all.

PART 3 EXECUTION

3.1 PREPARATION

A. Coordinate cutting and forming of roof and floor construction to receive drains to required invert and rim elevations.

B. Coordinate all rough-in and/or final connections to equipment and plumbing fixtures. Plumbing fixtures shall be located as required to meet all barrier free and American Disabilities Act codes and regulations.

C. Coordinate all piping invert elevations, location, routing, etc. to allow proper drainage from all plumbing fixtures to sewer mains. Verify all services existing and new for elevations, locations, etc. before commencing installation.

3.2 FIXTURE CONNECTIONS

A. In general, unless otherwise noted on the drawings, the sizes of all the branch connections to fixtures shall be no smaller than those listed in the following schedule and as required by local and state plumbing codes, latest edition:

<table>
<thead>
<tr>
<th>Fixture</th>
<th>Waste</th>
<th>Vent</th>
<th>C.W.</th>
<th>H.W.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lavatory</td>
<td>1½”</td>
<td>1¼”</td>
<td>½”</td>
<td>½”</td>
</tr>
<tr>
<td>Sinks (General)</td>
<td>1½”</td>
<td>1½”</td>
<td>½”</td>
<td>½”</td>
</tr>
<tr>
<td>Janitor’s Service Sink</td>
<td>3”</td>
<td>2”</td>
<td>½”</td>
<td>½”</td>
</tr>
<tr>
<td>Water Closet-Flush Valve</td>
<td>4”</td>
<td>2”</td>
<td>1¼”</td>
<td>---</td>
</tr>
<tr>
<td>Urinal-Flush Valve</td>
<td>2”</td>
<td>2”</td>
<td>1”</td>
<td>---</td>
</tr>
<tr>
<td>Wall Hydrants (Hose Bibb)</td>
<td>---</td>
<td>---</td>
<td>¾”</td>
<td>---</td>
</tr>
<tr>
<td>Drinking Fountain</td>
<td>1½”</td>
<td>1½”</td>
<td>½”</td>
<td>---</td>
</tr>
<tr>
<td>Showers</td>
<td>2”</td>
<td>2”</td>
<td>¾”</td>
<td>¾”</td>
</tr>
</tbody>
</table>

3.3 INSTALLATION

A. Plumbing fixtures and trim shall be protected against damage during construction. Fixtures damaged during this period shall be replaced.

B. All valves, waste and water supply piping servicing fixtures exposed beyond face of finished walls shall be brass, nickel, and chromium plated. Where fixtures are mounted in countertops and cabinet work concealing valves and piping, chrome plated brass finishes are not required.

C. All fixtures shall be independently valved with either integral stops or brass stops.

D. Waste connections to floor or wall outlet fixtures shall be gas and water-tight; fastened with an approved setting compound, gasket or washer. Rubber gaskets or putty are not acceptable. The fixture shall be set the proper distance from the wall or floor.

E. Where flush valves are specified with fixtures, supply to valve in each room shall be set at same height for that type of fixture, and valve shall be set in place so that center
line of valve discharge is directly above center line of fixture spud. Bending of nipple between valve and spud to achieve connection will not be permitted.

F. All brackets, cleats, plates, anchors, etc. required to support fixtures or piping rigidly in place shall be provided as work of this section and shall be installed behind finished walls.

G. Provide and install basic fixtures from one major fixture manufacturer. Also, accessories such as faucets, strainers, stops, traps, etc. shall be manufactured by one major company where possible.

H. All fixtures shall be set rigid, tight, plumb, level and true to assure rigidity and permanence. Provide chair carriers as manufactured by Wade, Josam, Zurn, or J.R. Smith for wall mounted fixtures. Carriers for wall mounted lavatories, drinking fountains, water coolers, and urinals shall have dual foot supports, tubular uprights, adjustable headers, alignment trusses, and all necessary accessories. Lavatory carriers shall be with concealed arms. Urinal carriers shall be with bearing plate. Water cooler and drinking fountain carriers shall be as required for proper support.

I. All wall mounted fixtures shall be tested by bearing the weight of 500 pounds without sagging or pulling away from the wall. Damage resulting from this test shall be made good by this contractor. All other piping and fixtures shall be secured to walls with wall plates, wall hangers and approved expansion shields and bolts.

J. Connections between earthenware fixtures and soil pipe flanges shall be made gas and water tight with closet setting compound or approved Neoprene gaskets, without use of putty. Hold down bolts shall be brass, not less than ¼” in diameter, and shall be equipped with nuts and washers.

K. Provide each fixture with an approved compression service stop. Exposed stops shall be either loose key or screwdriver type.

L. Caulk joint between wall and fixture at wall mounted lavatories, water closets, urinals, drinking fountains and service sinks with Silicone Sealant, white.

M. Conductors:
   1. All inside conductors, except as otherwise specified, shall be caulked water tight and supported so as to provide for contraction, expansion and settlement of the building.

   2. All connections between outlet at roof drains and conductors shall be made and caulked watertight. Install all inside conductors and cooperate with the roofing contractor to properly install connections to the roof drains.

N. Cleanouts:
   1. All soil, waste and drain pipes shall have cleanout at foot of stacks, outside near wall where line leaves building, at every change in the direction of run, at upper end of all horizontal runs, at intervals of not more than 100’-0” in straight runs of sanitary sewers and as required by code. All outlets shall be accessible so that drain line may be readily cleaned with a snake or other rodding tool. Extend cleanouts to finished floor or finished wall.

O. Floor Drains
1. Floor drain pans shall be furnished and installed for all floor drains (except when floor drain is located in floors on fill) and be made of lead sheets weighting 4 lbs. per square foot or of an approved material, extending a minimum of 12” beyond lip of the flashing ring with outer edges turned up. All floor drains, floor sinks, etc. shall have deep traps installed.

2. All fixtures shall be trapped if required by local or state plumbing codes.

3. All trap seals that are subject to loss by evaporation shall have a trap seal primer valve installed as required by Local or State Plumbing Codes. A trap seal primer valve shall conform to ASSE 1018 or ASSE 1044.

P. Flashings: Vent pipe flashings shall be by roofing contractor. Provide lead sleeves for vents.

Q. Roof Drains: Furnish roof drains as scheduled on drawings, and all other accessories as required for installation and as recommended by the drain manufacturer. The General Contractor will be responsible for roof openings, roof opening supports and flashings.

R. Roof drain pans shall be furnished and installed for each roof drain and overflow roof drain. Pans shall be pre-cut 30”x30” and shall be recessed 1½” deep. Deliver pan to general contractor for installation by roof deck trades.

S. Pipe relief from backflow preventer to nearest drain.

T. Install water hammer arrestors as required by Code, complete with means for access if so required by the Plumbing Inspector.

U. Cold water supply branch to each toilet room shall be provided with shock absorbers designed and sized as recommended by the manufacturer to eliminate water hammer.

V. All exposed supplies and valves in finished areas shall be brass chrome plated. Supply lines to all hanging fixtures shall be from the wall, unless otherwise noted on drawings.

W. Install shutoff valves on all branches. All water supplies to fixtures shall have valve on supply line to the fixture.

X. All plumbing fixtures shall be installed, vented, piped, trapped, etc. in accordance with all codes and regulations pertaining to this project’s location.

Y. Provide access to all thermostatic mixing valves and trap primer valves. If necessary, provide flush mounted stainless steel valve box with hinged cover and key lock.

Z. All fixtures supplied for bathing shall be supplied with a temperature control valve that conforms to ASSE 1016. All fixtures for hand washing shall be supplied with a temperature control valve that conforms to ASSE 1070.

END OF SECTION

MAI: 2020-1566
SECTION 22 07 00
PLUMBING PIPE INSULATION

PART 1 GENERAL

1.1 SECTION INCLUDES PIPE INSULATION FOR:

A. Domestic water piping system including cold water, hot water and hot water return.
B. Horizontal rain water conductors.
C. Horizontal and vertical overflow rain water conductors.
D. Underside of roof drains.
E. Valves and fittings.
F. Miscellaneous.

1.2 REFERENCES

A. Thermal insulation materials shall meet the property requirements of the following specifications as applicable to the specific product or end use:

B. American Society for Testing of Materials Specifications:

2. ASTM C533, "Standard Specification for Calcium Silicate Pipe & Block Insulation"
3. ASTM C585, "Recommended Practice for Inner and Outer Diameters of Rigid Pipe Insulation for Nominal Sizes of Pipe and Tubing (NPS System)"
4. ASTM C1136, "Standard Specification for Barrier Material, Vapor," Type 1 or 2 (jacket only)

C. Insulation materials, including all water and vapor barrier materials, closures, hangers, supports, fitting covers, and other accessories, shall be furnished and installed in strict accordance with project drawings, plans, and specifications.

1.3 SCOPE

A. The work covered by this specification consists of furnishing all labor, equipment, materials and accessories, and performing all operations required, for the correct fabrication and installation of thermal insulation applied to the following commercial piping systems, in accordance with the applicable project specifications and drawings, subject to the terms and conditions of the contract:

1. Hot Piping – Piping system with fluids 105°F and higher.
2. Cold Piping – Piping systems with fluids below 105°F. (Includes storm water systems)

B. Insulation, vapor barriers, jacketing, hangers, supports, accessory materials, etc. shall be installed according to manufacturers recommendations.
1.4 DEFINITIONS

A. The term "mineral fiber" as defined by the above specifications includes fibers manufactured of glass, rock, or slag processed from a molten state, with or without binder.

1.5 SYSTEM PERFORMANCE

A. Insulation material furnished and installed hereunder shall meet the minimum thickness requirements of Standard 90.1 (2007), "Energy Efficient Design of new Buildings" of the American Society of Heating, Refrigeration, and Air-Conditioning Engineers (ASHRAE) except minimum thickness shall be 1". However, if other factors such as condensation control or personnel protection are to be considered, the selection of the thickness of insulation should satisfy the controlling factor.

B. Insulation materials furnished and installed hereunder shall be Class A maximum of 25 flame spread, 35 fuel contributed and 50 smoke developed rating and shall meet the fire hazard requirements of each of the following specifications:

1. American Society for Testing of Materials ASTM E84
2. Underwriters’ Laboratories, Inc. UL 723
3. National Fire Protection Associations NFPA 255

C. Calcium silicate products shall include a visual identification system to permit positive field determination of their asbestos-free characteristic.

1.6 QUALITY ASSURANCE

A. The contractor shall use whatever means are necessary to protect the insulation materials and accessories before, during and after installation. No insulation material shall be installed that has become damaged in any way. The contractor shall also use all means necessary to protect work and materials installed by other trades.

B. If any insulation material has become wet because of transit or job site exposure to moisture or water, the contractor shall not install such material, and shall remove it from the job site. An exception may be allowed in cases where the contractor is able to demonstrate that wet insulation when fully dried out (either before installation, or afterward following exposure to system operating temperatures) will provide installed performance that is equivalent in all respects to new, completely dry insulation. In such cases, consult the insulation manufacturer for technical assistance.

PART 2 PRODUCTS

2.1 PIPE INSULATION ON INDOOR SYSTEMS

A. Molded pipe insulation shall be manufactured to meet ASTM C585 for sizes required in the particular system.

B. Molded fibrous glass pipe insulation shall comply with the requirements of ASTM C547. Heavy density Fiberglas pipe insulation with factory applied all-service jacket (ASJ) and Doublesure® two-component adhesive closure system, or Fiberglas Pipe and Tank Insulation, heavy density fiberglass insulation with end grain adhered to ASJ all service jacket. Joints shall be sealed by butt strips having a two-component sealing system or by applying staples and pressure sensitive tape. When self-sealing lap systems are used, sufficient thickness of insulation shall be used to maintain the outer surface...
temperature of the operating system below +150°F. Manufacturer's data regarding thickness constraints in relation to operating temperature shall be followed. When multiple layers are required, all inner layer(s) shall be unjacketed.

C. Fittings and valves shall be insulated with preformed fiberglass fittings, fabricated sections of fiberglass pipe insulation, fiberglass pipe and tank insulation, fiberglass blanket insulation, or insulating cement. Thickness shall be equal to adjacent pipe insulation. Finish shall match that used on straight sections.

D. Flanges, couplings, chilled water pump impeller housings, valve bonnets etc, shall be covered with an oversized pipe insulation section sized to provide the same insulation thickness as on the main pipe section. An oversized insulation section shall be used to form a collar between the two insulation sections with sections of insulation being used to fill gaps. Jacketing shall match that used on straight pipe sections. Rough cut ends shall be coated with a suitable vapor resistant mastic.

E. On cold systems, vapor barrier performance is extremely important. Particular care must be given to vapor sealing the fitting cover or finish to the pipe insulation vapor barrier. Valve stems shall be sealed with caulking to allow free movement of the stem but provide a seal against moisture incursion. All penetrations of the ASJ and exposed ends of insulation shall be sealed with vapor barrier mastic.

F. On hot systems where fittings are to be left exposed, insulation ends should be beveled away from bolts for easy access.

G. All insulated, exposed piping inside the building within 8'-0" above the floor shall be additionally jacketed with a multi-ply, fabric reinforced, self adhesive insulation cladding material with a vapor barrier and a thickness of 0.015". Jacketing system shall be Venture Clad Plus #1579CW-E or equal.

2.2 REFRIGERANT PIPING AND COOLING COIL DRAIN WITH INSTALLATION TEMPERATURE ABOVE 40°F

A. Insulate piping with ¾” Armstrong Armaflex type AP insulation. Insulation shall be flexible elastomeric thermal insulation, black in color, flame-spread rating of 25 or less and a smoke developed rating of 50 or less as tested by ASTM E84-91A "Method of Test Surface Burning Characteristics of Building Materials".

B. Fitting elbow covers shall be fabricated from miter-cut tabular form. In all cases, butt joints and seams are to be sealed with Armstrong 520 adhesive. 520 adhesive is a contact adhesive; therefore, in all cases, both surfaces to be joined are to be coated with adhesive with installation temperature above 40°F.

C. Where piping is located outdoors, cover Armaflex insulation with PVC jacketing installed with a glued application.

2.3 SUPPORT FOR PIPE WITH INSULATION

A. All piping shall be supported in such a manner that neither the insulation nor the vapor/weather barrier is compromised by the hanger or the effects of the hanger. In all cases, hanger spacing shall be such that butt joints may be made outside the hanger.
1. On all size piping of cold systems, the pipe hanger saddles shall be separated away from the pipe by utilizing inserts. The vapor barrier shall be continuous, including material covered by the hanger saddle.

2. On warm water piping systems 3” in diameter or less, insulated with Fiberglas insulation, may be supported by placing saddles of the proper length and spacing, as designated in Owens-Corning Pub. 1-IN-12534, under the insulation.

3. For hot or cold piping systems larger than 3” in diameter, Owens-Corning Calcium Silicate pipe insulation shall be used for high density inserts. Piping saddles for piping larger than 3” shall not be in contact with the piping.

4. Owens-Corning Calcium Silicate pipe insulation may be used to support the entire weight of the piping system provided the hanger saddle is designed so the maximum compressive load does not exceed 100 psi.

5. Where pipe shoes and roller supports are required, insulation shall be inserted in the pipe shoe to minimize pipe heat loss. Where possible, the pipe shoe shall be sized to be flush with the outer pipe insulation diameter.

6. Thermal expansion and contraction of the piping and insulation system can generally be taken care of by utilizing double layers of insulation and staggering both longitudinal and circumferential joints. Where long runs are encountered, expansion joints may be required where single layers of the insulation are being used.

7. On vertical runs, insulation support rings shall be used.

2.4 ACCESSORY MATERIALS

A. Accessory materials installed as part of insulation work under this section shall include (but not be limited to):


2. Field-applied jacketing materials - Sheet metal, plastic, canvas, fiberglass cloth, insulating cement; PVC fitting covers.


B. All accessory materials shall be installed in accordance with project drawings and specifications, manufacturer’s instructions, and/or in conformance with the current edition of the Midwest Insulation Contractors Association (MICA) “Commercial & Industrial Insulation Standards”.

2.5 INSULATION THICKNESSES

A. Fittings, including valves, flanges, unions, etc. shall be insulated with the same thickness as the required pipe insulation and covered with PVC fitting cover as specified.

B. Pipe insulation thickness shall be as follows unless noted otherwise on drawings:
<table>
<thead>
<tr>
<th>Piping System</th>
<th>Pipe Size</th>
<th>Insulation Thickness</th>
<th>Insulation Conductivity BTU-in H-FT²-F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domestic cold water</td>
<td>All sizes</td>
<td>1&quot;</td>
<td>0.28</td>
</tr>
<tr>
<td>Horizontal rain conductor piping</td>
<td>All sizes</td>
<td>1&quot;</td>
<td>0.28</td>
</tr>
<tr>
<td>Horizontal and vertical overflow rain water conductors</td>
<td>All sizes</td>
<td>1&quot;</td>
<td>0.28</td>
</tr>
<tr>
<td>Underside of roof drains</td>
<td>All sizes</td>
<td>1&quot;</td>
<td>0.28</td>
</tr>
<tr>
<td>Domestic hot water and hot water return (140°F and under)</td>
<td>Up thru 1¼ &quot;</td>
<td>1&quot;</td>
<td>0.28</td>
</tr>
<tr>
<td></td>
<td>1½&quot; and larger</td>
<td>1½&quot;</td>
<td></td>
</tr>
<tr>
<td>Domestic hot water and Hot water return (140°F to 200°F)</td>
<td>Up to 1¼&quot;</td>
<td>1 ½&quot;</td>
<td>0.28</td>
</tr>
<tr>
<td></td>
<td>1½&quot; and larger</td>
<td>2&quot;</td>
<td></td>
</tr>
</tbody>
</table>

**PART 3 EXECUTION**

**3.1 SITE INSPECTION**

A. Before starting work under this section, carefully inspect the site and installed work of other trades and verify that such work is complete to the point where installation of materials and accessories under this section can begin.

B. Verify that all materials and accessories can be installed in accordance with project drawings and specifications and material manufacturers’ recommendations.

C. Verify by inspecting product labeling, submittal data, and/or certifications which may accompany the shipments that all materials and accessories to be installed on the project may comply with applicable specifications and standards and meet specified thermal and physical properties.

**3.2 PREPARATION**

A. Ensure that all pipe and fitting surfaces over which insulation is to be installed are clean and dry.

B. Ensure that insulation is clean, dry, and in good mechanical condition with all factory-applied vapor or weather barriers intact and undamaged. Wet, dirty, or damaged insulation shall not be acceptable for installation. All damaged insulation installed will be removed and replaced by the Contractor at no extra cost to the Owner.

C. Ensure that pressure testing of piping and fittings has been completed prior to installing insulation.

**3.3 INSTALLATION**

A. General

1. Install all insulation materials and accessories in accordance with manufacturer’s published instructions and recognized industry practices to ensure that it will serve its intended purpose.
2. Install insulation on piping subsequent to installation of heat tracing, painting, testing, and acceptance tests.

3. Install insulation materials with smooth and even surfaces. Insulate each continuous run of piping with full-length units of insulation, with single cut piece to complete run. Do not use cut pieces or scraps abutting each other. Butt insulation joints firmly to ensure complete, tight fit overall piping surfaces.

4. Maintain the integrity of factory-applied vapor barrier jacketing on all pipe insulation, protecting it against puncture, tears or other damage. All staples used on cold pipe insulation shall be coated with suitable sealant to maintain vapor barrier integrity.

B. Fittings

1. Cover valves, fittings, and similar items in each piping system using one of the following:
   a. Mitered sections of insulation equivalent in thickness and composition to that installed on straight pipe runs.
   b. Insulation cement equal in thickness to the adjoining insulation.
   c. PVC fitting covers insulated with material equal in thickness and composition to adjoining insulation.

C. Penetrations

1. Extend piping insulation without interruption through walls, floors, and similar piping penetrations, except where otherwise specified.

D. Joints

1. Butt pipe insulation against hanger inserts. For hot pipes, apply 3” wide vapor barrier tape or band over butt joints. For cold piping apply wet coat of vapor barrier lap cement on butt joints, and seal joints with 3” wide vapor barrier tape or band.

2. All pipe insulation ends shall be tapered and sealed, regardless of service.

3.4 FIELD QUALITY ASSURANCE

A. Upon completion of all insulation work covered by this specification, visually inspect the work and verify that it has been correctly installed. This may be done while work is in progress, to assure compliance with requirements herein to cover and protect insulation materials during installation.

3.5 PROTECTION

A. Replace damaged insulation which cannot be satisfactorily repaired, including insulation with vapor barrier damage and moisture-saturated insulation.

B. The insulation contractor shall advise the general and/or the mechanical contractor as to requirements for protection of the insulation work during the remainder of the construction period, to avoid damage and deterioration of the finished insulation work.

3.6 SAFETY PRECAUTIONS
A. Insulation contractor's employees shall be properly protected during installation of all insulation. Protection shall include proper attire when handling and applying insulation materials, and shall include (but not be limited to) disposable dust respirators, gloves, hard hats, and eye protection.

B. The insulation contractor shall conduct all job site operations in compliance with applicable provisions of the Occupational Safety and Health Act, as well as with all state and/or local safety and health codes and regulations that may apply to the work.

3.7 ASBESTOS INSULATION

A. Any existing asbestos insulation on existing piping, valves, equipment, etc. where tie-ins are required, shall be removed by the Owner at Owner's expense. The contractor and Architect/Engineer shall not be responsible for any cost or work involved with removal or encapsulation of asbestos insulation.

END OF SECTION

MAI: 2020-1566
SECTION 22 10 00
PLUMBING PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Sanitary and storm piping system.
B. Domestic water piping system
C. Valves.

1.2 REFERENCES: Material and/or equipment specified in this section shall meet or exceed one or more of the property requirements or installation requirements of the following specifications/publications as applicable to the specific product or end use:

A. ANSI B31.1 - Power Piping.
B. ANSI B31.2 - Fuel Gas Piping.
C. ANSI B31.9 - Building Service Piping.
D. ASME - Boiler and Pressure Vessel Code.
E. ASME Sec. 9 - Welding and Brazing Qualifications.
F. ASME B16.1 - Cast Iron Pipe Flanges and Flanged Fittings Class 25, 125, 250 and 800.
G. ASME B16.3 - Malleable Iron Threaded Fittings.
H. ASME B16.4 - Cast Iron Threaded Fittings Class 125 and 250.
I. ASME B16.18 - Cast Bronze Solder-Joint Pressure Fittings.
J. ASME B16.22 - Wrought Copper and Bronze Solder-Joint Pressure Fittings
K. ASME B16.23 - Cast Copper Alloy Solder-Joint Drainage Fittings - DWV.
M. ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV.
N. ASTM A47 - Ferritic Malleable Iron Castings.
O. ASTM A53 - Pipe, Steel, Black and Hot-Dipped Zinc Coated, Welded.
P. ASTM A74 - Cast Iron Soil Pipe and Fittings.
Q. ASTM A106 - Carbon Steel Seamless Pipe.
R. ASTM A234 - Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures.
S. ASTM A536 - Ductile Iron Castings.
T. ASTM B32 - Solder Metal.
U. ASTM B42 - Seamless Copper Pipe.
V. ASTM B43 - Seamless Red Brass Pipe.
W. ASTM B75 - Seamless Copper Tube.
X. ASTM B88 - Seamless Copper Water Tube.
Y. ASTM B251 - Wrought Seamless Copper and Copper-Alloy Tube.
Z. ASTM B302 - Threadless Copper Pipe (TP).
AA. ASTM B306 - Copper Drainage Tube (DWV).
AB. ASTM C564 - Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
AC. ASTM D1785 - Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
AG. ASTM D2513 - Thermoplastic Gas Pressure Pipe, Tubing and Fittings.
AJ. ASTM D2683 - Socket-Type Polyethylene Fillings for Outside Diameter-Controlled Polyethylene Pipe.
AK. ASTM D2729 - Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
AL. ASTM D2751 - Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings.
AO. ASTM D3033 - Type PSP Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
AP. ASTM D3034 - Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
AQ. ASTM D3309 - Polybutylene (PB) Plastic Hot Water Distribution System.
AR. ASTM F477 - Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
AT. ASTM F891, Schedule 40 Cellular Core PVC-DWV Pipe.
AU. AWS A5.8 - Brazing Filler Metal.
AV. AWWA C105 - Polyethylene Encasement for Ductile Iron Piping for Water and Other Liquids.
AW. AWWA C110 - Ductile - Iron and Gray - Iron Fittings 3 in. through 48 in., for Water and Other Liquids.
AY. AWWA C151 - Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water or Other Liquids.
AZ. AWWA C606 – Grooved and Shouldered Joints.
BA. AWWA C651 - Disinfecting Water Mains.
BD. NCPWB - Procedure Specifications for Pipe Welding.

1.3 QUALITY ASSURANCE
A. Valves: Manufacturer's name and pressure rating marked on valve body.
B. Welding Materials and Procedures: Conform to ASME Code and applicable state labor regulations.
C. Welders Certification: In accordance with ASME Sec 9.
D. All grooved joint couplings, fittings, valves, and specialties shall be the products of a single manufacturer. Grooving tools shall be of the same manufacturer as the grooved components.
E. All castings used for coupling housings, fittings, valve bodies, etc. shall be date stamped for quality assurance and traceability.

1.4 DELIVERY, STORAGE, AND HANDLING
A. Deliver, store, protect and handle products to site.
B. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

C. Provide temporary protective coating on cast iron and steel valves.

D. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

E. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

PART 2 PRODUCTS

2.1 SANITARY, STORM AND VENT SEWER PIPING, BURIED WITHIN 5 FEET OF BUILDING (Must be approved by governing authorities)

A. Gravity Cast Iron Pipe: ASTM A74 service weight.
   1. Fittings: Cast iron.

B. Gravity Cast Iron Pipe: CISPI 301, hubless, service weight
   1. Fittings: Cast iron.
   2. Joints: ASTM C564, neoprene gasket system.

C. Gravity Schedule 40 PVC Pipe: ASTM D2729 and ASTM F891 DWV non-pressure cellular core.
   1. Fittings: PVC.

D. Gravity 10” and larger. Schedule 40 PVC gravity sewer pipe with integral bell and spigot joints.
   1. Fittings: PVC

E. Forced PVC Pipe:
   1. 4” and Larger - ASTM D2241, DR18-Class 150 AWWA C900.
   2. Fittings: ASTM D2466 PVC

2.2 SANITARY, STORM AND VENT PIPING, ABOVE GRADE (Must be approved by governing authorities)

A. Gravity Cast Iron Pipe: ASTM A74, service weight.
   1. Fittings: Cast iron.
   2. Joints: ASTM C564, hub and spigot, neoprene gasket system.

B. Gravity Cast Iron Pipe: CISPI 301, hubless, service weight.
   1. Fittings: Cast iron.

C. Gravity Steel Pipe: ASTM A53 Schedule 40, galvanized.
4. Mechanical Grooved Couplings: Ductile iron, galvanized. (as specified for Forced Drains)

D. PVC Pipe: ASTM D2729 (when approved by the Architect/Engineer).
   1. Fittings: PVC.

E. CPVC Pipe: ASTM D2846 (When approved by the Architect/Engineer).
   1. Fittings: ASTM D2846, CPVC.

F. Forced larger than 3": Steel Pipe: ASTM A53, Schedule 40, galvanized.
   1. Fittings: Galvanized steel.
   3. IPS Grooved Piping System.
      a. Victaulic mechanical pipe couplings, fitting, valves and other grooved components may be used as an option to welding, threading or flanged methods. All grooved components shall be of one manufacturer and shall conform to local code approval and/or as listed by ANSI B31.1, B31.9, ASME UL/FM IAPMO or BOC. Grooved end product manufacturer to be ISO-9001 certified.
      b. Roll or cut grooved ends as appropriate to pipe material, wall thickness, pressures, size and method of joining. Pipe ends shall be grooved in accordance with manufacturer’s current listed standards conforming to ANSI/AWWA C-606.
      c. Mechanical couplings shall be Victaulic style 107H “Installation-Ready” or approved manufacturer, rigid coupling. Victaulic style 177 “Installation-Ready”, and style 77 or 75 or equal coupling shall be used where system flexibility is desired at pumps and other mechanical equipment to reduce noise and vibration. Noise and vibration reduction is achieved by installing (3) style 77 or 75 or equal flexible couplings near the vibration source. Couplings shall be of cast ductile iron conforming to ASTM A536, grade 65-45-12.

2.3 DOMESTIC WATER PIPING, BURIED WITHIN 5 FEET OF BUILDING (Must be approved by governing authorities)

   1. ANSI thickness Class 50 minimum, nominal pipe wall thickness .27” minimum, rated 350 psi at laying condition Type 1.
   2. Cement lined as per AWWA C104 (ANSI A21.4)
   4. Fitting Joints: Mechanical, compact, ANSI/AAWWA C153/A21.53, with stainless steel or Corten anti-rotation bolts and sacrificial zinc anode cap on each bolt.
   5. Coating: Exterior of pipe and fittings, asphaltic coating as per ANSI/AWWA.
   6. Polyethylene encasement as per ANSI/AWWA C105/A21.5.
7. Concrete thrust blocks, installation, etc. as per published engineering and construction standards of Michigan Department of Transportation and local codes.
8. All material and installation shall be in accordance with manufacturers recommendations.

B. Copper Tubing: 2” and smaller - ASTM B88, Type K, soft temper.
   1. Fittings: ASME B16.18 cast bronze or ASME B16.22 wrought copper and bronze.
   3. No joints shall be located under floor unless standard pipe lengths are not long enough for the entire length of bury, then joints shall be kept to a minimum.

C. PVC Pipe
   1. 3” - ASTM D2241, SDR 21- Class 200 AWWA C900.
   2. 4” thru 12” - ASTM D2241, DR18 - Class 150, DR18 - AWWA C900.
   3. Fittings ASTM D2466, PVC.

2.4 DOMESTIC WATER PIPING, ABOVE GRADE INSIDE BUILDING (Must be approved by governing authorities)

A. Domestic water piping 6” and smaller shall be: Copper tubing: ASTM B88, Type L, hard drawn, seamless.
   1. Fittings: ASME B16.18 cast bronze tee tap or ASME B16.22 wrought copper and bronze.
   2. Fittings 1-1/2” and smaller: ASME B16.18 cast bronze or ASME B16.22 wrought copper, with 301 stainless steel internal components, EPDM seals, and push-to-connect ends. Victaulic Permalynx.
   3. Joints: ASTM B32, solder, Lead free Grade 95-A tin - antimony or tin and silver with melting range 430 to 535 degrees F or AWS A5BcuP silver braze.
   4. Fittings 2” and smaller: At the Contractor’s option, Schedule 10S stainless steel pipe with Vic-Press 304 fittings and couplings may be used in lieu of soldered copper. The seal material shall be UL classified in accordance with ANSI/NSF61 for Potable Water service.
   5. Joints 2” thru 8” may be mechanical pipe couplings of a bolted type with a central cavity design pressure-responsive gasket along with grooved end copper or bronze fittings as available, as manufactured by Victaulic.
   a. Copper Tube, ASTM B-88 (Type K or L) - Roll grooved only, at copper-tube dimensions. (Flaring to accommodate alternate sized couplings is not permitted).
   b. Mechanical Couplings - Shall be Victaulic Style 607H “Installation-Ready” rigid couplings for copper consisting of a ductile iron cast housing, with offsetting angle-pattern bolt pads, a synthetic rubber gasket of a central cavity pressure-responsive design, with ASTM A449 plated nuts and bolts to secure unit together.
   c. Coupling Housings - Shall be cast of ductile iron conforming to ASTM A-536 (Grade 65-45-12), with a copper colored enamel paint coating.
d. Gaskets - Shall be molded of synthetic rubber in a Flush-Seal configuration conforming to the copper tube size (CTS) outside diameter and coupling housing, of elastomers having properties as designated in ASTM D-2000. Reference shall always be made to the latest published Selection Guide for Gaskets for proper gasket selection for the intended service.

e. Water Service - Gasket supplied for water services from -30°F to +230°F Grade "E" EPDM compound molded of materials conforming to ASTM D-2000, designation 2CA615A25B24F17Z, recommended for hot water service within the specified temperature range, plus a variety of dilute acids, oil-free air, and many chemical services. Not recommended for petroleum services.
   1) Gaskets supplied with Style 607H couplings shall be grade EHP for water services from -30°F to +250°F.
   2) Gaskets shall be UL classified in accordance with ANSI/NSF61 for Potable Water service.
   3) Meets the low lead requirements of NSF-372.

f. Flange Adapters - Shall be Victaulic Style 641 Vic-Flange or equal adapters 2"-6", ductile iron ASTM A-536, engaging directly into roll grooved copper tube and fittings and bolting directly to ANSI Class 125 cast iron and Class 150 steel flanged components; installer to supply standard flange bolts. Flange casting shall have a corresponding gasket.

g. Fittings - Fittings shall be full flow (smooth turn elbows) copper fittings conforming with ASME B16.22 or cast bronze to ASME B16.18; with grooves designed to accept grooved end couplings at copper-tube dimensions. (Flaring to accommodate alternate sized couplings is not permitted). Victaulic Copper-Connection.

2.8 PIPE HANGERS AND SUPPORTS
A. Refer to Section 22 05 00.

2.9 FLANGES, UNIONS, AND COUPLINGS
A. Pipe Size 2 Inches and Under:
   1. Ferrous pipe: 150 psig malleable iron threaded unions.
   2. Copper tube and pipe: 150 psig bronze unions with soldered joints. (Solder shall be lead free.)

B. Pipe Size Over 2 Inches:
   1. Ferrous pipe: 150 psig forged steel slip-on flanges; 1/16 inch thick preformed neoprene gaskets.
   2. Copper tube and pipe: 150 psig slip-on bronze flanges; 1/16 inch thick preformed neoprene gaskets.

C. Grooved and Shouldered Pipe End Couplings:
   1. Unions and flanges for servicing and disconnect are not required in installations using grooved joint couplings. (The couplings shall serve as disconnect points.)
2. Housing: Two ductile iron clamps to engage and lock, designed to permit some angular deflection, contraction, and expansion where required; electroplated steel bolts, nuts, and washers conforming with ASTM A449; galvanized for galvanized pipe.

3. Sealing gasket: "C" shape or FlushSeal composition sealing gasket.

4. Gaskets shall be UL classified in accordance with ANSI/NSF-61 for Potable water service.

5. Basis of Design: Victaulic Company, Style 607H (Installation-Ready for Copper Tubing) and Style 107H or 177 (Installation-Ready for Steel Piping).

D. Dielectric Connections: Dielectric nipples shall be non-conducting for connection of dissimilar materials. Dielectric nipples shall be similar to Victaulic Style 647 or Style 47. A brass adapter dielectric union is not acceptable.

2.10 GATE VALVES

A. Up to and including 3 Inches: Bronze body, bronze trim, non-rising stem, handwheel, inside screw, single wedge or disc, solder or threaded ends.

B. Over 3 Inches: Iron body, bronze trim, rising stem, handwheel, OS&Y, single wedge, flanged or grooved ends. Basis of Design: Victaulic Series 771V.

2.11 GLOBE VALVES

A. Up to and including 3 Inches: Bronze body, bronze trim, rising stem, handwheel, inside screw, renewable composition disc, solder or screwed ends, with back seating capacity (repackable under pressure).

B. Over 3 Inches: Iron body, bronze trim, rising stem, handwheel, OS&Y, plug-type disc, flanged ends, renewable seat and disc.

2.12 BALL VALVES

A. Up to and including 3 Inches:
   1. Bronze one piece body, stainless steel ball, Teflon seats and stuffing box ring, lever handle and balancing stops, solder or threaded ends with union.
   2. Brass two piece body, chrome plated brass ball and stem, PTFE seats and seals, lever handle, and Vic-Press ends. Victaulic Series P589.

B. Over 1-1/2 Inches: Cast ductile iron steel body, chrome plated steel ball, teflon seat and stuffing box seals, lever handle, or gear drive handwheel for sizes 10 inches and over, flanged or grooved ends. Basis of Design: Victaulic Series 726.

2.13 PLUG VALVES

A. Up to and including 3 Inches:
   1. Elastomer coated ductile iron disc with integrally cast stem, copper-tube dimensioned grooved ends, lever handle or gear operator. Basis of Design: Victaulic Series 608.
   2. Bronze body, bronze tapered lubricated plug, teflon packing, threaded ends.

B. Over 3 Inches:
1. Cast iron body and lubricated plug, flanged ends.
2. Elastomer coated ductile iron plug with integrally cast stem, ductile iron body and bonnet, welded-in nickel seat, lever handle or gear operator. Basis of Design: Victaulic Series 377.
   a. For installation on IPS / Steel pipe sizes with Victaulic Style 307 transition coupling.

2.14 BUTTERFLY VALVES

A. Bronze body

1. Elastomer coated ductile iron disc with integrally cast stem, copper-tube dimensioned grooved ends, lever handle or gear operator. Basis of design: Victaulic Series 608.

2. Stainless steel disc, resilient replaceable seat, threaded ends, extended neck, 10 position lever handle.

B. Cast or ductile iron body, chrome plated ductile iron disc, resilient replaceable pressure responsive EPDM seat, wafer or lug ends or grooved ends if Victaulic grooved fittings are used, with extended neck and 10 position lever handle. (Stem shall be offset from the disc centerline to provide full 360-degree circumferential seating). Sizes 6” and larger furnish gear drive handwheel. Basis of Design: Victaulic MasterSeal™.

2.15 FLOW CONTROL VALVES

A. Construction: DZR brass (Ametal) or bronze body with union on inlet and outlet, temperature and pressure test plug on inlet and outlet with blowdown/backflush drain.

1. Body material shall be ISO 6509 compliant.

B. Calibration: Control flow within 3.5 percent of selected rating, over operating pressure range of 10 times minimum pressure required for control.


D. If called for on drawings, furnish Victaulic or Griswold flow control valve. Flow control valve shall automatically control flow rates with ± 5% accuracy. Valve control mechanism shall consist of a stainless steel cartridge with a ported cup and coil/helical spring to avoid corrosion. Four operating ranges shall be available with minimum range requiring less than 2 psig to actuate the mechanism. Manufacturer shall provide independent laboratory tests verifying accuracy and performance. Griswold flow control valve shall have a 5 year warrante to guarantee all materials and workmanship. See drawings for flow rate of valve.

2.16 SWING CHECK VALVES

A. Up to and including 3 inches: Bronze swing disc, solder or screwed ends.

B. Over 3 Inches: Iron body, stainless steel or bronze trim, swing disc, renewable disc and seat, grooved or flanged ends. Basis of Design: Victaulic Series 712.

2.17 SPRING LOADED CHECK VALVES
A. Iron body, bronze trim, stainless steel spring, renewable composition disc, screwed, wafer, or flanged ends.

B. Ductile iron body, stainless steel spring and shaft aluminum-bronze disc with elastomer seal or elastomer coated ductile iron disc with welded-in nickel seat, grooved ends. Basis of Design: Victaulic Series 716.

2.18 WATER PRESSURE REDUCING VALVES

A. Up thru 3 Inches: Bronze body, stainless steel and thermoplastic internal parts, fabric reinforced diaphragm, strainer, double union ends.

B. Over 3 Inches: Cast iron body, bronze fitted, elastomeric diaphragm and seat disc, flanged.

C. Valve shall be as manufactured by Bell and Gossett.

2.19 RELIEF VALVES

A. Furnish and install as shown on plans a diaphragm-assist operated bronze body ASME rated and nameplated safety relief valve with fail-safe disc to assure normal operation under emergency conditions. The valve shall have a low blowdown differential and shall be designed to relief system pressure in excess of the operating pressure specified for the system, within the maximum operating limitations of the valve. The ASME safety relief valve shall be engineered to prevent the system fluid from entering the spring chamber under normal operating conditions. The permanent valve nameplate shall display the BTUH and relief pressure ratings certified by the National Board of Boiler and Pressure Vessel Inspectors. Valve shall be as manufactured by Bell and Gossett.

2.20 STRAINERS

A. Size 3 inch and Under: Screwed brass body for 175 psig working pressure, Y pattern with 1/32 inch stainless steel perforated screen.

B. Size 4 inch: Flanged iron body for 175 psig working pressure, Y pattern with 3/64 inch stainless steel perforated screen.

C. Size 5 inch and Larger: Flanged iron body for 175 psig working pressure, basket pattern with 1/8 inch stainless steel perforated screen.


2.21 INSERTS

A. Inserts: Malleable iron case of steel shell and expansion plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

2.22 CONCRETE FOR THRUST RESTRAINT AND COLLARS

A. Concrete: Class A Concrete conforming to Divisions 500 and 700 of the SCDOT Standard Specifications.
1. Compressive strength of 3,000 psi at 28 days.
2. Air entrained.
3. Water cement ratio of 0.488 with rounded aggregate and 0.532 with angular aggregate.
4. Maximum slump of 3.5 inch for vibrated concrete and 4 inch for non-vibrated concrete.
5. Minimum cement content of 564 pounds per cubic yard for vibrated concrete and 602 pounds per cubic yard for non-vibrated concrete.

PART 3  EXECUTION

3.1 EXAMINATION
A. Verify that excavations are to required grade, dry, and not over-excavated.

3.2 PREPARATION
A. Ream pipe and tube ends. Remove burrs. Bevel or groove 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.
D. Unions and flanges for servicing and disconnect are not required in installations using grooved joint couplings. (The couplings shall serve as disconnect points.)

3.3 PLUMBING PIPING INSTALLATION
A. Install in accordance with manufacturer's instructions.
B. Dielectric nipples for connection of dissimilar materials. A brass adaptor dielectric union is not acceptable.
C. Route piping in orderly manner and maintain gradient.
D. Install piping to conserve building space and not interfere with use of space.
E. Group piping whenever practical at common elevations.
F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

1. For water systems, use adequate numbers of Victaulic Style 77 flexible couplings in header piping to accommodate thermal growth and contraction, and for the elimination of expansion loops. (In accordance with Victaulic instructions and as approved by the engineer). Where expansion loops are required, use Victaulic Style 77 couplings on the loops.

G. Provide clearance for installation of insulation and access to valves and fittings.
H. Provide access where valves and fittings are not exposed. Coordinate size and location of access doors.
I. Establish elevations of buried piping outside the building to ensure not less than 4’-0” of cover for sewers and not less than 5’-6” of cover for domestic water piping.
J. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to weld.

K. Provide support for utility meters in accordance with requirements of utility companies.

L. Prepare pipe, fittings, supports, and accessories not prefinished, ready for finish painting.

M. Underground sewers shall be a minimum of 3" in diameter. Sewers located within building shall have a minimum slope of 1/4" per foot for piping 3" and smaller and a minimum slope of 1/8" per foot for piping 4" and larger.

N. All junctions of drainage piping shall be made with combination "Y" and 1/8 bend fittings.

O. Install bell and spigot pipe with bell end upstream.

P. Terminate plumbing vents 12” minimum above roof. Furnish and install weather cap on top of all vent pipes.

Q. Install valves with stems upright or horizontal, not inverted.

R. Solder or "sweat" joints shall be used for all copper and brass fittings, valves and tubing, using the soldering flux and methods recommended by the manufacturer of the tubing and fittings. Solder shall be silver solder for buried piping. No lead solder shall be used on any potable water piping.

S. Pipe vents from gas pressure reducing valves to outdoors and terminate in weather proof hood.

T. Equipment using gas and related piping shall be installed in compliance with NFPA 54 and 58, as applicable.

U. Install ductile iron pipe and fittings in accordance with AWWA C600 and manufacturer’s instructions.

V. Steel Rods, Bolt, Lugs, and Brackets: Coat buried steel with one coat of coal tar coating before backfilling.

W. Maintain minimum 10-foot horizontal separation and 18 inch vertical separation of water main from sewer piping or as required by local code.

3.4 PLUMBING PIPING APPLICATION

A. Use grooved mechanical couplings and fasteners in accessible locations, risers and pipe chases with Architect/Engineer’s approval.

1. Grooved joints shall be installed in accordance with the manufacturer’s latest published installation instructions. Grooved ends shall be clean and free from indentations, projections, and roll marks in the area from pipe end to groove. Gaskets shall be of an elastomer grade suitable for the intended service, and shall be molded and produced by the coupling manufacturer. The grooved coupling manufacturer’s factory trained representative shall provide on-site training for contractor’s field personnel in the use of grooving tools and
installation of grooved joint products. The representative shall periodically visit the jobsite and review contractor is following best recommended practices in grooved product installation. (A distributor's representative is not considered qualified to conduct the training or jobsite visit(s).)

B. Install unions downstream of valves and at equipment or apparatus connections. Unions are not required in installations using grooved mechanical joint couplings. (The couplings shall serve as unions and disconnect points).

C. Install brass male adapters each side of valves in copper piped system. Sweat solder adapters to pipe.

D. Install gate, ball, or butterfly valves for shut-off and to isolate equipment, part of systems, or vertical risers. All branch piping take-offs from mains, risers, or branch piping shall have valves installed to allow isolation of branch piping.

E. Install globe, ball, or butterfly valves for throttling, bypass, or manual flow control services.

F. Provide spring loaded check valves on discharge of water pumps.

G. Provide plug valves in gas systems for shut-off service. Provide removable or fixed handle for each plug valve.

H. Provide flow controls in water recirculating systems where indicated.

3.5 INSTALLATION OF INSERTS

A. Install in accordance with manufacturer's instructions.

B. Provide inserts for placement in concrete formwork.

C. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.

D. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.

E. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.

F. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut flush with top of slab.

3.6 PIPE HANGERS AND SUPPORTS

A. Support horizontal piping as scheduled.

B. Install hangers to provide minimum ½ inch space between finished covering and adjacent work.

C. Place hangers within 12 inches of each horizontal elbow.

D. Use hangers with 1½ inch minimum vertical adjustment.
E. Support horizontal cast iron pipe adjacent to each hub, with 5 feet maximum spacing between hangers.

F. Support vertical piping at every floor. Support vertical cast iron pipe at each floor at hub.

G. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

H. Support riser piping independently of connected horizontal piping.

I. Provide copper plated hangers and supports for copper piping.

J. Design hangers for pipe movement without disengagement of supported pipe.

K. Prime coat and finish paint exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed. Hangers and supports located in mechanical spaces are considered exposed.

3.7 ERECTION TOLERANCES

A. Establish invert elevations, slopes for drainage to minimum 1/8 inch per foot for piping 4” and larger, ¼” per foot for piping 3” and smaller. Maintain gradients.

B. Slope water piping and arrange to drain at low points.

3.8 SERVICE CONNECTIONS

A. Provide new sanitary and storm sewer services. Before commencing work, check invert elevations required for sewer connections, confirm inverts and ensure that these can be properly connected with slope for drainage and cover to avoid freezing. Contractor shall pay all fees, cost, etc. to local authorities for tap-ins, inspections, etc. as required.

B. Provide new water service complete with reduced pressure backflow preventer, double check valve assembly or water meter with by-pass valves as required by the local authorities.

C. Provide sleeve in wall for service main and support at wall with reinforced concrete bridge. Caulk enlarged sleeve and make watertight with pliable material. Anchor service main inside to concrete wall.

D. Contractor shall pay all fees, costs, etc. to local authorities for tap-ins, inspections, etc. as required.

E. Provide new gas service complete with gas meter and regulators. Provide regulators on each line serving gravity type appliances, sized in accordance with equipment. Gas company is responsible for installation of gas service and meter. Contractor shall be responsible for all coordination, etc. Contractor shall inform the gas company of gas load for service for the building and meter size by the gas company. Owner shall pay all gas company charges for gas service directly to the gas company.

3.9 POLYETHYLENE ENCASEMENT
A. Encase Ductile Iron piping in polyethylene where indicated on drawings to prevent contact with surrounding backfill material.

B. Install in accordance with AWWA C105, Method A.

C. Terminate encasement 3 to 6 inches above ground where pipe is exposed.

3.10 CONCRETE THRUST RESTRAINT

A. Provide valves, tees, bends, caps, plugs and dead ends with concrete thrust blocks as indicated on drawings.

B. Pour concrete thrust blocks against undisturbed earth. Locate thrust blocks at each elbow or change of pipe direction to resist resultant force and so pipe and fitting joints will be accessible for repair.

C. Do not encase fitting joints and flanges.

END OF SECTION

MAI: 2020-1520
PART 1  GENERAL

1.1  RELATED SPECIFICATIONS AND DOCUMENTS

A. Drawings and related specifications for this project including General and Supplementary Conditions, Division 1, General Requirements, Instructions to Bidders, Addenda’s, etc. apply to and are considered a part of Division 23 - Mechanical Work.

B. Information in this division is intended to clarify or make additions to the requirements set forth in the General Conditions, Supplementary Conditions, and Division I of these specifications. Any conflict between this Division 23 and other sections or divisions of the specifications or drawings shall be brought to the attention of the Architect/Engineer in writing as a request for addendum prior to the bid opening.

C. Furnish all equipment, materials, articles, items, operations or methods listed, mentioned or scheduled on drawings, these specifications, manufacturer’s installation instructions and include all labor, materials, equipment and incidentals necessary for their complete installation and operation.

D. All information contained in this section applies to all sections within Division 23 as if it was part of each section.

1.2  DRAWINGS AND SPECIFICATIONS

A. The drawings and these specifications are intended to supplement each other and any material or labor called for in one shall be furnished even if not specifically mentioned in both. Any material or labor which is neither shown on the drawings nor listed in this specification, but is normally incurred or required for completion of work shall be furnished. If there is a discrepancy between the drawings and specifications, the more stringent of the two shall be followed.

B. Drawings are diagrammatic and are intended to show approximate location and general arrangement of systems and equipment. No attempt has been made to show every ell, tee, etc. Drawings shall not be scaled for location of systems, equipment, etc. All dimensions whether given on drawings or scaled shall be verified in field and coordinated with all other trades and existing field conditions. Some ductwork, piping, equipment, etc. locations may require changes in location due to field conditions and coordination with other trades will be made with no additional cost to the Owner. Failure to check will be no reason for additional compensation.

C. These drawings and the associated specifications are intended to provide complete furnishing, installation and operational HVAC systems as specified. If these drawings and associated specifications have information omitted that would not allow a completely operational system as is the intent of the Engineer, the bidder shall notify the Engineer a minimum one week prior to the bid date to allow for addenda. Once bids have been received, the Contractor shall be responsible for material, labor, etc., to furnish and install a completely operational mechanical system as is the intent of these drawings and associated specification.

D. The installation of all systems, equipment, etc., is subject to clarification with submitted shop drawings and field coordination requirements. Equipment outlines shown on drawings or dimensioned on drawings are limiting dimensions. Any
equipment that reduces the indicated clearances or exceeds specified or scheduled equipment dimensions shall not be used.

E. The Architect/Engineer and Owner reserve the right to make minor changes in the location of equipment, piping, ductwork, etc. at the time of rough-in without additional cost to the Owner.

F. The Mechanical Trades Contractor shall have completed for his portion of work, at least one installation of size and type comparable to this project and has been in satisfactory operation for at least two complete years. The Mechanical Trades Contractor shall also have a developed service department capable of negotiating service contracts with the Owner for systems herein specified.

1.3 AUTOCAD BACKGROUND FILES

A. The Contractor shall include in their bid any cost for requesting AutoCAD backgrounds for their use from the Architect or Engineer. The cost will be $150.00 for the first plan, and $50.00 for each additional plan that may be requested for AutoCAD use. A waiver of responsibility for the Architect and Engineer related to Contractor use of the CAD files shall be signed by the Contractor.

1.4 MANUFACTURER’S SPECIFICATIONS AND CAPACITIES

A. Some equipment, materials, etc. that are scheduled on the drawings or listed in any addenda may not be specified in this specification. The manufacturer’s specification and capacities shall be considered included and part of this specification whether it is specified in this specification or noted or scheduled on the drawings. The contractor shall remove and replace any “substituted” equipment or material that has been installed or is on site, which in the opinion of the Architect/Engineer does not meet the scheduled equipment or materials manufacturer’s capacities or specification at no additional cost to the Owner.

1.5 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspace, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

1.6 LOCAL CONDITIONS
A. Before submitting proposals, each contractor shall examine these specifications and associated drawings, addenda, etc. and shall examine the site of the project. The bidder shall fully investigate the site of this project, investigate coordination of his work with all other trades and existing conditions and completely satisfy himself as to the conditions to which the work is to be performed before submitting his/her bid. No allowances or considerations will be given at a later date for alleged misunderstanding as to the requirements of the work, materials to be furnished, or conditions required by the nature of this project site and coordination by the neglect on the bidder’s part to make such an examination and coordination.

B. Drawings show approximate location of existing services. The mechanical and electrical trades shall check with local utility companies or municipal agencies for exact location of services which they expect to encounter. The Mechanical Trades Contractor shall be responsible for hiring a company such as “Miss Dig” to stake out and locate all utilities in areas of excavation before commencing any work. The Mechanical Trades Contractor shall verify all elevations and locations of existing underground lines which are to be connected into or routed over or under. This verification shall be done prior to beginning work at this project.

1.7 QUALITY ASSURANCE

A. All work shall be performed in accordance with all local and state codes, laws and regulations applicable to the work for this project. The contractor shall be responsible for all permits and costs for inspections, etc., and for checking with each utility company supplying service to this project and shall determine from them all, any changes in boxes, meters, valves, service, etc., and shall include all cost for inspections, revisions to services, etc. in his bid as required by local agencies, utilities, etc. No extra payment will be made for such items after the contractor submits his bid.

B. In addition to all applicable Federal, State and local codes, the standards and codes listed below shall apply to all mechanical work. The reference to codes and standards shall be referenced to the latest edition or revision.

1. Air Diffusion Council (ADC)
2. Air Moving and Conditioning Assoc., Inc. (AMCA)
3. American Boiler Manufacturer’s Association (ABMA)
4. American Gas Association (AGA)
5. American National Standard Institute (ANSI)
6. American Refrigeration Institute (ARI)
7. American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE)
8. American Society of Mechanical Engineers (ASME)
9. American Society for Testing materials (ASTM)
10. American Welding Society
11. ANSI code of Pressure Piping and Unified Pressure Vessels
12. ASME Boiler and Pressure Vessel Code
13. Institute of Boiler and Radiator Manuf. (IBR)
14. National Electrical Manufacturer’s Association (NEMA)
15. Sheet Metal & Air Conditioning contractors National Association (SMACNA)
16. Standards of the Hydraulic Institute
17. Underwriters’ Laboratories (UL)
18. Williams-Steiger Occupational Safety & Health Act (OSHA)

C. In the event of conflict between drawings, codes, standards or specifications, the most stringent requirement shall apply
1.8 SUBMITTALS AND SHOP DRAWINGS

A. Submit electronic sets of complete shop drawings for all mechanical equipment and materials associated with Division 23 and associated drawings to the Architect/Engineer for review before fabrication of work or ordering of equipment. Shop drawings shall be submitted at the earliest possible time.

B. Shop drawings shall be first reviewed by the contractor. Inaccurate shop drawings shall be corrected by the contractor to meet specifications and schedules for this project. The contractor shall then initial the shop drawings as having been reviewed before submitting to the Architect/Engineer. Shop drawings shall have, in addition to the mechanical information, the electrical requirements for minimum circuit amperes and maximum fuse size ratings of the equipment.

C. Drawings which are rejected must be corrected and returned for Architect/Engineer review before ordering.

D. Furnish to the job site copies or prints of shop drawings that have been reviewed by the Engineer as soon as possible.

E. Include a copy of each shop drawing in the Operation and Maintenance Manual.

F. The checking and reviewing of shop drawings by the Architect/Engineer shall be construed as assisting the contractor and the Architect/Engineer’s action does not relieve the contractor from the responsibility for errors or omissions which may exist thereon. The contractor shall be held responsible for errors or omissions that are discovered after approval process and must be made good by the contractor.

1.9 PERMITS, INSPECTIONS AND TESTS

A. The Mechanical Trades Contractor shall take out all permits and arrange for necessary inspections and shall pay all assessments, fees and costs, etc., and make all tests as required by applicable codes. At the completion of the project, the Mechanical Trades Contractor shall furnish certificates of inspection and approval and secure final occupancy permit. Record copies shall be included in the Operation and Maintenance manuals.

1.10 RECORD DRAWINGS

A. Maintain an up-to-date set of "record" drawings showing actual equipment, piping, duct, etc. installation locations. Exact dimensions from column lines for all concealed work and tie-ins with elevations noted shall be included.

B. Include a set of reproducible drawings and a set of prints in each Operation and Maintenance Manual.

C. The Engineer reserves the right to request and be furnished any additional information he deems necessary to be shown on the record drawings.

1.11 OWNER'S INSTRUCTIONS

A. Upon completion of the project, the contractor shall be responsible for instructing the Owner's operating staff, in the presence of the Architect/Engineer's representative, in the proper operation and maintenance of the mechanical systems and equipment.
Include a statement signed by the Owner that instructions have been given for proper operation and maintenance of the mechanical systems and equipment.

1.12 GUARANTEES

A. Furnish a written guarantee, to the Architect/Engineer, that will make the contractor responsible at his own expense for any imperfections in material and/or workmanship which may develop under ordinary use within a period of one (1) year from final Owner's acceptance of the work.

B. Furnish all written guarantees from equipment and/or material manufacturers which shall include the operating and performance conditions and capabilities upon which they are based.

C. Permanent equipment that is used for temporary heat or cooling shall be guaranteed for one (1) year from the date of final acceptance of the project.

1.13 PORTABLE AND DETACHABLE PARTS

A. Retain all portable and detachable parts of installation such as keys, spare accessories, operating manuals, etc. include in the Operation and Maintenance Manual.

1.14 OPERATION AND MAINTENANCE MANUALS

A. Furnish to the Architect/Engineer two (2) copies of an approved bound (3 ring binder) book with tabs for sections covering each item of equipment. These notebooks shall include shop drawings, maintenance manuals, operating manuals and parts lists to instruct the Owner on proper operation and use as well as maintenance for each piece of equipment. These books shall also include contractors’, subcontractors’ and manufacturers’ names, telephone numbers and addresses.

B. Manuals shall also include sequence of operation, control equipment literature, wiring and control diagrams, certificates of guarantees, certificates of inspection, mechanical system test and balancing reports. The contractor shall accumulate and summarize the control and maintenance sequence in a typewritten sheet to be included in the report.

C. The manuals must be approved by the Architect/Engineer before final payment to the contractor. The Engineer reserves the right to request and be furnished any additional information that he deems necessary to be included in the manuals.

1.15 RESPONSIBILITIES FOR USE OF SUBSTITUTE MATERIALS

A. Contractor shall notify Architect/Engineer in writing at least ten (10) calendar days before bids are due for approval to use materials and/or equipment other than that which has been specified or scheduled. If substitute materials and/or equipment are approved and used, it will be this contractor's responsibility to guarantee that the items will function as the specified equipment or materials, will in no way alter the design of the structure or system, and will not require any additional mechanical work such as piping, ductwork, etc. Any additional cost required by substitute materials will be the responsibility of the contractor.

B. It will be the contractor's responsibility, at his own expense, to remove or replace any non-approved equipment or material or any approved equipment or materials not originally specified or scheduled if equipment and materials do not meet with the satisfaction of the Architect/Engineer.
C. It shall be the Contractor's (Mechanical Trades) responsibility to coordinate and pay for any Electrical Contractor costs due to any changes in substitute materials and/or equipment's power requirements, which differ from that shown on the design documents.

D. No consideration will be given to requests for substitute materials because of delivery problems unless the contractor can prove that orders were placed as soon as possible after contract was awarded and that delays were not caused by submittal of unscheduled or unspecified (substituted) materials to the Architect/Engineer.

1.16 COST BREAKDOWN AND EQUIPMENT LIST

A. The successful bidder shall be responsible for submitting a cost breakdown to the Architect/Engineer and Owner within ten (10) calendar days after date of request of the breakdown. During progress of the work, if changes occur which cause additional cost, the price on such items shall be broken down in accordance with the items listed in the breakdown.

B. The bidders shall be responsible for submitting a complete list of all equipment manufacturers, makes, models, etc. that will be used for this project with their proposal. The equipment list shall be typed on the contractors letterhead and shall be signed by the authorized officer.

1.17 MATERIALS AND EQUIPMENT

A. Materials and equipment furnished under this project shall have a minimum warrantee of one (1) year. All materials and equipment shall be new, of first class quality and shall be furnished, delivered, erected, installed and finished in every detail and shall be so selected and arranged as to fit into the building space. All material or equipment that is not specified but necessary for this project shall be subject to the approval of the Architect/Engineer.

B. Any materials or equipment not specified or scheduled but similar to that which has had prior approval shall be listed as a substitution and noted on the proposal form as such.

C. The contractor shall include all miscellaneous materials and labor required to completely install and operate the mechanical systems as is intended by these drawings and specification.

1.18 TEMPORARY HEATING OR COOLING OF SPACE/BUILDING DURING CONSTRUCTION

A. It is not recommended to use HVAC equipment being furnished for the project for temporary heating and cooling of the space/building during construction. If it is necessary to utilize the HVAC equipment for tempering air, filters shall be placed at face of each return diffuser or grille. Mechanical Contractor shall be responsible for removing temporary; filters at each return diffuser, cleaning return air ductwork and installing new filters within the HVAC equipment before space/building is turned over to the Owner.

1.19 SCHEDULE, COORDINATION AND INSTALLATION OF WORK

A. The contractor shall carry on work in such a manner as to meet the dates as scheduled by the General Contractor and shall work overtime at no expense to the Owner as...
required to comply with the schedule. This contractor shall schedule all work with Owner and Architect/Engineer and schedule shut down of systems with Owner.

B. Examine the site and all drawings and specifications and coordinate work with all other trades before commencing work for this project. Arrange work essentially as shown with the exact layout to be made on the job to suit actual conditions. Precise locations of equipment and materials shall be coordinated and shall be the responsibility of this contractor. Should any conflicts in location occur, and necessary deviations from drawings are required as determined by the Architect/Engineer, the contractor shall make necessary adjustments without additional cost to the Owner. Any damage to HVAC equipment due to HVAC equipment operation during construction shall be paid for by the Mechanical Contractor.

C. All equipment, piping, ductwork, etc. shall be located and/or routed to allow for the most convenient access for servicing.

D. Arrange for necessary access doors, panels, etc. to allow servicing of equipment, piping, valves, fire dampers, etc. Perform any cutting and patching as required, made necessary by failure to make proper arrangements.

E. Indicated equipment connections, sizes and locations shall be verified and connected according to manufacturer's shop drawings and installation instructions. Thoroughly investigate the space provided for equipment and connections before ordering equipment. All equipment shall be selected to fit into the space allowed, including connections with adequate space allowed for operation and maintenance.

F. All work shall be installed in a neat and workmanlike manner, using skilled personnel thoroughly qualified in the trade or duties that they are to perform. Rough work will be rejected.

G. Coordinate all equipment deliveries and schedules to allow timely installation. Contractor shall separate equipment into sections and reassemble in building if required by the installation at no extra cost to the Owner.

H. Furnish a superintendent approved by the Architect/Engineer to oversee and coordinate the work to be performed with all other trades.

I. Coordinate location of pipes, ductwork, etc. with other building components such as structural components (beams, joists, columns, etc.), electrical components (lighting, conduits, etc.) and architectural components (walls, ceilings, floors, pipe chases, roof, etc.).

J. Before starting work, Contractor shall verify that available space for proposed pipes, ducts, equipment etc. is adequate for the intended purpose and will result in a first class installation. Irregardless of drawings, responsibility for first class operating systems rests with the Contractor.

K. Arrange for chases, slots, openings, etc. and other building components to allow for mechanical systems installation. Coordinate cutting and patching of these components to accommodate installation. This contractor shall be responsible for accurately locating for the general trades all chases, shafts, etc. and shall be responsible for all cutting and patching if these chases were not accurate or not coordinated in time with the general trades. Coordinate installation of all sleeves in walls, on floors or other structural or architectural components.
L. Sequence, coordinate and integrate installation of equipment and materials for efficient work flow during the project. Particular attention should be spent on larger pieces of equipment.

M. Install equipment and materials with provisions for necessary access for service and maintenance. Allow space for removal of all parts that may require replacement or servicing.

N. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

O. Coordinate requirements for access panels and doors for mechanical items requiring access that are concealed behind finished surfaces. When access panels are required, valves and equipment components requiring access shall be located to minimize the number of panels.

P. Examine the work as it progresses and alert the Architect/Engineer in writing of any instances or obstructions that will prevent this contractor from performing his/her work.

1.20 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

1.21 COOPERATION WITH ARCHITECT/ENGINEER AND OTHERS

A. Coordinate all aspects of the mechanical system installation with all other trades, existing conditions, etc.

B. If the bidder believes that changes in design are required to meet intended design capacities and operation or material and/or equipment is obviously omitted from these specifications and drawings, the bidder shall contact the Architect/Engineer in writing at least ten (10) days before bid date. The acceptance of a bid by the Owner shall be binding and shall indicate that the bidder does not require any changes in design nor additional costs in order to meet the design and performance of the mechanical system as indicated in these specifications and drawings.

1.22 WORK INVOLVING OTHER TRADES

A. Equipment or materials specified in Division 23 may have to be installed by other trades (such as electrical trades or architectural trades) due to code requirements or union jurisdictional requirements. Where this occurs, this contractor shall include all costs required by other trades to complete the work and hire the respective trade to perform this work.

1.23 PERFORMANCE DATA AND ACCESSIBILITY

A. All performance data specified in this specification or scheduled on drawings shall be considered actual performance of the equipment after installation. The supplier and installer shall be responsible for suitable allowances to adjust equipment to design capacities when actual operating and installation conditions differ from drawings.
B. All equipment and materials shall be installed to allow access for servicing and maintenance. Coordinate final location of such equipment and materials that are concealed with required access doors on panels. Allow ample space for replacement or servicing. Extend all grease fittings to an accessible location.

1.24 CUTTING AND PATCHING

A. Unless noted otherwise, the Mechanical Trades shall be responsible for all cutting, patching and associated work required under Division 23. This work shall be performed by trades normally performing this type of work except drilling of holes shall be done by the contractor requiring same. This includes replacing areas of cutting required by this work with proper reinforcing, termite shielding, materials, finishing, etc. to restore the areas to their original condition, and filling all openings around ducts, piping, etc. with approved fire retardant materials. Regardless, all drilling of holes shall be the responsibility of the Contractor requiring same.

B. If noted on drawings that the General Trades will be responsible for all cutting and patching, it will be the Mechanical Trades responsibility to notify all General Trades during bidding of all areas requiring cutting and patching. Regardless, all drilling of holes shall be the responsibility of the contractor requiring same.

1.25 WORK IN EXISTING BUILDINGS

A. Coordinate and schedule all work in existing building with Owner and Architect/Engineer. Systems shall be kept in operation at all times if at all possible. If a system shut-down is required, the contractor shall schedule with the Owner, the time and length of shut-down. A system shall not be shut down without written permission from the Owner.

B. All existing equipment, piping, ductwork, etc. that is to be removed shall remain the property of the Owner. The contractor shall remove and locate this material that remains the property of the Owner to a location determined by the Owner somewhere on site. If the Owner does not want to maintain possession of the removed material, the contractor shall be responsible for removing material from the site and disposing of this material as necessary to meet all codes and requirements and shall pay all costs as required for any disposal fees, inspections, permits, etc.

C. All existing piping, equipment, etc. whether shown on drawings or not that is to be removed and/or abandoned and does not remain property of the Owner shall be removed from site.

D. Any existing piping, valves, mechanical equipment, etc. serving the existing building which are shown or not shown on drawings and are required for systems operation shall remain in use. If these systems require relocation to allow installation of new systems, the contractor shall be responsible for relocating to an Owner and Architect/Engineer approved location. The contractor shall pay all cost for this work and include such cost in his/her bid. (As specified previously, contractor shall be responsible for examining site and include all cost for work required to complete this project.)

1.26 ACCESS TO EQUIPMENT, HEATING COILS, VALVES, ETC.

A. Coordinate access panels with type of construction and furnish access panels in areas that are non-accessible. Access panels shall be furnished by this contractor and installed by the General Contractor. The access panels shall be all approved, UL
labeled and fired rated and shall be located and sized to allow access to equipment, heating coils, valves, fire dampers, etc.

B. Where access panels are required, valves, equipment etc. shall be located as to require the least number of access panels.

1.27 EQUIPMENT GUARDS
A. All rotating or moving parts of equipment that are located so as to be a hazard shall be fully enclosed or properly guarded as to meet or exceed all regulations and OSHA requirements.

1.28 EQUIPMENT CONNECTIONS
A. Connections to equipment, plumbing fixtures, etc. shall be made in accordance with shop drawings, rough-in dimensions furnished by the manufacturer, codes, etc. and may vary with connections shown on drawings. The contractor shall be responsible for making connections and number of connectors as per shop drawings, codes, etc. at no additional cost to the Owner.

1.29 ELECTRICAL CONNECTIONS
A. The Electrical Trades shall be responsible for furnishing and installing all electrical equipment, wiring, etc. required for operation of mechanical equipment unless otherwise noted on the drawings. The Mechanical Trades shall furnish detailed information and wiring diagrams to the Electrical Trades for all equipment specified and/or scheduled for this project. In the event that the Mechanical Trades furnishes an “approved equal” or “alternate” that require changes in the original electrical design, the Mechanical Trades shall pay all costs to the Electrical Trades as required to make satisfactory adjustments. All electrical work shall be done in accordance with the latest edition of the National Electric Code.

B. See the temperature control or building automation system specification (if applicable) for description of electrical contractor work and Division 23 temperature control work.

1.30 MOTORS, MOTOR STARTERS AND DISCONNECTS
A. Unless otherwise noted on drawings, motors shall be of constant speed 1750 rpm, new NEMA Design B, 40°C rise, horse power rated, open drip-proof except TEFC in dirty atmosphere, induction type motor with service factor of 1.15 and be of sufficient capacity to continuously operate the apparatus to which it is connected under all conditions of operation without exceeding nameplate ratings.

B. Motors shall be premium efficiency as calculated using IEEE test method 112B.

C. Motors ½ Hp. or larger shall be three phase; motors under ½ Hp. shall be 115 volt, 60 cycle, single phase. Before ordering the motors, the contractor shall verify correct motor voltage with the Electrical Trades and field conditions.

D. The Mechanical Trades shall furnish, for equipment under Division 23, all special switches, disconnects, starters, alternators, etc. as specified or scheduled to be factory furnished and/or factory installed with the equipment including wiring diagrams, etc. whether it is to be factory installed or field wired. All other motor starters,
disconnects, etc. not noted as factory furnished shall be furnished and installed by the Electrical Trades.

E. Starters that are to be factory furnished with equipment shall be of the combination type and shall be as specified under Electrical Trades Division. Furnish overload protection for each phase.

F. All wiring methods and materials shall meet NEMA, National Electric Code and State of Michigan Code requirements.

G. All displays on control panels shall be on face of the panels.

H. Motors having V-belt shall be furnished with base slide rails or other form of adjustment.

1.31 LUBRICATION AND MAINTENANCE

A. Contractor shall maintain, oil, lubricate, etc. all equipment furnished under Division 23 until final acceptance by the Owner. Protect all bearings and shafts during installation and thoroughly grease the steel shafts to prevent corrosion. The contractor shall be responsible for any and all damage to bearings, shaft, etc. of Division 23 equipment operated or not until final acceptance by the Owner.

1.32 BASES AND SUPPORTS

A. This contractor shall be responsible for furnishing all equipment pads and supports for equipment and materials required by Division 23 unless otherwise noted on drawings.

B. All floor mounted mechanical equipment shall have a reinforced concrete pad furnished unless otherwise noted on drawings. The concrete pads shall be tied to the building floor with expansion bolts located maximum of 4'-0" on centers with a minimum of four (4) bolts, set before pouring and concealed within the pad. The Mechanical Trades shall verify exact pad or support size with the equipment manufacturer and shall size pad with adequate area to allow sufficient room for installation of vibration isolators, equipment mounting hardware, etc. Concrete pads shall have a 45 degree bevel at the top edge. The contractor shall verify exact location of concrete pads.

C. Furnish all steel, hanging material, rods, etc. for suspending equipment off floor unless otherwise noted on drawings for equipment to be furnished under Division 23. This includes all structural steel for supporting between beams.

D. All support structure shall be of strength to safely withstand all stresses and loads to which they will be subjected and shall distribute load properly over the building area. Supports shall be designed to avoid undue strain to equipment and to avoid interference with piping, pipe connections, service and maintenance clearances, etc.

E. Where equipment is to be floor mounted and requires legs, this contractor shall furnish and install structural steel members or steel pipe and fittings for legs. Fasten and brace to equipment and furnish flange at base to allow bolting to floor.

F. Where equipment is to be ceiling or wall mounted, furnish necessary platform, structural steel, hardware, etc. as is most suitable for support of this equipment.

G. All supports shall be approved by the Architect/Engineer.
H. All piping, ductwork, etc. shall be suspended from structural steel members utilizing rods and approved hanger devices. Do not use metal deck for support. Beam clamps such as the Grinnell Fig. 260 or approved equal shall be used. Sheet metal “straps” shall not be used in place of rods.

I. The mechanical trades shall be responsible for furnishing and setting in place all mechanical equipment, roof curbs and piping/duct roof curbs. The general trade shall be responsible for the roof work and associated flashing. The mechanical trade shall furnish and install treated wood base blocking as required to level curb and to match roof insulation thickness. Curb shall be as specified, or if not specified should be similar to Pate or Thy-curb with heavy gauge galvanized steel, insulated and with wood nailer. Height of curb scheduled or specified shall be height required to top of curb above finished roof. If height is not specified or noted, a minimum 12” high above finished roof will be required. (pipe support units shall be at height required). Rooftop units will be shipped knocked down with the mechanical trade responsible for assembly on site. Roof curb shall mate with unit and provide support and a watertight installation.

1.33 SLEEVES, PLATES AND COLLARS

A. Furnish all sleeves, plates and collars for piping, ductwork, etc. passing through walls, floor ceilings, foundations, etc. Coordinate with the General Contractor the exact location and size of required openings. No pipe or duct shall pass through a wall, floor ceiling, etc. without a sleeve. This contractor shall be responsible for sleeve locations and securing sleeves before concrete is formed.

B. Sleeves for steel pipe shall be standard weight black steel pipe. For walls, foundations and ceilings, sleeve shall be kept flush with finished surfaces. For floors, the sleeve shall be set flush with bottom of concrete construction and be extended up ¼” above concrete floor. Sleeves shall be set in place before construction of walls, floors, ceilings, etc.

C. Sleeves for copper pipe shall be type "M" hard copper tubing installed typical to that of steel pipe sleeves.

D. Sleeves for piping shall be sized to allow insulation to run continuous through sleeve whenever possible and to allow not less than ¼” all around bare pipe or insulation.

E. Sleeves for ducts passing through floors shall be 14 gauge black steel for ducts up to 24” maximum dimension, and 12 gauge black steel for ducts 25” and over maximum dimension. Sleeves shall be kept flush with the finished wall surface.

F. Where insulated piping passes through walls or floor sleeves, furnish 22 gauge galvanized band around insulation of same length as the sleeve length. Band shall fit snugly over insulation and be held in place by steel metal collars all around insulation to cover openings.

G. All penetration voids shall be sealed smoke tight with non-combustible materials similar to 3M or Hilti firestop systems to maintain the integrity of the fire rated structure. In a non-fire rated assembly, seal all voids with non-hardening sealant.

H. Where bare piping 2” and smaller pass through wall or floors, furnish polished chrome plated brass escutcheons, split type. Bare piping 2½” and larger that pass through walls or floor, furnish 22 gauge galvanized steel metal collars so as to cover opening.
I. Where piping penetrates an outside wall, below grade, utilize a mechanical sleeve, similar to link-seal, with stainless steel nuts and bolts on fasteners.

1.34 RIGGING AND HOISTING

A. Perform all required rigging, hoisting, transportation, moving, etc. of all equipment, materials, etc. to be furnished and/or installed under Division 23 whether furnished by this contractor or by the Owner or other trades.

1.35 STORAGE FACILITY

A. Furnish and maintain a weatherproof storage facility on the site of adequate size to store miscellaneous equipment and/or materials to prevent exposure to the weather. Location of shed shall be determined by the Owner and Architect/Engineer. The Owner reserves the right to deny storage of materials or equipment in any existing or new buildings.

1.36 PROTECTION FROM DAMAGE

A. The contractor shall be responsible for all materials, equipment, etc. and all work installed by himself and shall protect it from damage until final acceptance of this project by the Owner.

B. Furnish all coverings and protection from dirt, dust, rain, storm, heat, traffic, wear, etc. and all possible injury including that by other workmen. Any equipment, workmanship, materials, etc. damaged prior to final acceptance by the Owner of this project shall be properly repaired at no expense to the Owner.

C. Protect all equipment from damage by covering or coating. Any dented, scratched, rusted or marred surface finishes will not be accepted.

D. Protect all equipment, materials, etc. from freezing.

1.37 COMMON PIPE MATERIALS AND INSTALLATION INSTRUCTIONS

A. Refer to individual Division 23 piping Sections for pipe, tube, and fitting materials and joining methods.

B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

C. Refer to individual Division 23 piping Sections for special joining materials not listed below.

1. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
   
   a. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch (3.2-mm) maximum thickness unless thickness or specific material is indicated.
   
   1) Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
   
   2) Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.

2. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
3. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.


5. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAg1, silver alloy for refrigerant piping, unless otherwise indicated.

6. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

1.38 PIPE HANGERS AND SUPPORTS

A. Hangers and saddles shall be Modern Pipe Support Corp., Grinnel/Anvil, Autogrip, or M-CO. Inserts shall be of the type to receive a machine bolt head or nut after installation, permit horizontal adjustment, and shall be flush with the surface. For copper pipe with steel hangers, clean and wrap pipe with two layers of plastic insulating tape at point of contact. Roller supports shall be adjustable type with insulated standoff. Rods shall be used for suspended installation. Sheet metal “straps” shall not be used in place of rods.

B. Hangers for piping with vapor barrier sealed insulation shall be multipurpose pipe saddles fitting over the insulation. Wire or perforated strap iron will not be permitted for pipe supports. Do not support hangers from roof deck. Furnish and install all support steel as required to suspend from structural steel joist or beams. Hangers shall be clevis or split ring type with vertical adjustment and beam clamp similar to Grinnell/Anvil Fig. 260, with maximum spacing per ASHRAE Standards:

<table>
<thead>
<tr>
<th>Pipe Size</th>
<th>Steel Pipe</th>
<th>Copper Pipe</th>
<th>PVC Pipe</th>
<th>Rod Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>½ to ¾ inch</td>
<td>6 feet</td>
<td>5 feet</td>
<td>4 feet</td>
<td>3/8”</td>
</tr>
<tr>
<td>1 inch</td>
<td>7 feet</td>
<td>5 feet</td>
<td>4 feet</td>
<td>3/8”</td>
</tr>
<tr>
<td>1 ¼ inch</td>
<td>7 feet</td>
<td>7 feet</td>
<td>4 feet</td>
<td>3/8”</td>
</tr>
<tr>
<td>1½ inch</td>
<td>7 feet</td>
<td>7 feet</td>
<td>4 feet</td>
<td>1/2”</td>
</tr>
<tr>
<td>2 inch</td>
<td>10 feet</td>
<td>8 feet</td>
<td>4 feet</td>
<td>1/2”</td>
</tr>
<tr>
<td>2½ inch</td>
<td>11 feet</td>
<td>9 feet</td>
<td>4 feet</td>
<td>5/8”</td>
</tr>
<tr>
<td>3 inch</td>
<td>11 feet</td>
<td>9 feet</td>
<td>4 feet</td>
<td>5/8”</td>
</tr>
<tr>
<td>3 ½ inch</td>
<td>13 feet</td>
<td>11 feet</td>
<td>4 feet</td>
<td>5/8”</td>
</tr>
<tr>
<td>4 inch</td>
<td>14 feet</td>
<td>12 feet</td>
<td>4 feet</td>
<td>5/8”</td>
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<tr>
<td>5 inch</td>
<td>14 feet</td>
<td>12 feet</td>
<td>4 feet</td>
<td>3/4”</td>
</tr>
<tr>
<td>6 inch</td>
<td>14 feet</td>
<td>--</td>
<td>4 feet</td>
<td>3/4”</td>
</tr>
<tr>
<td>8 inch</td>
<td>16 feet</td>
<td>--</td>
<td>4 feet</td>
<td>7/8”</td>
</tr>
</tbody>
</table>

C. Conform to ASME B31.9, ASTM F708, MSS SP58, MSS SP69 and MSS SP89.

D. Hangers for Hot Pipe Sizes ½ to 1½ Inch: Malleable iron, adjustable swivel, split ring.

E. Hangers for Cold Pipes sizes ½” to 1½” and Hot and Cold Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.


G. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
H. Wall Support for Pipe Sizes up thru 3 Inches: Cast iron hook.


J. Vertical Support: Steel riser unistrut clamps at high, mid, and low locations.

K. Floor Support for Cold Pipe all sizes and Hot Pipe Sizes up thru 4 Inches: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

L. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

M. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.

N. Inserts: Malleable iron case of steel shell and expander plug for threaded connection with lateral adjustments, top slot for reinforcing rods, lugs for attaching to forms, size inserts to suit threaded hanger rods.

1.39 PIPING, DUCTWORK AND EQUIPMENT SUPPORT

A. Attachments of mechanical equipment to structural members are the responsibility of the installing trade. Structural members shall not be field cut, welded or otherwise modified without approval of the Architect/Engineer. Attachment to steel joist shall be made at panel points. When routing piping or ductwork perpendicular to joist, a support shall be provided at every steel joist; when parallel to joist, a support shall be provided at no more than 6’ on centers or two panel bays. Structural members shall not be overloaded as a result of attachments. Attachment/equipment loading for all trades resulting in total load greater than an equivalent uniform 5 psf for any member shall be submitted to the Architect/Engineer for review. Mechanical Trades may contact the project Structural Engineer as required for panel point location assistance and welder certification requirements. Electrical Trades are still responsible for design, layout, and fabrication and installation of electrical supports and support attachment methods. Mechanical Trades shall submit attachment methods to the Structural Engineer for review.

B. Install products in accordance with manufacturer’s instructions.

C. Do not fasten supports to pipes, ducts, mechanical equipment, and conduit.

D. Do not use spring steel clips and clamps.

E. Do not use powder-actuated anchors.

F. Do not drill or cut structural members without permission from Architect/Engineer.

G. Fabricate supports from structural steel or steel channel. Rigidly weld members or use hexagon head bolts to present neat appearance with adequate strength and rigidity. Use spring lock washers under all nuts.

1.40 PIPING SYSTEMS SHUT OFF VALVES
A. Shut off valves shall be installed at all branch lines off main piping, or where mains divide/separate to serve different areas, to allow isolation of all branch piping and systems they serve such as air handling units, areas or wings of the building, etc.

1.41 CLEANING AND FINISHING

A. During construction period, remove all debris, rubbish, tools, equipment, unused materials, etc. as required or requested by the Architect/Engineer. All cost for cleanup and removal will be the responsibility of the contractor.

B. Upon completion of the project and before final acceptance by the Owner, the entire installation shall be thoroughly cleaned, all rubbish and unused material removed to the satisfaction of the Architect/Engineer. All dust and dirt shall be removed from all equipment, piping, ductwork, etc.

C. Thoroughly clean all heating units, fans and fan wheels, diffusers and grilles, air handler plenums and air filter frames, etc. using compressed air if necessary.

D. Finish paint all equipment, materials, piping, etc. as noted on drawings or listed in this specification. Match Owner’s existing color scheme. Any Division 23 equipment which has been scratched or damaged shall be finished equal to the original finish.

1.42 DUCTWORK MANUAL BALANCING DAMPERS

A. All duct branch take off’s to diffusers, grilles, regulators, etc. shall have manual balancing dampers installed to allow balancing of outlets.

1.43 EQUIPMENT/SYSTEMS START-UP

A. Furnish and schedule manufacturer’s start-up service for all equipment and systems. These start-up services shall be performed in the presence of, and to the satisfaction of the Owner and Architect/Engineer.

1.44 EQUIPMENT/SYSTEMS SIGN-OFF

A. The Mechanical Trades shall furnish written sign-offs on all systems stating that the equipment and systems have been checked, tested, started and that their operation has been verified correct through the entire range of operation that can be expected through the seasons.

1.45 SUBSTANTIAL COMPLETION

A. Contractor shall submit a letter to the Architect/Engineer advising that all work has been completed in accordance with plans and specifications and the project is ready for a final walk-thru.

END OF SECTION

MAI: 2020-1566
PART 1 GENERAL

1.1 SECTION INCLUDES
A. Pressure gages and Pressure gage taps.
B. Thermometers and thermometer wells.
C. Static pressure gages.
D. Filter gages.

1.2 REFERENCES: Material and/or equipment specified in this section shall meet or exceed one or more of the property requirements or installation requirements of the following specifications/publications as applicable to the specific product or end use:
A. ASME - B40.1 - Gages - Pressure Indicating Dial Type - Elastic Element.
C. ASTM E77 - Verification and Calibration of Liquid-in-Glass Thermometers.

1.3 SCOPE
A. The work covered by this specification consists of furnishing all labor, equipment, materials and performing all operations required, for the correct and complete fabrication and installation of gages and meters in accordance with the applicable project specifications, drawings, codes, regulations and standards.

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

PART 2 PRODUCTS

2.1 PRESSURE GAGES
A. Gage: ASME B40.1, 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: 4½ inch diameter.
   3. Mid-Scale Accuracy: One percent.

2.2 PRESSURE GAGE ACCESSORIES
A. Gage Cock: Ball valve.
B. Pulsation Damper: Pressure snubber, brass with 1/4 inch connection.
C. Siphon: ¼ inch angle or straight pattern.

2.3 STEM TYPE THERMOMETERS

A. Thermometer: ASTM E1, adjustable angle, liquid-in-glass, lens front tube, cast aluminum case with enamel finish, cast aluminum adjustable joint with positive locking device.
   1. Size: 9 inch scale.
   2. Window: Acrylic.
   3. Stem: die-cast zinc, length to suit.
   4. Accuracy: ASTM E77 1 percent.
   5. Calibration: Both degrees F and degrees C.

2.4 DIAL THERMOMETERS

A. Thermometer: ASTM E1, stainless steel case, vapor or liquid actuated with brass or copper bulb, copper or bronze braided capillary, white with black markings and black pointer glass lens.
   1. Size: 4½ inch.
   2. Lens: Clear glass Lexan.
   3. Length of Capillary: Minimum 5 feet.
   4. Accuracy: 2 percent.
   5. Calibration: Both degrees F and degrees C.

2.5 THERMOMETER SUPPORTS

A. Socket: Brass separable sockets for thermometer stems with or without extensions as required, and with cap and chain.

B. Flange: 3 inch outside diameter reversible flange, designed to fasten to sheet metal air ducts, with brass perforated stem.

2.6 TEST PLUGS

A. Test Plug: Similar to Petes Plug, ¼ inch or ½ inch brass fitting and cap for receiving 1/8 inch outside diameter pressure or temperature probe with Nordel or Viton core for temperatures up to 275 degrees F.

B. Test Kit: Carrying case, internally padded and fitted containing two 3 ½ inch diameter pressure gages, two gage adapters with 1/8 inch probes, two 1 ½ inch dial thermometers.

2.7 STATIC PRESSURE GAGES

A. 3½ inch diameter dial in metal case, diaphragm actuated, black figures on white background, front recalibration adjustment, 2 percent of full scale accuracy.

B. Inclined manometer, red liquid on white background with black figures, front recalibration adjustment, 3 percent of full scale accuracy.

C. Accessories: Static pressure tips with compression fittings for bulkhead mounting, ¼ inch diameter tubing.

PART 3 EXECUTION
3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide one pressure gage per pump, installing taps on suction and discharge of pump. Pipe to gage.

C. Install pressure gages with pulsation dampers. Provide gage cock to isolate each gage. Provide siphon on gages in steam systems. Extend nipples and siphons to allow clearance from insulation.

D. Install thermometers in piping systems in sockets in short couplings. Enlarge pipes smaller than 2½ inch for installation of thermometer sockets. Ensure sockets allow clearance from insulation.

E. Install thermometers in air duct systems on flanges.

F. Install thermometer sockets adjacent to controls systems thermostat, transmitter, or sensor sockets, where thermometers are provided on local panels.

G. Locate duct mounted thermometers minimum 10 feet downstream of mixing dampers, coils, or other devices causing air turbulence.

H. Coil and conceal excess capillary on remote element instruments.

I. Provide instruments with scale ranges selected according to service with largest appropriate scale.

J. Install gages and thermometers in locations where they are easily read from normal operating level. Install vertical to 45 degrees off vertical.

K. Adjust gages and thermometers to final angle, clean windows and lenses, and calibrate to zero.

L. Locate test plugs adjacent to thermometers and thermometer sockets, adjacent to pressure gages and pressure gage taps, and adjacent to control device sockets.

END OF SECTION

MAI: 2020-1566
PART 1  GENERAL

1.1  SECTION INCLUDES

A.  Vibration isolation.

1.2  PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION

A.  Placement of isolators in floating floor slabs.

1.3  CONCRETE FURNISHED AND INSTALLED BY OTHERS

A.  All concrete shall be furnished and installed by the General Contractor unless otherwise noted on drawings.

B.  This contractor shall be responsible for coordinating all concrete work with the general trades during bidding (includes equipment, pads, etc.).

1.4  PERFORMANCE REQUIREMENTS

A.  Provide vibration isolation on motor driven equipment over 0.5 HP, plus connected piping and ductwork.

B.  Provide minimum static deflection of isolators for equipment as indicated.

1.  Basement, Under 20 hp
   a.  Under 400 rpm: 1 inch
   b.  400 - 600 rpm: 1 inch
   c.  600 - 800 rpm: 0.5 inch
   d.  800 - 900 rpm: 0.2 inch
   e.  1100 - 1500 rpm: 0.14 inch
   f.  Over 1500 rpm: 0.1 inch

2.  Basement, Over 20 hp
   a.  Under 400 rpm: 2 inch
   b.  400 - 600 rpm: 2 inch
   c.  600 - 800 rpm: 1 inch
   d.  800 - 900 rpm: 0.5 inch
   e.  1100 - 1500 rpm: 0.2 inch
   f.  Over 1500 rpm: 0.15 inch

3.  Upper Floors, Normal
   a.  Under 400 rpm: 3.5 inch
   b.  400 - 600 rpm: 3.5 inch
   c.  600 - 800 rpm: 2 inch
   d.  800 - 900 rpm: 1 inch
   e.  1100 - 1500 rpm: 0.5 inch
   f.  Over 1500 rpm: 0.2 inch

4.  Upper Floors, Critical
   a.  Under 400 rpm: 3.5 inch
   b.  400 - 600 rpm: 3.5 inch
   c.  600 - 800 rpm: 3.5 inch
   d.  800 - 900 rpm: 2 inch
   e.  1100 - 1500 rpm: 1 inch
f. Over 1500 rpm: 0.5 inch

C. Upper floor locations shall be considered critical unless otherwise indicated.

D. Use concrete inertia bases for fans having static pressure in excess of 3.5 inch WC or motors in excess of 40 HP, and on base mounted pumps over 10 HP.

PART 2 PRODUCTS

2.1 VIBRATION ISOLATORS

A. Open Spring Isolators:
   1. Spring Isolators:
      a. For Exterior and Humid Areas: Provide hot dipped galvanized housings and neoprene coated springs.
      b. Code: Color code springs for load carrying capacity.
   2. Springs: Minimum horizontal stiffness equal to 75 percent vertical stiffness, with working deflection between 0.3 and 0.6 of maximum deflection.
   3. Spring Mounts: Provide with leveling devices, minimum 0.25 inch thick neoprene sound pads, and zinc chromate plated hardware.
   4. Sound Pads: Size for minimum deflection of 0.05 inch; meet requirements for neoprene pad isolators.

B. Restrained Spring Isolators:
   1. Spring Isolators:
      a. For Exterior and Humid Areas: Provide hot dipped galvanized housings and neoprene coated springs.
      b. Code: Color code springs for load carrying capacity.
   2. Springs: Minimum horizontal stiffness equal to 75 percent vertical stiffness, with working deflection between 0.3 and 0.6 of maximum deflection.
   3. Spring Mounts: Provide with leveling devices, minimum 0.25 inch thick neoprene sound pads, and zinc chromate plated hardware.
   4. Sound Pads: Size for minimum deflection of 0.05 inch; meet requirements for neoprene pad isolators.
   5. Restraint: Provide heavy mounting frame and limit stops.

C. Closed Spring Isolators:
   1. Spring Isolators:
      a. For Exterior and Humid Areas: Provide hot dipped galvanized housings and neoprene coated springs.
      b. Code: Color code springs for load carrying capacity.
   2. Type: Closed spring mount with top and bottom housing separated with neoprene rubber stabilizers.
   3. Springs: Minimum horizontal stiffness equal to 75 percent vertical stiffness, with working deflection between 0.3 and 0.6 of maximum deflection.
   4. Housings: Incorporate neoprene isolation pad meeting requirements for neoprene pad isolators, and neoprene side stabilizers with minimum 0.25 inch clearance.

D. Restrained Closed Spring Isolators:
   1. Spring Isolators:
      a. For Exterior and Humid Areas: Provide hot dipped galvanized housings and neoprene coated springs.
      b. Code: Color code springs for load carrying capacity.
   2. Type: Closed spring mount with top and bottom housing separated with neoprene rubber stabilizers.
3. Springs: Minimum horizontal stiffness equal to 75 percent vertical stiffness, with working deflection between 0.3 and 0.6 of maximum deflection.
4. Housings: Incorporate neoprene isolation pad meeting requirements for neoprene pad isolators, and neoprene side stabilizers with minimum 0.25 inch clearance and limit stops.

E. Spring Hanger:
1. Spring Isolators:
   a. For Exterior and Humid Areas: Provide hot dipped galvanized housings and neoprene coated springs.
   b. Code: Color code springs for load carrying capacity.
2. Springs: Minimum horizontal stiffness equal to 75 percent vertical stiffness, with working deflection between 0.3 and 0.6 of maximum deflection.
3. Housings: Incorporate [neoprene isolation pad meeting requirements for neoprene pad isolators] [rubber hanger with threaded insert].

F. Neoprene Pad Isolators:
1. Rubber or neoprene waffle pads.
   a. 30 durometer.
   b. Minimum ½ inch thick.
   c. Maximum loading 40 psi.
   d. Height of ribs shall not exceed 0.7 times width.

G. Configuration: ½ inch thick waffle pads bonded each side of ¼ inch thick steel plate.

H. Rubber Mount or Hanger: Molded rubber designed for 0.5 inches deflection with threaded insert.

I. Glass Fiber Pads: Neoprene jacketed pre-compressed molded glass fiber.

J. Seismic Snubbers:
1. Type: Non-directional and double acting unit consisting of interlocking steel members restrained by neoprene elements.
2. Neoprene Elements: Replaceable, minimum of 0.75 inch thick.
3. Capacity: 4 times load assigned to mount groupings at 0.4 inch deflection.
4. Attachment Points and Fasteners: Capable of withstanding 3 times rated load capacity of seismic snubber.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions. See drawings for types of vibration isolation required.

B. Install isolation for motor driven equipment.

C. Bases:
   1. Set steel bases for one inch clearance between housekeeping pad and base.
   2. Set concrete inertia bases for 2 inch clearance between housekeeping pad and base.

D. Adjust equipment level.

E. Install spring hangers without binding.
F. On closed spring isolators, adjust so side stabilizers are clear under normal operating conditions.

G. Prior to making piping connections to equipment with operating weights substantially different from installed weights, block up equipment with temporary shims to final height. When full load is applied, adjust isolators to load to allow shim removal.

H. Provide pairs of horizontal limit springs on fans with more than 6.0 inch static pressure, and on hanger supported, horizontally mounted axial fans.

I. Support piping connections to isolated equipment resiliently to nearest flexible pipe connector.

J. Connect wiring to isolated equipment with flexible hanging loop.

3.2 MANUFACTURER’S FIELD SERVICES

A. Inspect isolated equipment after installation and submit report. Include static deflections.

END OF SECTION

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PART 1 GENERAL

1.1 SECTION INCLUDES

A. Nameplates.
B. Tags.
C. Stencils.
D. Pipe Markers.

1.2 REFERENCES: Material and/or equipment specified in this section shall meet or exceed one or more of the property requirements or installation requirements of the following specifications/publications as applicable to the specific product or end use:

A. ANSI or equal standards for the Identification of Piping Systems.

PART 2 PRODUCTS

2.1 NAMEPLATES

A. Description: Laminated three-layer plastic with engraved black letters on light contrasting background color. Furnish and install on all mechanical equipment.

2.2 TAGS

A. Metal Tags: Brass with stamped letters; tag size minimum 1½ inch diameter with smooth edges.
B. Chart: Typewritten letter size list in anodized aluminum frame.

2.3 STENCILS

A. Stencils: With clean cut symbols and letters of following size:
1. ¾ to 1¼ inch Outside Diameter of Insulation or Pipe: 8 inch long color field, ½ inch high letters.
2. 1½ to 2 inch Outside Diameter of Insulation or Pipe: 8 inch long color field, ¾ inch high letters.
3. 2½ to 6 inch Outside Diameter of Insulation or Pipe: 12 inch long color field, 1¼ inch high letters.
4. 8 to 10 inch Outside Diameter of Insulation or Pipe: 24 inch long color field, 2½ inch high letters.

B. Stencil Paint shall be semi-gloss enamel, colors conforming to ASME A13.1.

2.4 PIPE MARKERS

A. Color: Match existing or conform to ANSI/OSHA standards.
B. 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.

C. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

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.

2.5 CEILING TACKS

A. Description: Steel with ¼ inch diameter color coded head.

B. Color code as follows:
   1. Yellow - HVAC equipment
   2. Red - Fire dampers/smoke dampers
   3. Green - Plumbing valves
   4. Blue - Heating/cooling valves

PART 3 EXECUTION

3.1 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

B. Prepare surfaces as required by manufacturer’s installations for stencil painting.

3.2 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.

D. Install plastic tape pipe markers complete around pipe in accordance with manufacturer’s instructions.

E. Identify each piece of equipment with plastic nameplates. Small devices, such as in-line pumps, may be identified with tags.

F. Identify control panels and major control components outside panels with plastic nameplates.

G. Identify thermostats relating to terminal boxes or valves with nameplates.

H. Identify valves in main and branch piping with tags.

I. Tag automatic controls, instruments, and relays. Key to control schematic.

J. Identify piping, concealed or exposed, with plastic tape pipe markers or stenciled painting. Identify service, flow direction, and pressure. Install in clear view and align
with axis of piping. Locate identification not to exceed 10 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.

K. Identify ductwork with stenciled painting. Identify with air handling unit identification number and area served. Locate identification at air handling unit, at each side of penetration of structure or enclosure, and at each obstruction.

L. Provide ceiling tacks to locate valves or dampers above T-bar type panel ceilings. Locate in corner of panel closest to equipment.

M. Identify access points at the exterior of all fire, smoke, or combination fire/smoke dampers with a permanent label, having letters not less than ½” in height, reading fire damper, smoke damper or fire/smoke damper respectively.

END OF SECTION

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PART 1 GENERAL

1.1 SECTION INCLUDES

A. Testing, adjustment, and balancing of air systems.
B. Testing, adjustment, and balancing of hydronic systems.
C. Measurement of final operating condition of HVAC systems.

1.2 RELATED SECTIONS AND DRAWINGS

A. All drawings and specification sections apply to work in this section. Furnish all items, articles, materials, equipment, operations or methods that are mentioned, listed or scheduled on drawings or are in this specification including all labor, equipment, materials and miscellaneous incidentals necessary and/or required for the completion of this project. The work covered under this section of the specifications is in no way complete within itself but is supplementary to the entire specification and drawings.

1.3 REFERENCES: Material and/or equipment specified in this section shall meet or exceed one or more of the property requirements or installation requirements of the following specifications/publications as applicable to the specific product or end use:

A. AABC - National Standards for Total System Balance.
B. ADC - Test Code for Grilles, Registers, and Diffusers.

1.4 SUBMITTALS

A. Submit electronic draft copies of report for review prior to final acceptance of Project. Provide electronic final copies for Architect/Engineer review and for inclusion in operating and maintenance manuals.

B. Provide reports in 3-ring binder manuals, complete with index page and indexing tabs, with cover identification at front and side. Include set of reduced drawings with air outlets and equipment identified to correspond with data sheets, and indicating thermostat locations. Binder shall be high quality hard cover type.

C. Include detailed procedures, agenda, sample report forms and copy of NEBB Project Performance Guaranty prior to commencing system balance.

D. Test Reports: Indicate data on AABC National Standards for Total System Balance forms or forms approved in writing by Architect/Engineer.
1.5 PROJECT RECORD DOCUMENTS

A. Record actual locations of flow measuring stations and/or balancing valves and rough setting.

1.6 QUALITY ASSURANCE

A. Perform total system balance in accordance with AABC National Standards for Field Measurement and Instrumentation, Total System Balance.

B. Maintain one copy of each document on site.

C. The final air balance report shall be approved by the Architect/Engineer prior to final payment to the Contractor. The Engineer reserves the right to ask for and be furnished any additional information he deems necessary to be shown on air/water balance report.

1.7 QUALIFICATIONS

A. Agency: Independent company (not associated with the systems installing contractor) specializing in the testing, adjusting, and balancing of systems specified in this Section with minimum three years experience and NEBB certified. The test and balance agency selected by the Contractor shall be approved by the Engineer. The Mechanical Trades shall be responsible for any cost differences between the test and balance agency selected by the Contractor and the test and balance agency approved by the Engineer.

1.8 SEQUENCING AND SCHEDULING

A. Sequence work to commence after completion of systems and schedule completion of work before Substantial Completion of Project. Coordinate project schedule with contractor. The Mechanical Trades shall coordinate and schedule the on-site balancing with the Engineer to allow the Engineer the ability to be at the project site during the time of the balancing. If the Engineer is not scheduled to oversee the balance of systems, the Mechanical Trades shall be responsible for rebalancing the system in the presence of the Engineer and be responsible for all costs for such.

B. The Test and Balance Agency shall schedule/coordinate (through the Mechanical Contractor) with the Temperature Control Contractor. The Temperature Control Contractor should be on site during the air balance to verify proper operation of the system required for the air balance.

C. Acceptable Test and Balance Contractors.
   1. HiTech Test and Balance (Freeland, MI)
   2. Absolute Balance Company (South Lyon, MI)
   3. Enviro-Aire/Total Balance Company (St Clair Shores, MI)
   4. Ener-Tech Testing (Holly, MI)
   5. International Test & Balance (Southfield, MI)
   6. Pro-Mec Engineering Services, Inc. (Grand Ledge, MI)

PART 2 PRODUCTS - Not used

PART 3 EXECUTION
3.1 EXAMINATION

A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
1. Systems are started and operating in a safe and normal condition.
2. Temperature control systems are installed complete and operable.
3. Proper thermal overload protection is in place for electrical equipment.
4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
5. Duct systems are clean of debris.
6. Fans are rotating correctly.
7. Fire and volume dampers are in place and open.
8. Air coil fins are cleaned and combed.
9. Access doors are closed and duct end caps are in place.
10. Air outlets are installed and connected.
11. Duct system leakage is minimized.
12. Hydronic systems are flushed, filled, and vented.
13. Pumps are rotating correctly.
14. Proper strainer baskets are clean and in place.
15. Service and balance valves are open.

B. Submit field reports. Report defects and deficiencies noted during performance of services which prevent system balance.

C. Beginning of work means acceptance of existing conditions.

3.2 PREPARATION

A. Provide a review of proposed design drawings and advise appropriate trades about additional balancing devices required to attain design conditions.

B. Advise Engineer about additional balancing devices required to attain design conditions.

C. Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to Architect/Engineer to facilitate spot checks during testing.

3.3 INSTALLATION TOLERANCES

A. Air Handling Systems: Adjust to within plus or minus 10 percent of design for supply, return and exhaust systems.

B. Air Outlets and Inlets: Adjust to within plus 10 percent and minus 5 percent of design and to Owner's satisfaction. Respond to Owner complaints of unsatisfactory room temperatures by adjusting outlets and/or inlets to more or less air as required.

C. Hydronic Systems: Adjust to within plus or minus 10 percent of design.

3.4 ADJUSTING

A. Ensure recorded data represents actual measured or observed conditions.

B. Permanently mark settings of adjustment devices allowing settings to be restored. Set and lock memory stops.
C. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.

D. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

E. At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by the Owner.

F. Check and adjust systems approximately six months after final acceptance and submit report.

3.5 AIR SYSTEM PROCEDURE

A. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities. The air balance agency shall be responsible for removing all adjustable motor pulleys and replacing them with fixed motor pulleys after air balancing the system. Include costs for all air systems to be readjusted to required air volumes. Pitot duct mains at supply air and return air ducts at air handling systems and exhaust fans to verify air quantity at units vs. at diffusers and grilles.

B. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.

C. Measure air quantities at air inlets and outlets.

D. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.

E. Use volume control devices at outlets to regulate air quantities so that outlets do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers in ducts.

F. Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by damper regulation.

G. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.

H. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.

I. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.

J. Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.

K. Where modulating dampers are provided, take measurements and balance at extreme conditions. Balance variable volume systems at maximum air flow rate, full cooling, and at minimum air flow rate, full heating.
L. Measure building static pressure and adjust supply, return, and exhaust air systems to provide required relationship between each to maintain approximately 0.05 inches positive static pressure near the building entries.

M. Check units for motorized damper leakage. Adjust air quantities with mixing dampers set first for cooling, then heating, then modulating.

N. For variable air volume units set volume controller to air flow setting indicated. Confirm connections properly made and confirm proper operation for automatic variable air volume temperature control.

O. On VAV boxes, adjust for proper operation.

P. Advise Mechanical Contractor about additional balancing devices required to attain design conditions.

Q. Adjust adjustable pitch sheaves to setting as required by actual conditions. If sheave size or type changes are recommended, include the recommendation in the draft copy of the report to allow the Owner to be informed of, and be responsible for, the recommendation for the change.

3.6 WATER SYSTEM PROCEDURE

A. Adjust water systems to provide required or design quantities.

B. Use calibrated Venturi tubes, orifices, or other metered fittings and pressure gages to determine flow rates for system balance. Where flow metering devices are not installed, base flow balance on temperature difference across various heat transfer elements in the system.

C. Adjust systems to provide specified pressure drops and flows through heat transfer elements prior to thermal testing. Perform balancing by measurement of temperature differential in conjunction with air balancing.

D. Effect system balance with automatic control valves fully open to heat transfer elements.

E. Effect adjustment of water distribution systems by means of balancing cocks, valves, and fittings. Do not use service or shut-off valves for balancing unless indexed for balanced point.

F. Where available pump capacity is less than total flow requirements or individual system parts, full flow in one part may be simulated by temporary restriction of flow to other parts.

G. Advise Mechanical Contractor about additional balancing devices required to attain design conditions.

H. If pump impellor trimming or size change is recommended to improve reliability or reduce operating cost, include the recommendation in the draft copy of the report, to allow the Owner to be informed of, and be responsible for, the recommendation for the change.

3.7 SCHEDULES
A. Equipment Requiring Testing, Adjusting, and Balancing shall include but not be limited to: Air moving equipment such as exhaust fans, air handlers, return fans, etc.; terminal devices such as grilles and diffusers, variable air volume boxes, etc.; all hydronic systems such as pumps, chillers, flow control valves, coils, etc. See drawings for equipment utilized for this project and submit applicable report forms for this project air and/or water system(s).

B. Report Forms
1. Title Page:
   a. Name of Testing, Adjusting, and Balancing Agency
   b. Address of Testing, Adjusting, and Balancing Agency
   c. Telephone number of Testing, Adjusting, and Balancing Agency
   d. Project name
   e. Project location
   f. Project Architect
   g. Project Engineer
   h. Project Contractor
   i. Project altitude
   j. Report date
2. Summary Comments:
   a. Design versus final performance
   b. Notable characteristics of system
   c. Description of systems operation sequence
   d. Summary of outdoor and exhaust flows to indicate amount of building pressurization
   e. Nomenclature used throughout report
   f. Test conditions
3. Instrument List:
   a. Instrument
   b. Manufacturer
   c. Model number
   d. Serial number
   e. Range
   f. Calibration date
4. Electric Motors:
   a. Manufacturer
   b. Model/Frame
   c. HP/BHP
   d. Phase, voltage, amperage; nameplate, actual, no load
   e. RPM
   f. Service factor
   g. Starter size, rating, heater elements
   h. Sheave Make/Size/Bore
5. V-Belt Drive:
   a. Identification/location
   b. Required driven RPM
   c. Driven sheave, diameter and RPM
   d. Belt, size and quantity
   e. Motor sheave diameter and RPM
   f. Center to center distance, maximum, minimum, and actual
6. Pump Data:
   a. Identification/number
   b. Manufacturer
   c. Size/model
   d. Impeller
e. Service
f. Design flow rate, pressure drop, BHP
g. Actual flow rate, pressure drop, BHP
h. Discharge pressure
i. Suction pressure
j. Total operating head pressure
k. Shut off, discharge and suction pressures
l. Shut off, total head pressure
m. Heat output

7. Air Cooled Condenser:
a. Identification/number
b. Location
c. Manufacturer
d. Model number
e. Serial number
f. Entering DB air temperature, design and actual
g. Leaving DB air temperature, design and actual
h. Number of compressors

8. Cooling Coil Data:
a. Identification/number
b. Location
c. Service
d. Manufacturer
e. Air flow, design and actual
f. Entering air DB temperature, design and actual
g. Entering air WB temperature, design and actual
h. Leaving air DB temperature, design and actual
i. Leaving air WB temperature, design and actual
j. Water flow, design and actual
k. Water pressure drop, design and actual
l. Entering water temperature, design and actual
m. Leaving water temperature, design and actual
n. Saturated suction temperature, design and actual
o. Air pressure drop, design and actual

9. Heating Coil Data:
a. Identification/number
b. Location
c. Service
d. Manufacturer
e. Air flow, design and actual
f. Water flow, design and actual
g. Water pressure drop, design and actual
h. Entering water temperature, design and actual
i. Leaving water temperature, design and actual
j. Entering air temperature, design and actual
k. Leaving air temperature, design and actual
l. Air pressure drop, design and actual

10. Air Moving Equipment:
a. Location
b. Manufacturer
c. Model number
d. Serial number
e. Arrangement/Class/Discharge
f. Air flow, specified and actual per pilot readings at equipment and per totaled outlets.
g. Return air flow, specified and actual per pitot readings at equipment and per totaled inlets.

h. Outside air flow, specified and actual per pitot.

i. External and total static pressure, specified and actual

c. Inlet pressure

d. Discharge pressure

l. Sheave Make/Size/Bore

m. Number of Belts/Make/Size

n. Fan RPM

11. Return Air/Outside Air Data:
a. Identification/location

b. Design return air flow

c. Actual return air flow per pitot readings at equipment and per totaled grilles air flow measurement

d. Design outside air flow

e. Actual outside air flow per pitot readings

f. Return air temperature

g. Outside air temperature

h. Required mixed air temperature

i. Actual mixed air temperature

j. Design outside/return air ratio

k. Actual outside/return air ratio

12. Exhaust Fan Data:
a. Location

b. Manufacturer

c. Model number

d. Serial number

e. Air flow, specified and actual per pitot readings at exhaust fan and per totaled exhaust grilles or duct inlets.

f. Static pressure, specified and actual

g. Inlet pressure

h. Discharge pressure

i. Sheave Make/Size/Bore

j. Number of Belts/Make/Size

k. Fan RPM

13. Duct Traverse:
a. System zone/branch and at all equipment (AHUs, RTUs, EFs, etc.)

b. Duct size

c. Area

d. Design velocity

e. Design air flow

f. Test velocity

g. Test air flow

h. Duct static pressure

i. Air temperature

j. Air correction factor

14. Duct Leak Test:
a. Description of ductwork under test

b. Duct design operating pressure

c. Duct design test static pressure

d. Duct capacity, air flow

e. Maximum allowable leakage duct capacity times leak factor

f. Test apparatus

1) Blower

2) Orifice, tube size

3) Orifice size
4) Calibrated
   g. Test static pressure
   h. Test orifice differential pressure
   i. Leakage

15. Terminal Unit Data:
   a. Manufacturer
   b. Type, constant, variable, single, dual duct
   c. Identification/number
   d. Location
   e. Model number
   f. Size
   g. Minimum static pressure
   h. Minimum design air flow
   i. Maximum design air flow
   j. Maximum actual air flow
   k. Inlet static pressure

16. Air Distribution Test Sheet:
   a. Air terminal number
   b. Room number/location
   c. Terminal type
   d. Terminal size
   e. Area factor
   f. Design velocity
   g. Design air flow
   h. Test (final) velocity
   i. Test (final) air flow
   j. Percent of design air flow

17. Sound Level Report:
   a. Location
   b. Octave bands-equipment off
   c. Octave bands-equipment on

18. Vibration Test:
   a. Location of points:
      1) Fan bearing, drive end
      2) Fan bearing, opposite end
      3) Motor bearing, center (if applicable)
      4) Motor bearing, drive end
      5) Motor bearing, opposite end
      6) Casing (bottom or top)
      7) Casing (side)
      8) Duct after flexible connection (discharge)
      9) Duct after flexible connection (suction)
   b. Test readings:
      1) Horizontal, velocity and displacement
      2) Vertical, velocity and displacement
      3) Axial, velocity and displacement
   c. Normally acceptable readings, velocity and acceleration
   d. Unusual conditions at time of test
   e. Vibration source (if non-complying)

END OF SECTION

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SECTION 23 07 13
EXTERNAL DUCT INSULATION

PART 1 GENERAL

1.1 SECTION INCLUDES EXTERNAL INSULATION FOR:

A. Supply air ducts. Note: See drawings or Section 230825, internal duct cover, for notes on whether the supply air ductwork downstream of VAV boxes is to be insulated. If drawings or Section 230825 call for internal duct insulation, delete external duct insulation downstream of the VAV box.

B. Outside air intake ducts.

C. Ducts located outdoors.

1.2 RELATED SECTIONS

A. All drawings and specification sections apply to work in this section. Furnish all items, articles, materials, equipment, operations or methods that are mentioned, listed or scheduled on drawings or are in this specification including all labor, equipment, materials and miscellaneous incidentals necessary and/or required for the completion of this project. The work covered under this section of the specifications is in no way complete within itself but is supplementary to the entire specification and drawings.

1.3 REFERENCES

A. Thermal insulation materials shall meet the property requirements of one or more of the following specifications as applicable to the specific product or end use:

   1. American Society for Testing of Materials and Specifications:

      a. ASTM C533, "Standard Specification for Calcium Silicate Pipe and Block Insulation"


      c. ASTM C612, "Standard Specification for Mineral Fiber Block and Board Thermal Insulation"

      d. ASTM C1136, "Standard Specification for Barrier Material, Vapor," Type 1 or 2 (jacket only)

B. Insulation materials, including all weather and vapor barrier material, closures, hangers, supports, fitting covers, and other accessories shall be furnished and installed in strict accordance with project drawings, plans and specifications.

1.4 SCOPE

A. The work covered by this specification consists of furnishing all labor, equipment, materials and performing all operations required, for the correct fabrication and installation of thermal insulation applied to commercial ductwork systems in accordance with the applicable project specifications, and drawings, subject to the terms and conditions of the contract.

B. The above temperature ranges are typical for these systems. However, if contract specifications call for service temperatures outside the above ranges, consult the
manufacturer’s published data to determine the operating temperature limitations of
the insulation products or products under consideration.

1.5 DEFINITIONS

A. The term “mineral fiber” as defined by the above specifications includes fibers
manufactured of glass, rock, or slag processed from a molten state with or without
binder.

B. Exposed ductwork shall include ductwork installed in areas used by personnel in the
normal use of the building, such as finished work rooms, offices, mechanical rooms,
storage rooms, etc.

C. Exposed finished areas include areas that normally have finished walls, ceilings, floors,
etc. such as offices.

D. Concealed ductwork shall include ductwork installed in areas similar to pipe tunnels,
covered pipe trenches, spaces inside walls, duct or pipe shafts, spaces above dropped
ceilings, unfinished attic spaces, crawl spaces, etc.

1.6 SYSTEM PERFORMANCE

A. Insulation materials furnished and installed hereunder should meet the minimum
economic insulation thickness requirements of the North American Insulation
Manufacturer’s Association (NAIMA) (Formerly known as TIMA), to ensure cost
effective energy conservation performance. Alternatively, materials should exceed the
minimum thickness requirements of National Voluntary Consensus Standard 90.1
(1989), energy Efficient Design of New Buildings”, of the American Society of Heating,
Refrigeration, and Air Conditioning Engineers (ASHRAE). However, if other factors
such as condensation control or personnel protection are to be considered, the
selection of the thickness of insulation should satisfy the controlling factor.

B. Insulation materials furnished and installed hereunder shall be Class A, maximum of 25
flame spread, 35 fuel contributed and 50 smoke developed rating and shall meet the
fire hazard requirements of the following specifications:

1. American Society for Testing of Materials ASTM E84
2. Underwriter’s laboratories, Inc. UL 723

C. Calcium silicate products shall include a visual identification system to permit positive
field determination of their asbestos-free characteristic.

1.7 QUALITY ASSURANCE

A. Insulation materials and accessories furnished and installed hereunder shall, where
required, be accompanied by manufacturers’ current submittal or data sheets showing
compliance with applicable specifications.

B. Insulation materials and accessories shall be installed in a workmanlike manner by
skilled and experienced workers who are regularly engaged in commercial insulation
work.

1.8 DELIVERY AND STORAGE OF MATERIALS
A. All of the insulation materials and accessories covered by this specification shall be delivered to the job site and stored in a safe, dry place with appropriate labels and/or other product identification.

B. The contractor shall use whatever means are necessary to protect the insulation materials and accessories before, during and after installation. No insulation materials shall be installed that has become damaged in any way. The contractor shall also use all means necessary to protect work and materials installed by other trades.

C. If any insulation material has become wet the contractor shall not install such material, and shall remove it from the job site. An exception may be allowed in cases where the contractor is able to demonstrate that wet insulation when fully dried out (either before installation, or afterward following exposure to system operating temperatures) will provide installed performance that is equivalent in all respects to new, completely dry insulation. In such cases, consult the insulation manufacturer for technical assistance.

PART 2 PRODUCTS

2.1 DUCTWORK LOCATED INDOORS

A. Ductwork shall be externally insulated with Fiberglas insulation in blanket, batt or board form, selected to conform readily to the surface to which it will be applied. Vapor barrier shall be legibly printed by the manufacturer to indicate nominal thickness, R-value and type of insulation. External insulation shall be as follows:

1. Concealed Ductwork
   a. Rectangular, round or oval ductwork: Fiberglas All-Service duct wrap, light density glass fiber insulation in roll form, 1½" thick, 1.0 lb per cubic foot density, faced with a reinforced foil/kraft laminate vapor barrier. All joints shall be stapled with outward clinching staples and where a vapor barrier is required, sealed with pressure sensitive tape matching the facing, FRK backing stock or glass fabric and mastic. Adjacent sections shall be tightly butted with the 2" tape flap overlapping.

2. Exposed Rectangular Ductwork
   a. Rectangular: Fiberglas type 705, 2" thick, 3.0 lbs per cubic foot density insulation, heavy density glass fiber insulation in semi-rigid or rigid board form, faced with reinforced foil/kraft laminate vapor barrier. All joints shall be stapled with outward clinching staples and where a vapor barrier is required, sealed with pressure sensitive tape matching the facing, FRK backing stock or glass fabric and mastic. Adjacent sections shall be tightly butted with the 2" tape flap overlapping.

3. Exposed Round or Oval Ductwork
   a. Cross Section less than 10" diameter: Fiberglas all-service duct wrap, 1½" thick, 1.5 lb per cubic foot density, with FSK foil face. All joints shall be stapled with outward clinching staples and where a vapor barrier is required, sealed with pressure sensitive tape matching the facing, FRK backing stock or glass fabric and mastic. Adjacent sections shall be tightly butted with the 2" tape flap overlapping. If installed in high abuse
areas like gymnasiums or locker rooms, use 1” thick elastomeric with foil type wrap (similar to Venture Clad Plus).

b. Cross section 10” or more in diameter: Fiberglas, Pipe and Tank Insulation, heavy density glass 1½” thick 4.5 lb per cubic foot density, semi-rigid insulation, end grain factory-adhered to ASJ all-service jacket. All joints shall be stapled with outward clinching staples where a vapor barrier is required, sealed with pressure sensitive tape matching the facing, FRK backing stock or glass fabric and mastic. Adjacent sections shall be tightly butted with the 2” tape flap overlapping.

4. Ductwork Located Outdoors

a. All ductwork (supply, return, exhaust, outside air, relief air) located outdoors shall be covered externally with either 2” of flexible elastomeric closed-cell insulation or 2” of Foamglas® closed cell insulation.

b. Installation shall meet manufacturer’s recommendations, with all joints firmly butted and secured with adhesives or fasteners.

c. All ductwork insulation shall be jacketed with a multi-ply, fabric reinforced, self-adhesive insulation cladding material with a vapor barrier and a thickness of 0.015”. Jacketing system shall be Venture Clad Plus #1579CW-E, or equal.

d. Install all insulation and jacketing in accordance with manufacturer’s installation instructions.

e. Rectangular ductwork shall be installed with a crown or slope on top to prevent water from ponding. Insulation and jacketing shall be installed on top of duct and crown or slope shim.

f. Jacketing shall be installed to each of the sides separately, starting with bottom, then sides and finally the top. Each side shall overlap the other by 3”. The sides shall overlap the bottom and the top shall overlap the sides.

g. All jacketing seams must be taped with manufacturer’s recommended jointing/seaming tape.

h. All underlying foil faced insulation must be sealed with foil or FSK tape.

PART 3  EXECUTION

3.1 SITE INSPECTION

A. Before starting work under this section, carefully inspect the site and installed work of other trades and verify that such work is complete to the point where installation of materials and accessories under this section can begin.

B. Verify that all materials and accessories can be installed in accordance with project drawings and specifications and material manufacturers’ recommendations.

C. Verify by inspecting product labeling, submittal data, and/or certifications which may accompany the shipments that all materials and accessories to be installed on the
project comply with applicable specifications and standards and meet specified thermal and physical properties.

3.2 PREPARATION

A. Ensure that all seams and joints in ductwork have been sealed by the contractor responsible for duct systems.

B. Ensure that pressure testing of duct systems has been completed prior to installing insulation.

C. Ensure that all duct surfaces over which or within which insulation is to be installed are clean and dry.

D. Ensure that insulation is clean, dry, and in good mechanical condition with all factory-applied vapor or weather barriers intact and undamaged. Wet, dirty, or damaged insulation shall not be acceptable for installation.

3.3 INSTALLATION

A. General

1. Install insulation in accordance with manufacturer's published instructions and recognized industry practice to ensure that it will serve its intended purpose.

2. Install insulation materials with smooth and even surfaces. Butt joints firmly together to ensure complete and tight fit over surfaces to be covered.

3. Maintain the integrity of factory-applied vapor barrier jacketing on all insulation, protecting it against puncture, tears or other damage. All staples used on ductwork insulation shall be coated with suitable sealant to maintain vapor barrier integrity.

B. Penetrations

1. Extend ductwork insulation without interruption through walls, floors etc., except at fire dampers or unless noted otherwise.

C. Duct Wrap Insulation

1. Insulation shall be applied to sheet metal ductwork or plenums with all joints butted firmly together, using manufacturer's recommended stretch-out tables (see Owens-Corning Pub. No. 3-MS-9266) to prevent excessive compression. Insulation shall be secured with mechanical fasteners spaced at 16" maximum centers on the bottom of 24" or wider ducts to prevent the insulation from sagging.

2. All joints shall be firmly butted together and where a vapor barrier is required, sealed with pressure sensitive tape matching the facing, FRK backing stock or glass fabric and mastic. Adjacent sections shall be tightly butted with the 2" tape flap overlapping.

D. Rigid Insulation
1. Board shall be secured to ductwork with adhesive or with mechanical fasteners with welded pins, secured with insulation caps and washers matching color of the vapor barrier facing. If used, mechanical fasteners shall be within 3” (max.) of board edges, 12” maximum on center.

2. All joints shall be firmly butted together and where a vapor barrier is required, sealed with pressure sensitive tape matching the facing, FRK backing stock or glass fabric and mastic.Adjacent sections shall be tightly butted with the 2” tape flap overlapping.

3. Corner angles shall be installed on all external corners of rigid duct insulation in exposed finished areas before jacketing, except kitchen hood exhaust duct insulation which shall have no corner angles.

3.4 FIELD QUALITY ASSURANCE

A. Upon completion of all insulation work covered by this specification, visually inspect the work and verify that it has been correctly installed. This may be done while work is in progress, to assure compliance with requirements herein to cover and protect insulation materials during installation.

3.5 PROTECTION

A. Replace damaged insulation which cannot be satisfactorily repaired, including insulation with vapor barrier damage and moisture-saturated insulation.

B. Protect the insulation work during the remainder of the construction period to avoid damage and deterioration of the finished insulation work.

3.6 SAFETY PRECAUTIONS

A. Insulation contractor’s employees shall be properly protected during installation of all insulation. Protection shall include proper attire when handling and applying insulation materials, and shall include (but not be limited to) disposable dust respirators, gloves, hard hats, and eye protection.

B. The insulation contractor shall conduct all job site operations in compliance with applicable provisions of the Occupational Safety and Health Act, as well as with all state and/or local safety and health codes and regulations that may apply to the work.

3.7 ASBESTOS INSULATION

A. Any existing asbestos insulation on existing ductwork, equipment, etc. where tie-ins are required, shall be removed by the Owner at the Owner’s expense. The Contractor and Architect/Engineer shall not be responsible for any cost or work involved with removal or encapsulation of asbestos insulation.

END OF SECTION

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SECTION 23 07 19
HVAC PIPE SYSTEM INSULATION

PART 1 GENERAL

1.1 SECTION INCLUDES PIPE INSULATION FOR:

A. Heating hot water supply and return piping system.
B. Refrigerant piping system.
C. Cooling coil drain piping inside the building.
D. Outdoor piping.
E. Valves and fittings.
F. Miscellaneous tanks, valves, chilled water pump impellor housings, piping, etc.

1.2 RELATED SECTIONS

A. All drawings and specification sections apply to work in this section. Furnish all items, articles, materials, equipment, operations or methods that are mentioned, listed or scheduled on drawings or are in this specification, including all labor, equipment, materials and miscellaneous incidentals necessary and/or required for the completion of this project. The work covered under this section of the specifications is in no way complete within itself, but is supplementary to the entire specification and drawings.

1.3 REFERENCES

A. Thermal insulation materials shall meet the property requirements of the following specifications as applicable to the specific product or end use:
B. American Society for Testing of Materials Specifications:
   2. ASTM C533, "Standard Specification for Calcium Silicate Pipe & Block Insulation"
   3. ASTM C585, "Recommended Practice for Inner and Outer Diameters of Rigid Pipe Insulation for Nominal Sizes of Pipe and Tubing (NPS System)"
   4. ASTM C1136, "Standard Specification for Barrier Material, Vapor," Type 1 or 2 (jacket only)
C. Insulation materials, including all water and vapor barrier materials, closures, hangers, supports, fitting covers, and other accessories, shall be furnished and installed in strict accordance with project drawings, plans, and specifications.

1.4 SCOPE

A. The work covered by this specification consists of furnishing all labor, equipment, materials and accessories, and performing all operations required, for the correct fabrication and installation of thermal insulation applied to the following commercial piping systems, in accordance with the applicable project specifications and drawings, subject to the terms and conditions of the contract:
1. Hot Piping – Fluid temperature 105°F and up.
2. Cold Piping – Fluid temperature below 105°F.

B. Insulation, vapor barriers, jacketing, hangers, supports, accessory materials, etc. shall be installed according to manufacturer’s recommendations.

1.5 DEFINITIONS

A. The term "mineral fiber" as defined by the above specifications includes fibers manufactured of glass, rock, or slag processed from a molten state, with or without binder.

1.6 SYSTEM PERFORMANCE

A. Insulation material furnished and installed hereunder shall meet the minimum thickness requirements of Standard 90.1 (2007), "Energy Efficient Design of new Buildings" of the American Society of Heating, Refrigeration, and Air-Conditioning Engineers (ASHRAE) except minimum thickness shall be 1”. However, if other factors such as condensation control or personnel protection are to be considered, the selection of the thickness of insulation should satisfy the controlling factor.

B. Insulation materials furnished and installed hereunder shall be Class A maximum of 25 flame spread, 35 fuel contributed and 50 smoke developed rating and shall meet the fire hazard requirements of each of the following specifications:
   1. American Society for Testing of Materials ASTM E84
   2. Underwriters’ Laboratories, Inc. UL 723
   3. National Fire Protection Associations NFPA 255

C. Calcium silicate products shall include a visual identification system to permit positive field determination of their asbestos-free characteristic.

1.7 QUALITY ASSURANCE

A. The contractor shall use whatever means are necessary to protect the insulation materials and accessories before, during and after installation. No insulation material shall be installed that has become damaged in any way. The contractor shall also use all means necessary to protect work and materials installed by other trades.

B. If any insulation material has become wet because of transit or job site exposure to moisture or water, the contractor shall not install such material, and shall remove it from the job site. An exception may be allowed in cases where the contractor is able to demonstrate that wet insulation when fully dried out (either before installation, or afterward following exposure to system operating temperatures) will provide installed performance that is equivalent in all respects to new, completely dry insulation. In such cases, consult the insulation manufacturer for technical assistance.

PART 2 PRODUCTS

2.1 PIPE INSULATION ON INDOOR SYSTEMS

A. Molded pipe insulation shall be manufactured to meet ASTM C585 for sizes required in the particular system.

B. Molded fibrous glass pipe insulation shall comply with the requirements of ASTM C547. Heavy density Fiberglas pipe insulation with factory applied all-service jacket (ASJ)
and Doublesure® two-component adhesive closure system, or Fiberglas Pipe and Tank Insulation, heavy density fiberglass insulation with end grain adhered to ASJ all service jacket. Joints shall be sealed by butt strips having a two-component sealing system or by applying staples and pressure sensitive tape. When self-sealing lap systems are used, sufficient thickness of insulation shall be used to maintain the outer surface temperature of the operating system below +150°F. Manufacturer’s data regarding thickness constraints in relation to operating temperature shall be followed. When multiple layers are required, all inner layer(s) shall be unjacketed.

C. Fittings and valves shall be insulated with preformed fiberglass fittings, fabricated sections of fiberglass pipe insulation, fiberglass pipe and tank insulation, fiberglass blanket insulation, or insulating cement. Thickness shall be equal to adjacent pipe insulation. Finish shall match that used on straight sections.

D. Flanges, couplings, chilled water pump impeller housings, valve bonnets etc, shall be covered with an oversized pipe insulation section sized to provide the same insulation thickness as on the main pipe section. An oversized insulation section shall be used to form a collar between the two insulation sections with sections of insulation being used to fill gaps. Jacketing shall match that used on straight pipe sections. Rough cut ends shall be coated with a suitable vapor resistant mastic.

E. On cold systems, vapor barrier performance is extremely important. Particular care must be given to vapor sealing the fitting cover or finish to the pipe insulation vapor barrier. Valve stems shall be sealed with caulking to allow free movement of the stem but provide a seal against moisture incursion. All penetrations of the ASJ and exposed ends of insulation shall be sealed with vapor barrier mastic.

F. On hot systems where fittings are to be left exposed, insulation ends should be beveled away from bolts for easy access.

G. All insulated, exposed piping inside the building within 8'-0" above the floor shall be additionally jacketed with a multi-ply, fabric reinforced, self adhesive insulation cladding material with a vapor barrier and a thickness of 0.015". Jacketing system shall be Venture Clad Plus #1579CW-E or equal.

2.2 REFRIGERANT PIPING AND COOLING COIL DRAIN WITH INSTALLATION TEMPERATURE ABOVE 40°F

A. Insulate piping with ¾" closed-cell, fiber-free elastomeric foam equal to Armaflex type AP insulation. Insulation shall be flexible elastomeric thermal insulation, black in color, flame-spread rating of 25 or less and a smoke developed rating of 50 or less as tested by ASTM E84-91A “Method of Test Surface Burning Characteristics of Building Materials”.

B. Fitting elbow covers shall be fabricated from miter-cut tabular form. In all cases, butt joints and seams are to be sealed with Armstrong 520 adhesive. 520 adhesive is a contact adhesive; therefore, in all cases, both surfaces to be joined are to be coated with adhesive with installation temperature above 40°F.

C. Where piping is located outdoors, cover Armaflex insulation with PVC jacketing installed with a glued application.

2.3 SUPPORT FOR PIPE WITH INSULATION
A. All piping shall be supported in such a manner that neither the insulation or the vapor/weather barrier is compromised by the hanger or the effects of the hanger. In all cases, hanger spacing shall be such that butt joints may be made outside the hanger.

1. On all size piping of cold systems, the pipe hanger saddles shall be separated away from the pipe by utilizing inserts. The vapor barrier shall be continuous, including material covered by the hanger saddle. Utilize a clevis style hanger with protective shield per MSS SP-69.

2. On warm water piping systems 3" in diameter or less, insulated with Fiberglas insulation, may be supported by placing saddles of the proper length and spacing, as designated in Owens-Corning Pub. 1-IN-12534, under the insulation.

3. For hot or cold piping systems larger than 2½" in diameter, Owens-Corning Calcium Silicate pipe insulation shall be used for high density inserts. Piping saddles for piping larger than 3" shall not be in contact with the piping. Vapor barrier shall cover inserts.

4. Owens-Corning Calcium Silicate pipe insulation may be used to support the entire weight of the piping system provided the hanger saddle is designed so the maximum compressive load does not exceed 100 psi.

5. Where pipe shoes and roller supports are required, insulation shall be inserted in the pipe shoe to minimize pipe heat loss. Where possible, the pipe shoe shall be sized to be flush with the outer pipe insulation diameter.

6. Thermal expansion and contraction of the piping and insulation system can generally be taken care of by utilizing double layers of insulation and staggering both longitudinal and circumferential joints. Where long runs are encountered, expansion joints may be required where single layers of the insulation are being used.

7. On vertical runs, insulation support rings shall be used.

2.4 ACCESSORY MATERIALS

A. Accessory materials installed as part of insulation work under this section shall include (but not be limited to):


2. Field-applied jacketing materials - Sheet metal, plastic, canvas, fiberglass cloth, insulating cement; PVC fitting covers.


B. All accessory materials shall be installed in accordance with project drawings and specifications, manufacturer’s instructions, and/or in conformance with the current edition of the Midwest Insulation Contractors Association (MICA) “Commercial & Industrial Insulation Standards”.

2.5 INSULATION THICKNESSES
A. Fittings, including valves, flanges, unions, etc. shall be insulated with the same thickness as the required pipe insulation and covered with PVC fitting cover as specified.

B. Pipe insulation thickness shall be as follows unless noted otherwise on drawings:

<table>
<thead>
<tr>
<th>Piping System</th>
<th>Pipe Size</th>
<th>Insulation Thickness</th>
<th>Insulation Conductivity BTU in H-Ft2-F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heating hot water</td>
<td>Up thru 1¼”</td>
<td>1½”</td>
<td>0.29</td>
</tr>
<tr>
<td>(200°F and below)</td>
<td>1½” and larger</td>
<td>2”</td>
<td></td>
</tr>
<tr>
<td>Refrigerant piping</td>
<td>up to 1¼”</td>
<td>¾”</td>
<td>0.28</td>
</tr>
<tr>
<td>(Armaflex insulation)</td>
<td>1½” and larger</td>
<td>1”</td>
<td></td>
</tr>
</tbody>
</table>

Note: piping located outdoors shall have the same insulation thickness as noted above.

PART 3  EXECUTION

3.1 SITE INSPECTION

A. Before starting work under this section, carefully inspect the site and installed work of other trades and verify that such work is complete to the point where installation of materials and accessories under this section can begin.

B. Verify that all materials and accessories can be installed in accordance with project drawings and specifications and material manufacturers' recommendations.

C. Verify by inspecting product labeling, submittal data, and/or certifications which may accompany the shipments that all materials and accessories to be installed on the project may comply with applicable specifications and standards and meet specified thermal and physical properties.

3.2 PREPARATION

A. Ensure that all pipe and fitting surfaces over which insulation is to be installed are clean and dry.

B. Ensure that insulation is clean, dry, and in good mechanical condition with all factory-applied vapor or weather barriers intact and undamaged. Wet, dirty, or damaged insulation shall not be acceptable for installation. All damaged insulation installed will be removed and replaced by the Contractor at no extra cost to the Owner.

C. Ensure that pressure testing of piping and fittings has been completed prior to installing insulation.

3.3 INSTALLATION

A. General

1. Install all insulation materials and accessories in accordance with manufacturer's published instructions and recognized industry practices to ensure that it will serve its intended purpose.
2. Install insulation on piping subsequent to installation of heat tracing, painting, testing, and acceptance tests.

3. Install insulation materials with smooth and even surfaces. Insulate each continuous run of piping with full-length units of insulation, with single cut piece to complete run. Do not use cut pieces or scraps abutting each other. Butt insulation joints firmly to ensure complete, tight fit overall piping surfaces.

4. Maintain the integrity of factory-applied vapor barrier jacketing on all pipe insulation, protecting it against puncture, tears or other damage. All staples used on cold pipe insulation shall be coated with suitable sealant to maintain vapor barrier integrity.

B. Fittings
1. Cover valves, fittings, and similar items in each piping system using one of the following:
   a. Mitered sections of insulation equivalent in thickness and composition to that installed on straight pipe runs.
   b. Insulation cement equal in thickness to the adjoining insulation.
   c. PVC fitting covers insulated with material equal in thickness and composition to adjoining insulation.

C. Penetrations
1. Extend piping insulation without interruption through walls, floors, and similar piping penetrations, except where otherwise specified.

D. Joints
1. Butt pipe insulation against hanger inserts. For hot pipes, apply 3" wide vapor barrier tape or band over butt joints. For cold piping apply wet coat of vapor barrier lap cement on butt joints, and seal joints with 3" wide vapor barrier tape or band.
2. All pipe insulation ends shall be tapered and sealed, regardless of service.

3.4 FIELD QUALITY ASSURANCE

A. Upon completion of all insulation work covered by this specification, visually inspect the work and verify that it has been correctly installed. This may be done while work is in progress, to assure compliance with requirements herein to cover and protect insulation materials during installation.

3.5 PROTECTION

A. Replace damaged insulation which cannot be satisfactorily repaired, including insulation with vapor barrier damage and moisture-saturated insulation.

B. The insulation contractor shall advise the general and/or the mechanical contractor as to requirements for protection of the insulation work during the remainder of the construction period, to avoid damage and deterioration of the finished insulation work.

3.6 SAFETY PRECAUTIONS

A. Insulation contractor's employees shall be properly protected during installation of all insulation. Protection shall include proper attire when handling and applying insulation
materials, and shall include (but not be limited to) disposable dust respirators, gloves, hard hats, and eye protection.

B. The insulation contractor shall conduct all job site operations in compliance with applicable provisions of the Occupational Safety and Health Act, as well as with all state and/or local safety and health codes and regulations that may apply to the work.

3.7 ASBESTOS INSULATION

A. Any existing asbestos insulation on existing piping, valves, equipment, etc. where tie-ins are required, shall be removed by the Owner at Owner's expense. The contractor and Architect/Engineer shall not be responsible for any cost or work involved with removal or encapsulation of asbestos insulation.

END OF SECTION

MAI: 2020-1566
PART 1 GENERAL

1.1 SECTION INCLUDES

A. Resistance temperature detector (RTD) and transmitter.
B. Pressure sensor and transmitter.
C. Flow sensor and transmitter.
D. Differential pressure sensor.

1.2 ENVIRONMENTAL REQUIREMENTS

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

PART 2 PRODUCTS

2.1 RESISTANCE TEMPERATURE DETECTOR (RTD) AND TRANSMITTER

A. Furnish and install resistance temperature detector (RTD) and transmitters of quantity, size and at locations as indicated on drawings. The RTD sensing element shall be directly mounted to a transmitter for measuring a temperature and transmitting an isolated linear 4 to 20 mA dc output for use in a standard two-wire 24V dc system. The unit shall be accurate to ± 0.2% of span or its span range. The span range shall be verified with the span of the operating temperature of the system.

B. A 316 stainless steel element sheath, spring loaded into a 316 stainless steel well having a 3” lagging length and a ¾” NPT process connection. The unit shall have a watertight (NEMA Type 4) electrical enclosure with a ½” NPT conduit connection.

C. Sensors and transmitters shall be by ABB Kent Taylor, Bell and Gossett or approved equal.

2.2 PRESSURE SENSOR AND TRANSMITTER

A. Furnish and install pressure gauge sensor and transmitter of quantity, size and at locations as indicated on drawings for measuring gauge pressure and transmitting an isolated linear 4 to 20 mA dc output for use in a standard two-wire 24V dc system. The unit shall be accurate to ± 0.5% of full span and have an adjustable span limit and withstand over ranges up to a static pressure of 100 psi with negligible change in output. (Verify span of pressure capable of system shown on drawings to be monitored for selection of full span of sensor.)

B. Pressure sensor shall have stainless steel wetted parts with ¼” NPT male process connection. Unit shall be protected against radio frequency interference and shall have a watertight (NEMA Type 4) electrical enclosure with a ½” NPT conduit connection.
C. Sensors and transmitters shall be by ABB Kent Taylor, Bell and Gossett, Kele or approved equal.

2.3 DIFFERENTIAL PRESSURE SENSOR

A. Furnish and field mount differential pressure transmitters of quantity, size and location as indicated on plans for measuring differential pressure and transmitting an isolated linear 4 to 20 mA dc output for use in a standard two-wire 24V dc system. The unit shall be accurate to ± 0.25% of full span limit (as required for system) and shall withstand over ranges up to a static pressure of 200 psi with negligible change in output.

B. The units shall have a corrosion resistant stainless steel body with ¼” N.P.T. process connections. A 3 valve bypass manifold shall be included. Unit shall be protected against radio frequency interference and shall have a watertight (NEMA Type 4) electrical enclosure with ½” N.P.T. conduit connection.

C. Sensor and transmitters shall be by ABB Kent Taylor, Bell and Gossett or approved equal.

2.4 FLOW SENSOR AND TRANSMITTER

A. Furnish and install flow sensors and transmitters of quantity, sizes and at locations as indicated on drawings.

B. Flow sensor shall be magnetic flow type, transmitter integral with season, accuracy of ± 0.2% of reading, 4 to 20 mA dc output for use in a standard two-wire 24V dc system.

C. Flow sensor and transmitter shall mount directly into pipe line at any attitude, but insuring that electrodes are not in vertical plane.

D. Unit shall have 150 psi rated carbon steel flanges, end connection with polyurethane liner and stainless steel electrodes.

E. Flow sensor and transmitter shall be ABB Kent Taylor Magmaster.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide instruments with scale ranges selected according to service with largest appropriate scale.

C. Install sensors and transmitters in locations where they are easily serviced.

D. Locate test plugs adjacent to sensors and transmitters.

E. Furnish and install all piping, pipe wells, mounting hardware, etc. required for installation of sensors and transmitters.

END OF SECTION

MAI: 2020-1566
SECTION 23 21 00
HYDRONIC PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Pipe and pipe fittings.
B. Valves.
C. Heating hot water piping system.
D. Equipment drains and overflows.

1.2 REFERENCES: Material and/or equipment specified in this section shall meet or exceed one or more of the property requirements or installation requirements of the following specifications/publications as applicable to the specific product or end use.

B. ASME B16.3 - Malleable Iron Threaded Fittings Class 150 and 300.
C. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings.
D. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
E. ASME B31.5 - Refrigeration Piping.
F. ASTM A53 - Pipe, Steel, Black and Hot-Dipped, Zinc Coated Welded and Seamless.
G. ASTM A234 - Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures.
H. ASTM A312 - Seamless and Welded Austenitic Stainless Steel Pipe.
J. ASTM A536 - Ductile Iron Castings.
K. ASTM B32 - Solder Metal.
L. ASTM B88 - Seamless Copper Water Tube.
N. ASTM F708 - Design and Installation of Rigid Pipe Hangers.
P. AWS A5.8 - Brazing Filler Metal.
Q. AWS D1.1 - Structural Welding Code.

R. MSS SP58 - Pipe Hangers and Supports - Materials, Design and Manufacture.

S. MSS SP69 - Pipe Hangers and Supports - Selection and Application.

T. MSS SP89 - Pipe Hangers and Supports - Fabrication and Installation Practices.

U. ANSI/AWWA C606 - Grooved and Shouldered Joints.

PART 2 PRODUCTS

2.1 HEATING HOT WATER PIPING up to 230°F, ABOVE GRADE

A. Heating hot water piping 3” and smaller shall be:

1. Copper tubing: ASTM B88, Type L hard drawn.
   a. Fittings: ASME B16.18 cast bronze, tee tap or ASME B16.22 solder wrought copper.
   b. Joints: 95-5 tin-antimony or tin and silver with melting range 430 to 535 degrees F.
   c. Heating hot water piping 2” thru 3” may be Victaulic ‘CTS’ grooved piping system using EPDM gasketing as an option to soldering.
      1) Roll grooved ends as appropriate to type L hard drawn tubing, pressures, size and method of joining, Tubing ends shall be grooved in accordance with manufacturer’s current listed standards to copper tube dimensions. (Flaring of tubing ends to accommodate alternate sized couplings is not allowed.
      2) Victaulic Style 607H Installation-Ready couplings shall consist of ductile iron housings, conforming to ASTM A395 and A536, cast with offsetting, angle-pattern bolt pads, coated with grade EHP gasket suitable for water temperatures to +250 degrees F, copper colored alkyd enamel, complete with type synthetic rubber gasket.
         a) Installation ready, for direct stab installation without field disassembly.
      3) Valves Victaulic Style 608 butterfly valve with grooved ends manufactured to copper tube dimensions.
      4) Victaulic ‘CTS’ Grooved End Fittings: ASME B16.18 bronze sand cast or ASME B16.22 wrought copper. Manufactured to copper tube dimensions. (Flaring of fitting end to IPS dimensions is not allowed).
      5) Gasketing shall be Grade “EHP” EPDM compound (red & green color coded) conforming to ASTM D-2000. Temperature operating range - 30°F to +250°F.

B. Heating hot water piping 4” and larger shall be steel pipe: ASTM A53, Schedule 40, wall black steel, beveled ends for welding.

1. Fittings: ASTM B16.3, malleable iron or STM A234, forged steel welding type fittings.


C. Heating hot water piping ½” through 2” may be Victaulic Vic Press 304™ System using EPDM “E” O- ring seals.

1. Piping shall be stainless steel schedule 10S pipe conforming to ASTM A312, Type 304/304L [316/316L]. Working pressures to 500 psi.
2. Coupling and fitting housings shall be Vic Press 304™ products formed of precision cold drawn stainless steel, with self contained O-ring seals in the coupling/fitting ends.

3. O-Ring Seals - O-ring seals shall be molded of synthetic rubber, Grade "E" EPDM recommended for water services from -30°F to +230°F.

4. Valves - Victaulic or equal Style P589 Vic Press 304™ end ball valve, 300 psi, ½" through 2" size range, forged brass body, ASTM B-16 chrome plated ASTM B283 brass ball and stem, TFE seats and stem washer, Fluoroelastomer O-ring.

5. Assembly - Pipe ends must be marked according to instructions supplied and fully inserted into the coupling/fitting housing up to the pipe stop. Fitting ends shall be pressed onto the pipe using only a Pressfit Tool (PFT-510 series) equipped with the proper size pressing jaws in accordance with the latest Pressfit System Product Assembly and Tool Operation Manual.

6. Pipe Preparation - Stainless steel pipe shall be square cut plus or minus 0.030", properly deburred and cleaned to ensure leak-tight O-ring seal, in accordance with latest Victaulic Vic Press 304™ System published information.

D. Heating hot water piping 2½" and larger may be Victaulic grooved piping system using EPDM gasketing as an option to welding, threading or flanging.

1. Piping shall be ASTM A53, schedule 40 black steel with mechanical grooves.

2. All grooved components shall be of one manufacturer and shall conform to local code approval and/or as listed by ANSI B31.1, B31.9, ASME, UL/FM IAMPO or BOCA. Grooved end product manufacturer to be ISO-9001 certified.

3. Roll or cut grooved ends as appropriate to pipe material, wall thickness, pressures, size and method of joining. Pipe ends shall be grooved in accordance with manufacturers current listed standards conforming to ANSI/AWWA C606. Grooving tools shall be of the same manufacturer as the grooved components.

4. Mechanical couplings shall consist of ductile iron housings, conforming to ASTM A395 and A536, complete with synthetic rubber gasket.

a. Victaulic style 07 (zero-flex) rigid coupling. Housings cast with offsetting, angle-pattern bolt pads to provide system rigidity for support and hanging in accordance with ANSI B31.1, B31.9 and NFPA 13. Victaulic style HP-70 rigid coupling for high pressure service.
   1) Installation ready, for direct stab installation without field disassembly, including grade EHP gasket. Victaulic Style 107.

b. Victaulic style 177 “Installation-Ready” and style 77 or 75 coupling shall be used where system flexibility is desired at pumps and other mechanical equipment to reduce noise and vibration. Noise and vibration reduction is achieved by installing (3) flexible couplings near the vibration source.

c. 14” and Larger: Victaulic AGS series two segment couplings with lead-in chamfer on housing key and wide width FlushSeal® gasket.
   1) Rigid Type: Housing key shall fill the wedge shaped AGS groove and provide rigidity and system support and hanging in accordance with ANSI B31.1 and B31.9. Victaulic Style W07.
2) Flexible Type: Housing key shall fit into the wedge shaped AGS groove and allow for linear and angular pipe movement. Victaulic Style W77.

1. Mechanical reducing couplings shall be Victaulic Style 750 or equal for pipe runs for reducers.

2. Victaulic grooved end fittings manufactured from ASTM A395 and A536, ductile iron; ASTM A234 forged steel; or factory-fabricated from carbon steel pipe conforming to ASTM A53. Grooved ends in accordance with ANSI/AWWA C606.

3. Gasketing shall be grade EHP gasket suitable for water temperatures to +250°F or Grade “E” EPDM compound (green color coded) conforming to ASTM D-2000 designation 2CA615A25B24F17Z. Temperature operating range -30°F to +230°F.

2.2 EQUIPMENT DRAINS AND OVERFLOWS

A. Equipment drains, cooling coil drains, overflows and piping from relief valves 1” and smaller shall be Copper Tubing: ASTM B88, Type L, hard drawn.

1. Fittings: ASME B16.18 cast brass tee tap or ASME B16.22 solder wrought copper.

2. Joints: Solder, lead free, 95-5 tin-antimony, or tin and silver, with melting range 430 to 535 degrees F.

B. Equipment drains, cooling coil drains, overflows and piping from relief valves 1¼” thru 2” shall be ASTM A53, schedule 40 black steel with threaded joints.

2.3 PIPE HANGERS AND SUPPORTS

A. Refer to Section 23 05 00.

2.4 UNIONS, FLANGES, AND COUPLINGS

A. Unions for Pipe 3 Inches and Under:

1. Copper Pipe: Bronze, soldered joints.


3. On piping systems where grooved joint mechanical couplings are used, unions are not required. (Couplings shall serve as unions).

B. Flanges for Pipe 4 Inches and Larger:

1. Ferrous Piping: 150 psig forged steel, slip-on.

2. Gaskets: 1/16 inch thick preformed neoprene.

C. Flange Adapters for Grooved Pipe and Fittings 2 ½ Inches and Larger:

1. Ferrous Piping: Class 125/150 for use with grooved end pipe and fittings. Victaulic Style 741/W741.

D. Grooved and Shouldered Pipe End Couplings when approved by Architect/Engineer:

1. Housing Clamps: Two ductile iron to engage and lock, designed to permit some angular deflection, contraction, and expansion where required.
2. Sealing Gasket: C-shape elastomer composition for operating temperature range from -30 degrees F to 230 degrees F for EPDM Grade E gaskets, and EPDM-HP for operating temperature range from -30 degrees F to 250 degrees F.
3. Accessories: Electroplated steel bolts, nuts, and washers conforming with ASTM A449.

E. Dielectric Connections

1. Dielectric nipples shall be non-conducting for connection of dissimilar piping materials. Dielectric nipples shall be similar to Victaulic Style 647 or Style 47. A brass adaptor dielectric union is not acceptable.

2.5 GATE VALVES

A. Up To and Including 3 Inches:
   1. Bronze body, bronze trim, screwed bonnet, rising stem, handwheel, inside screw with backseating stem, solid wedge disc, alloy seat rings, solder ends.

B. Over 3 Inches:
   1. Iron body, bronze trim, bolted bonnet, rising stem, handwheel, outside screw and yoke, solid wedge disc with bronze seat rings, flanged or grooved ends. (Grooved ends only if approved by Architect/Engineer.) Basis of Design: Victaulic Series 771V.

2.6 GLOBE OR ANGLE VALVES

A. Up To and Including 3 Inches:
   1. Bronze body, bronze trim, screwed bonnet, rising stem and handwheel, inside screw with backseating stem, renewable composition disc and bronze seat solder ends.

B. Over 3 Inches:
   1. Iron body, bronze trim, bolted bonnet, rising stem, handwheel, outside screw and yoke, rotating plug-type disc with renewable seat ring and disc, flanged ends.

2.7 BALL VALVES

A. Up To and Including 2 Inches:
   1. Bronze one piece body, stainless steel ball, teflon seats and stuffing box ring, lever handle with balancing stops, solder ends.
   2. Forged brass, two piece body, chrome plated brass ball and stem, PTFE seats and stem washer, lever handle, Vic Press 304™ ends. Victaulic Series P589.

B. Over 2½ Inches:
   1. Cast steel body, chrome plated steel ball, teflon seat and stuffing box seals, lever handle, or gear drive handwheel for sizes 10 inches and over, flanged.
   2. Ductile iron body, chrome plated carbon steel ball and stem, TFE seats, lever handle or gear operator, grooved ends. Victaulic Series 726.

2.8 PLUG VALVES

A. Up To and Including 3 Inches:
1. Bronze body, bronze tapered plug, full port opening, non-lubricated, teflon packing, threaded ends.
2. Operator: One plug valve wrench for every ten plug valves minimum of one.

B. Over 3 Inches:
1. Cast iron body and plug, full port opening, pressure lubricated, teflon packing, flanged ends or grooved ends if Victaulic grooved end fittings are used.
3. Operator: Each plug valve shall have a wrench handle with set screw.

2.9 BUTTERFLY VALVES
A. Body: PPS (Polypropylene Sulfide) or enamel coated cast or ductile iron with resilient replaceable pressure responsive EPDM seat or disc mounted seal, wafer or lug ends or grooved ends if Victaulic grooved end fittings are used. Stem shall be offset from the disc centerline to provide full 360 degree circumferential seating.
B. Disc: Aluminum bronze, electroless-nickel or PPS coated ductile iron or stainless steel.
C. Operator: 10 position lever handle up to 4”. Larger than 4” shall have gear drive handwheel.
D. Basis of Design: Victaulic MasterSeal™ or AGS-Vic300.

2.10 SWING CHECK VALVES
A. Up To and Including 3 Inches:
1. Bronze body, bronze trim, bronze rotating swing disc, with composition disc, solder ends.
B. Over 3 Inches:
1. Iron body, bronze trim, bronze or bronze faced rotating swing disc, renewable disc and seat, flanged ends or grooved ends if Victaulic grooved end fittings are used.

2.11 SPRING LOADED CHECK VALVES
A. Iron body, bronze trim, split plate, hinged with stainless steel spring, resilient seal bonded to body, wafer or threaded lug ends.
B. Ductile iron body, stainless steel spring and shaft, aluminum-bronze disc with elastomer seal or elastomer coated ductile iron disc with welded-in nickel seat, grooved ends. Basis of Design: Victaulic Series 716.

PART 3 EXECUTION
3.1 PREPARATION
A. Ream pipe and tube ends. Remove burrs. Bevel or groove plain end ferrous pipe.
B. Remove scale and dirt on inside and outside before assembly.
C. Prepare piping connections to equipment with flanges, grooved joint couplings, or unions.
D. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.

3.2 INSTALLATION

A. Install in accordance with manufacturer’s instructions.

B. Install piping to ASME B31.5 and B31.9.

C. Route piping in orderly manner, parallel to building structure, and maintain gradient.

D. Install piping to conserve building space, and not interfere with use of space.

E. Group piping whenever practical at common elevations.

F. Sleeve pipe passing through partitions, walls and floors.

G. Slope piping and arrange to drain at low points. Use eccentric reducers to maintain top of pipe level.

H. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
   1. For water systems, use adequate numbers of Victaulic Style 77 flexible couplings in header piping to accommodate thermal growth and contraction, and for the elimination of expansion loops. (In accordance with Victaulic instructions and as approved by the engineer). Where expansion loops are required, use Victaulic Style 77 couplings ion the loops.

I. Where more than one piping system material is specified, ensure system components are compatible and joined to ensure the integrity of the system is not jeopardized. Provide necessary joining fittings. Ensure flanges, union and couplings for servicing are consistently provided.

J. Grooved ends shall be clean and free from indentations, projections, and roll marks in the area from pipe end to groove.

K. The grooved coupling manufacturer’s factory trained representative shall provide on-site training for contractor’s field personnel in the use of grooving tools and installation of grooved joint products. The representative shall periodically visit the jobsite and review contractor is following best recommended practices in grooved product installation. (A distributor’s representative is not considered qualified to conduct the training or jobsite visit(s) ).

L. Use grooved mechanical couplings and fasteners as approved by the Architect/Engineer.

M. Use unions, flanges, and couplings downstream of valves and at equipment or apparatus connections. Do not use direct welded or threaded connections to valves, equipment or other apparatus.

N. Use non-conducting dielectric nipples or couplings, whenever joining dissimilar metals.

O. Provide pipe hangers and supports in accordance with ASTM B31.9 unless indicated otherwise.
P. Use gate, ball or butterfly valves for shut-off and to isolate equipment, part of systems, or vertical risers. All branch piping take-offs from mains, risers or branch piping shall have valves installed to allow isolation of branch piping and equipment/areas being served.

Q. Use globe, ball or butterfly valves for throttling, bypass, or manual flow control services.

R. Use butterfly valves interchangeably with gate and globe valves.

S. Use only butterfly valves in chilled and condenser water systems for throttling and isolation service.

T. Use lug or grooved end butterfly valves to isolate equipment.

U. Use check valves or triple duty valves on discharge of pumps where shown on drawings.

V. Use plug cocks for throttling service. Use non-lubricated plug cocks only when shut-off or isolating valves are also provided.

W. Use ¾ inch ball valves with cap for drains at main shut-off valves, low points of piping, bases of vertical risers, and at equipment. Pipe to nearest floor drain.

X. 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.
   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 flush with top of slab.

Y. Pipe Hangers and Supports:
   1. Install in accordance with ASTM B31.9, ASTM F708 and MSS SP89.
   2. Support horizontal piping as scheduled.
   3. Install hangers to provide minimum ½ inch space between finished covering and adjacent work.
   4. Place hangers within 12 inches of each horizontal elbow.
   5. Use hangers with 1½ inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
   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.

Z. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.
AA. Provide access where valves and fittings are not exposed. Coordinate size and location of access doors.

BB. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welds.

CC. Apply one coat of primer and one coat of paint to all unfinished exposed pipe, fittings, supports and accessories. For example, unfinished piping exposed within a mechanical room, outdoors, within any room shall be primed and painted.

DD. Install valves with stems upright or horizontal, not inverted.

EE. Provide balancing devices where indicated on drawings, as required to attain design quantities, and as recommended by balancing agency.

FF. After filling system, check for leaks and repair to leak-tight condition.

GG. After completion, clean strainers, flush and fill systems and test system to be sure all air is eliminated from piping, coils, etc.

3.3 TESTING

A. Hydrostatically test at 100 psi in excess of the working pressure for four (4) hours. This pressure to be on piping only, not on equipment.

END OF SECTION

MAI: 2020-1566
PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Testing of piping systems.
B. Cleaning of piping systems.
C. Chemical feeder equipment.
D. Chemical treatment.
E. Substantial completion check list and sign-off forms.

1.2 PRODUCTS FURNISHED, BUT NOT INSTALLED, UNDER THIS SECTION

A. Chemical shot feeder, glycol feed system, placement of water coupon rack, etc. shall be furnished by the contractor responsible for chemical treatment of the systems, installed by the Mechanical Trade. Shot feeder shall be installed at a serviceable, low height.

1.3 QUALIFICATIONS

A. The chemical treatment company shall specialize in water treatment of mechanical systems. The company shall have local representatives with water analysis laboratories and full time service personnel.

1.4 REGULATORY REQUIREMENTS

A. Conform to applicable code for addition of non-potable chemicals to building mechanical systems, and for public sewage systems.
B. Products requiring electrical connection and listed and classified by UL as suitable for the purpose specified and indicated.

1.5 MAINTENANCE SERVICE

A. Furnish service and maintenance of treatment systems and system water for one year from date of substantial completion.
B. Provide monthly technical service visits to perform field inspections and make water analysis on site. Detail findings in writing on proper practices, chemical treating requirements, and corrective actions needed. Submit two copies of field service report to Owner after each visit.
C. Provide laboratory and technical assistance services during this maintenance period.
D. Provide training course for Owner’s personnel, instructing them on installation, care, maintenance, testing, and operation of the water treatment systems. Arrange course at startup of systems.
E. Provide on-site inspections of equipment during scheduled or emergency shutdown to properly evaluate success of water treatment program, and make recommendations in writing based on these inspections.

1.6 MAINTENANCE MATERIALS
A. Provide sufficient chemicals for treatment and testing during warranty period.

PART 2 PRODUCTS

2.1 BYPASS (POT) FEEDER
A. 5.0 gallon quick opening cap for working pressure of 175 psig. See drawings for additional information.

2.2 DRIP FEEDER
A. Plastic reservoir with coil of capillary tubing with probe, weight, charging syringe, and clip.

2.3 SOLUTION METERING PUMP
A. Positive displacement, diaphragm pump with adjustable flow rate, thermoplastic construction, continuous duty fully enclosed electric motor and drive, and built in relief valve.

2.4 SOLUTION TANKS
A. 50 gallon capacity, polyethylene, self-supporting, 5 gallon graduated markings; molded fiberglass cover with recess for mounting pump, agitator, and liquid level switch.

2.5 AGITATOR
A. Totally enclosed electric motor, cast iron clamp and motor mount, 5/8 inch diameter Type 316 stainless steel propeller.

2.6 LIQUID LEVEL SWITCH
A. Polypropylene housing with integrally mounted PVC air trap, receptacles for connection to metering pump, and low level alarm.

2.7 CONDUCTIVITY CONTROLLER
A. Packaged monitor controller with solid state circuiting, five percent accuracy, linear dial adjustment, built-in calibration switch, on-off switch and light, control function light, output to control circuit and recorder.

2.8 WATER METER
A. Displacement type cold water meter with sealed, tamper-proof magnetic drive, impulse contact register, single pole, double throw dry contact switch.

2.9 SOLENOID VALVES
A. Forged brass body globe pattern, normally open or closed as required, general purpose explosion-proof and watertight solenoid enclosure, and continuous duty coil.

2.10 TIMERS

A. Electronic timers, infinitely adjustable over full range, 150 second and five minute range, mounted together in cabinet with hands-off-automatic switches and status lights.

2.11 TEST EQUIPMENT

A. Provide white enamel test cabinet with local and fluorescent light, capable of accommodating 4-10 ml, zeroing titrating burettes and associated reagents.

B. Provide the following test kits:
1. Alkalinity titration test kit.
2. Chloride titration test kit.
3. Sulphite titration test kit.
4. Total hardness titration test kit.
5. Low phosphate test kit.
6. Conductivity bridge, range 0-10,000 microhms.
7. Creosol red pH slide complete with reagent.
8. Portable electronic conductivity meter.
9. High nitrite test kit.

PART 3 - EXECUTION

3.1 HEATING HOT WATER PIPING SYSTEMS

A. Testing
1. Before equipment is connected, hydrostatically test at 1.5 times the maximum system pressure, but not less than 100 psig in excess of the working pressure for four hours. This pressure to be on piping only, not equipment.

B. Cleaning and Flushing
1. Systems shall be operational, filled, started and vented prior to cleaning. Use water meter and record capacity in system.
2. Place terminal control valves in open position during cleaning.
3. Verify that electric power is available and of the correct characteristics.
4. Install cleaning chemicals. Concentration shall be one pound per 100 gallons of water or as recommended by manufacturer of chemicals.
   a. Utilize liquid alkaline compound with emulsifying agents and detergents to remove grease and petroleum products.
   b. Utilize biocide; chlorine release agents such as sodium hypochlorite or calcium hypochlorite, or micro biocides such as quarteratany ammonial compounds, tributyl tin oxide, emthlene bis (thiocyanate), or isothiazolones.
5. Apply heat where circulating, slowly raising water temperature to 160°F and maintain for 12 hours minimum.
6. Remove heat and circulate until water temperature is 100°F or less. Drain system as quickly as possible and refill with clean water.
7. Circulate for 6 hours at design temperature, then drain. Flush with clean water for one hour. Refill with clean water and repeat until system cleaner and all material is removed. Water shall be clear upon last drain.
8. Use neutralizer agents as recommended by the system cleaner supplier.
9. Remove, clean and replace strainer screens.
10. Inspect, remove sludge, and flush low points of piping system with clean water after cleaning process is completed. Include disassembly of components as required.
11. Install sequestering agent to reduce deposits and adjust pH. Install corrosion inhibitors and conductivity enhancers. All chemical treatment shall be as recommended by manufacturers and chemical treatment contractor. If system is to utilize a glycol water mixture, the glycol shall contain the sequestering agent and corrosion inhibitors.

C. System Water Treatment
1. Provide one bypass feeder on each system. Install isolating and drain valves and necessary piping. Install around balancing valve downstream of circulating pumps unless indicated otherwise.
2. Introduce chemicals through bypass feeder when required or indicated by a test.
3. Provide 3/4” water coupon rack around circulating pumps with space for four test specimens.

3.2 SYSTEM COMPLETION CHECKLIST

A. The checklist which follows this specification section is to be considered part of the specifications.

B. The checklist is to be completed by the Installing Contractor and the prime Mechanical Contractor for each item as directed.

END OF SECTION

MAI: 2020-1566
By signing this form, the Contractor is certifying that he has personally witnessed completion of that item, and it is complete and complies with all respects to the drawings and specifications.

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---

## SYSTEMS COMPLETION CHECKLIST

<table>
<thead>
<tr>
<th>Inspection/Review Item</th>
<th>Notice Required</th>
<th>Installing Contractor</th>
<th>Date</th>
<th>Owner’s Representative Signature</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Required</td>
<td>Name</td>
<td>Signature</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rooftop Units</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gas Heat Exchanger</td>
<td>When Completed</td>
<td></td>
<td></td>
<td></td>
<td>Verify heat exchangers have been piped properly per drawings and thoroughly cleaned of all construction dust and debris.</td>
</tr>
<tr>
<td>Spring Isolator Roof Curb</td>
<td>When Completed</td>
<td></td>
<td></td>
<td></td>
<td>Verify all shipping blocking has been removed and curb has been flashed properly.</td>
</tr>
<tr>
<td>Duct Connectors</td>
<td>When Completed</td>
<td></td>
<td></td>
<td></td>
<td>Verify all duct connections to unit are complete and that flex duct connections were used.</td>
</tr>
<tr>
<td>Motorized Dampers</td>
<td>When Completed</td>
<td></td>
<td></td>
<td></td>
<td>Verify linkages are free to operate and temperature control operation is correct.</td>
</tr>
<tr>
<td>Duct Smoke Detectors</td>
<td>When Completed</td>
<td></td>
<td></td>
<td></td>
<td>Verify duct smoke detectors have been installed and are operational.</td>
</tr>
<tr>
<td>Temperature Controls</td>
<td>When Completed</td>
<td></td>
<td></td>
<td></td>
<td>Verify all temperature control points have been installed and are operational.</td>
</tr>
<tr>
<td>Identification</td>
<td>When Completed</td>
<td></td>
<td></td>
<td></td>
<td>Verify AHU properly identified and labeled per specification.</td>
</tr>
<tr>
<td>Cooling Coil Condensate Drain</td>
<td>When Completed</td>
<td></td>
<td></td>
<td></td>
<td>Verify P-trap on drain is piped correctly with minimum depth of seal greater than total static pressure possible by RTU. Verify drain pipe extended to roof drain.</td>
</tr>
<tr>
<td>Filters</td>
<td>When Completed</td>
<td></td>
<td></td>
<td></td>
<td>Verify prefilters and final filters are clean and ready for final air balance.</td>
</tr>
<tr>
<td>Supply Fans</td>
<td>When Completed</td>
<td></td>
<td></td>
<td></td>
<td>Verify proper rotation and operation.</td>
</tr>
</tbody>
</table>
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<tbody>
<tr>
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<td></td>
<td></td>
</tr>
<tr>
<td>HVAC Ductwork Systems</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ductwork Inspection</td>
<td>When Completed</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Balance Dampers</td>
<td>When Completed</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fire and Smoke Dampers</td>
<td>When Completed</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Louvers, Hoods, Exhaust Fans</td>
<td>When Completed</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flexible Ductwork</td>
<td>When Completed</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Duct Insulation</td>
<td>When Completed</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Duct Cleaning</td>
<td>When Completed</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diffusers and Registers</td>
<td>When Completed</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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### COMPLETION SYSTEMS CHECKLIST

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<tr>
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</tbody>
</table>

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SC-3
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SC-3

### HVAC Piping and Circulating Pump Systems

<table>
<thead>
<tr>
<th>Description</th>
<th>Time</th>
<th>Status</th>
<th>Verification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flushing and testing of heating hot water piping system</td>
<td>48 hours</td>
<td></td>
<td>Flushed and tested per specification.</td>
</tr>
<tr>
<td>Valving</td>
<td>When completed</td>
<td></td>
<td>Verify that all valves have been installed at all branch locations.</td>
</tr>
<tr>
<td>Pipe and Fitting Insulation</td>
<td>When Completed</td>
<td></td>
<td>Verify all piping and fittings are per specification.</td>
</tr>
<tr>
<td>Air Vents</td>
<td>When completed</td>
<td></td>
<td>Verify air vents at all high points of hydronic piping systems and all air bled from system.</td>
</tr>
<tr>
<td>Labeling and valve tagging identification</td>
<td>When completed</td>
<td></td>
<td>Verify system identification is complete per specification.</td>
</tr>
<tr>
<td>Owner’s training</td>
<td>When Completed</td>
<td></td>
<td>Verify that Owner has been instructed on operation and maintenance of systems.</td>
</tr>
</tbody>
</table>
## SYSTEMS COMPLETION CHECKLIST

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<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Verify all ducts connected to unit with flex direct connection.</td>
</tr>
<tr>
<td>Return Fan</td>
<td>At Completion</td>
<td></td>
<td></td>
<td></td>
<td>Verify shipping blocking removed from vibration isolators</td>
</tr>
<tr>
<td>Return Fan</td>
<td>At Completion</td>
<td></td>
<td></td>
<td></td>
<td>When suspended from structure, verify spring isolators were utilized.</td>
</tr>
<tr>
<td>Return Fan</td>
<td>At Completion</td>
<td></td>
<td></td>
<td></td>
<td>Verify fan rotation is correct.</td>
</tr>
<tr>
<td>Return Fan</td>
<td>At Completion</td>
<td></td>
<td></td>
<td></td>
<td>Verify temperature control points are installed and giving proper operation.</td>
</tr>
<tr>
<td>Relief/Exhaust Damper</td>
<td>At Completion</td>
<td></td>
<td></td>
<td></td>
<td>Verify linkages operate freely and motor operation gives correct control.</td>
</tr>
<tr>
<td>Return Fan</td>
<td>At Completion</td>
<td></td>
<td></td>
<td></td>
<td>Verify identification and labeling of Return Fan is complete</td>
</tr>
<tr>
<td>Exhaust Fans</td>
<td>At Completion</td>
<td></td>
<td></td>
<td></td>
<td>Verify fans installed properly on roof curb and curb completely flashed.</td>
</tr>
<tr>
<td>Exhaust Fans</td>
<td>At Completion</td>
<td></td>
<td></td>
<td></td>
<td>Verify proper fan rotation.</td>
</tr>
<tr>
<td>Exhaust Fans</td>
<td>At Completion</td>
<td></td>
<td></td>
<td></td>
<td>Verify fans are controlled by the temperature control system and have proper operation.</td>
</tr>
</tbody>
</table>

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SC-3
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Name</td>
<td>Signature</td>
<td>Name</td>
<td>Signature</td>
</tr>
<tr>
<td><strong>Miscellaneous</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>As-built drawings of all systems</td>
<td>At completion of installation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operation and Maintenance manuals</td>
<td>At completion of installation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Air Balance Report</td>
<td>At completion of installation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water Balance Report</td>
<td>At completion of installation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>One complete set of shop drawings for Owner</td>
<td>At completion of project</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inspection, local authority approvals, etc.</td>
<td>At completion of project</td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

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SC-3
SECTION 23 30 00
AIR DISTRIBUTION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Metal ductwork
B. Casing and plenums.
C. Single wall spiral duct and fittings
D. Dampers.
E. Duct cleaning.
F. Roof hoods, exhaust fans, grilles and louvers.
G. Return air fan.

1.2 REFERENCES: Material and/or equipment specified in this section shall meet or exceed one or more of the property requirements or installation requirements of the following specifications/publications as applicable to the specific product or end use:

A. ASTM A36 - Structural Steel.
B. ASTM A90 - Weight of Coating on Zinc-Coated (Galvanized) Iron or Steel Articles.
E. ASTM A480 - General Requirements for Flat-Rolled Stainless and Heat Resisting Steel Plate, Sheet, and Strip.
F. ASTM A525 - General Requirements for Steel Sheet.
G. ASTM A527 - Steel Sheet, Zinc Coated (Galvanized) by Hot Dip Process, Lock Forming Quality.
H. ASTM A568 - Steel, Sheet, Carbon, and High-Strength, Low Alloy, Hot-Rolled and Cold-Rolled.
I. ASTM A569 - Steel, Carbon (0.15 Maximum, Percent), Hot-Rolled Sheet and Strip, Commercial Quality.
J. ASTM B209 - Aluminum and Aluminum-Alloy Sheet and Plate.
K. AWS D9.1 - Welding of Sheet Metal.
1.3 SCOPE
A. The work covered by this specification consists of furnishing all labor, equipment, materials and performing all operations required, for the correct and complete fabrication and installation of ductwork in accordance with the applicable project specifications, drawings, codes, regulations and standards.

1.4 PERFORMANCE REQUIREMENTS
A. No variation of duct configuration or sizes will be permitted except by written permission from the Engineer. Size round ducts installed in place of rectangular ducts in accordance with ASHRAE table of equivalent rectangular and round ducts.

1.5 QUALITY ASSURANCE
A. Perform Work in accordance with SMACNA - HVAC Duct Construction Standards - Metal and Flexible as a minimum. Where requirements are specified in this specification, or noted on drawings above the minimum SMACNA Standards, the more stringent specified and noted requirements and practices shall be followed.
B. Maintain one copy of document on site.

1.6 QUALIFICATIONS
A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years experience.
B. Installer: Company specializing in performing the work of this section with minimum five years experience.

1.7 REGULATORY REQUIREMENTS
A. Construct ductwork to NFPA 90A and SMACNA standards, latest edition.

1.8 ENVIRONMENTAL REQUIREMENTS
A. Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.

B. Maintain temperatures during and after installation of duct sealants.

PART 2 PRODUCTS

2.1 DUCT - SHEET METAL HVAC DUCTWORK


B. Fasteners: Rivets, bolts, or sheet metal screws.

C. Sealant:
   1. Non-hardening, water resistant, fire resistive, compatible with mating materials; liquid used alone or with tape, or heavy mastic. All ductwork joints, connections, etc. shall be sealed.

D. Duct Hangers: Rod and trapeze duct support shall be used for all ductwork with one dimension 18” or larger. Smaller duct may be installed with strap hanger system using SMACNA Standard as minimum.
   1. Hanger Rod: ASTM A36; steel; threaded both ends, threaded one end, or continuously threaded, with steel angle trapeze and non-eccentric beam clamps.
   2. Hanger rods, angles trapeze sizing and spacing shall meet SMACNA standards, and local and state building codes for duct sizes being supported.
   3. Straps and hanger attachment system sizing, spacing, and installation shall meet SMANCA Standards, local and state building codes, etc. for duct size and supports.
   4. Duct hangers shall not be supported from metal deck. Furnish and install all support steel as required to suspend with beam clamps similar to Grinnell Fig. 260 from structural steel joists or beams.

2.2 DUCTWORK FABRICATION

A. Fabricate and support in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible as a minimum. Where requirements are specified in this specification, or noted on drawings above the minimum SMACNA Standards, the more stringent specified and noted requirements and practices shall be followed. Provide duct material, gages, reinforcing, and sealing for operating pressures not less than 6” w.c. on upstream side (higher pressure side) of variable air volume boxes. Return air duct, exhaust air duct and downstream side of variable air volume boxes (low pressure side) shall be constructed to not less than 2” w.c.

B. Construct T’s, bends, and elbows with radius of not less than 1½ times width of duct on centerline. Where not possible, and engineer’s written approval is obtained, rectangular elbows may be used, provided turning vanes are utilized. Where acoustical lining is indicated, provide turning vanes of perforated metal with glass fiber insulation.
C. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.

D. Fabricate continuously welded round and oval duct fittings two gages heavier than duct gages indicated in SMACNA Standard. Joints shall be minimum 4 inch cemented slip joint, brazed or electric welded. Prime coat welded joints.

E. Provide standard 45 degree lateral wye takeoffs unless otherwise indicated where 90 degree conical tee connections may be used.

F. Duct Sealant
   1. All ductwork including supply air, outside air, return air, exhaust air and relief air ductwork shall have joints sealed.
   2. Ductwork designed at SMACNA 6" pressure shall meet SMACNA Class “A” seal requirements.
   3. Ductwork designed at SMACNA 2" pressure shall meet SMACNA Class “C” seal requirements.

2.3 SINGLE WALL SPIRAL DUCT AND FITTINGS

A. General
   1. All round and/or flat oval spiral duct and fittings shall be manufactured by a company whose primary business is the manufacture of spiral duct and fittings and who has been in business for at least ten (10) years. All spiral duct and fittings shall be manufactured by the same firm and shall be as shown on the contract drawings.
   2. All spiral duct and fittings shall be manufactured from G-60 galvanized steel meeting ASTM A924 and A653 requirements, with a prime coat finish.

B. Construction
   1. Branch connections shall be made with 90° conical and 45° straight taps as shown on the drawings. All branch connections shall be made as a separate fitting. Factory or field installation of taps to spiral duct shall not be allowed without written approval of the engineer. Manufacturer's published individual fitting performances shall be on file with the design engineer ten (10) days prior to bid.
   2. All elbows shall be fabricated with a centerline radius of 1.5 times the diameter. 90° and 45° elbows in diameters 3” round through 10” round shall be stamped or pleated elbows. All other elbows shall be of the gored type, fabricated in accordance with the following:

<table>
<thead>
<tr>
<th>DEGREE OF ELBOW</th>
<th>NUMBER OF GORES</th>
</tr>
</thead>
<tbody>
<tr>
<td>less than 36°</td>
<td>2</td>
</tr>
<tr>
<td>37° thru 71°</td>
<td>3</td>
</tr>
<tr>
<td>72° thru 90°</td>
<td>5</td>
</tr>
</tbody>
</table>
Where it is necessary to use two-piece mitered elbows, they shall have a minimum number of vanes in accordance with the following:

<table>
<thead>
<tr>
<th>DUCT DIAMETER</th>
<th>NUMBER OF VANES</th>
</tr>
</thead>
<tbody>
<tr>
<td>3” thru 9”</td>
<td>2</td>
</tr>
<tr>
<td>10” thru 20”</td>
<td>3</td>
</tr>
<tr>
<td>21” and up</td>
<td>5</td>
</tr>
</tbody>
</table>

3. Circumferential and longitudinal seams of all fittings shall be a continuous weld or spot welded and sealed with mastic. All welds shall be painted to prevent corrosion.

4. All field joints up to and including 60” shall be made with a 2” slip-fit or slip coupling. Diameters 62” round and larger shall be joined with 2”x2”x3/16” Vanstone flanges for fittings and solid welded flanges for spiral duct.

5. Proprietary connectors such as manufactured by Ductmate or AccuFlange may also be used in lieu of slip connections or angle flanges.

6. Access doors shall be supplied by the duct manufacturer at all fire and/or smoke dampers.

7. All flanges and access doors shall be factory installed. Shipments of loose flanges, access doors or taps for field installation into spiral duct will not be allowed.

C. Metal Gauges

1. Metal gauges for single wall round ducts shall be as follows:

   a. Round ducts with maximum 2” W.G. positive static pressure:

      | DUCT DIAMETER | SPIRAL DUCT | FITTINGS AND LONGITUDINAL SEAM DUCT |
      |---------------|-------------|--------------------------------------|
      | 3” thru 26”   | 26          | 24                                   |
      | 28” thru 36”  | 24          | 22                                   |
      | 38” thru 50”  | 22          | 20                                   |
      | 52” thru 60”  | 20          | 18                                   |
      | 62” thru 78”  | 18          | 16                                   |

   b. Round ducts with maximum 2” W.G. negative static pressure:

      | DUCT DIAMETER | SPIRAL DUCT | FITTINGS AND LONGITUDINAL SEAM DUCT |
      |---------------|-------------|--------------------------------------|
      | 3” thru 17”   | 26          | 24                                   |
      | 18” thru 20”  | 24          | 22                                   |
      | 21” thru 22”  | 24          | 20                                   |
      | 24” thru 26”  | 22          | 20                                   |
      | 28” thru 30”  | 22          | 18                                   |
      | 32” thru 34”  | 20          | 18                                   |
      | 36” thru 42”  | 20          | 16                                   |
      | 44” thru 48”  | 20          | 18(note 1 & 3)                       |
      | 50” thru 60”  | 18          | 18(note 2 & 3)                       |
Notes:
1. Reinforce with 1"x1"x1/8" girth rings every 6 feet.
2. Reinforce with 1 1/4" x 1 1/4" x 3/16" girth rings every 4 ft.
3. When companion flange joints are used as reinforcement, 44” to 48” diameter shall be 2"x2"x3/16" and 50” to 60” diameter shall be 2 1/2"x2 1/2" x 3/16".

D. Manufacturers
1. All spiral duct fittings shall be as manufactured by SEMCO Incorporated or approved equal.

2.4 DUCT ACCESS DOORS
A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible as a minimum. Where requirements are specified in this specification, or noted on drawings above the minimum SMACNA Standards, the more stringent specified and noted requirements and practices shall be followed.

B. Fabrication: Rigid and close-fitting of galvanized steel with sealing gaskets and quick fastening locking devices. For insulated ductwork, install minimum one inch thick insulation with sheet metal cover.
   1. Less Than 12 Inches Square: Secure with sash locks.
   2. Up to 18 Inches Square: Provide two hinges and two sash locks.
   3. Up to 24 x 48 Inches: Three hinges and two compression latches with outside and inside handles.
   4. Larger Sizes: Provide an additional hinge.

C. Access doors with sheet metal screw fasteners are not acceptable.

2.5 DUCT TEST HOLES
A. Temporary Test Holes: Cut or drill in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.
B. Permanent Test Holes: Factory fabricated, air tight flanged fittings with screw cap. Provide extended neck fittings to clear insulation.

2.6 EQUIPMENT FLEXIBLE DUCT CONNECTIONS (To air moving equipment.)
A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible as a minimum. Where requirements are specified in this specification, or noted on drawings above the minimum SMACNA Standards, the more stringent specified and noted requirements and practices shall be followed.

B. Connector: Fabric crimped into metal edging strip.
   1. Fabric: UL listed fire-retardant neoprene coated woven glass fiber fabric to NFPA 90A, minimum density 30 oz per sq yd.
   3. Metal: 3 inch wide 24 gage galvanized steel.

2.7 FLEXIBLE INSULATED DUCTS
A. All flexible ducts used to connect diffuser, grilles, etc. shall be similar to Flexmaster USA, Inc.; Type #3. Flex duct shall be insulated type consisting of a factory fabricated
assembly of a trilaminate of aluminum foil, fiberglass and polyester. It shall be mechanically locked without adhesive into a formed aluminum helix on the ducts outside surface and shall withstand a minimum 6" w.c. operating pressure. The duct material shall be factory wrapped in a thick blanket of fiberglass insulation with a "C" factor of .25 or less. The insulation shall be encased in a fire retardant polyethylene protective vapor barrier with a perm rating of not over 0.1 grains per square foot per hour per inch of mercury. The flexible duct shall be constructed in accordance with and be listed as UL 181 Class I air duct and comply with NFPA 90A and 90B and have a flame spread of not over 25 and a smoke developed of not over 50. The flexible duct shall have a minimum pressure rating of 12" w.c. through a temperature range of -20°F to 250°F. Flexible duct shall be UL rated.

B. Maximum length of flexible duct shall be 5'-0" to each outlet unless indicated otherwise on drawing.

C. Flexible duct shall be installed without bends unless so indicated on drawing.

2.8 DUCT SPIN-IN FITTINGS

A. Low pressure spin-in fittings (take-offs from main duct to flexible duct) shall be similar to Flexmaster USA, Inc. Model CB-D conical bellmouth fitting with damper and positive locking wing nut. Edges of the take-off opening in the duct shall be sealed with fire retardant duct sealer.

2.9 AIR TURNING DEVICES/EXTRACTORS

A. Multi-blade device with blades aligned in short dimension, steel construction, with individually adjustable blades and mounting straps.

2.10 BACKDRAFT DAMPERS.

A. Gravity Backdraft Dampers, Size 18 x 18 inches or Smaller, Furnished with Air Moving Equipment: Air moving equipment manufacturers standard construction.

B. Multi-Blade, Parallel Action Gravity Balanced Backdraft Dampers: 16 gage thick galvanized steel with center pivoted blades of maximum 6 inch width, with felt or flexible vinyl sealed edges, linked together in rattle-free manner with 90 degree stop, steel ball bearings, and plated steel pivot pin; adjustment device to permit setting for varying differential static pressure.

2.11 FIRE, SMOKE AND COMBINATION FIRE/SMOKE DAMPERS

A. Fire dampers shall be fabricated in accordance with NFPA 90A and UL 555. They shall have a minimum rating of 1½ hour, have a dynamic closure rating of 3,000 fpm and 6" wg and be so identified with a UL label. Smoke dampers shall be fabricated in accordance with NFPA 90A and UL 555S with same rating as fire damper and be so identified with a UL label. Smoke damper shall be opposed blade type, normal functions to close automatically and opened by a factory installed electric actuator. A smoke damper may also be a fire damper if its location lends itself to the multiple functions and it meets the requirements of both.

B. Provide factory sleeve and collar for each damper.

C. Operators: Factory installed UL listed and labeled spring closed motorized open, electric type suitable for 120 volts, single phase, 60 Hz. Provide end switches to
indicate damper position. Locate damper operator on exterior of duct and link to
damper operating shaft.

D. Normally Closed Smoke Responsive Fire Dampers: Curtain type, opening by gravity
upon actuation of electro-thermal link, flexible stainless steel blade edge seals to
provide constant sealing pressure.

G. Normally Open Smoke Responsive Fire Dampers: Curtain type, closing upon actuation
of electro-thermal link, flexible stainless steel blade edge seals to provide constant
sealing pressure, stainless steel springs with locking devices to ensure positive closure
for units mounted horizontally.

F. Ceiling Dampers: Galvanized steel, 22 gage frame and 16 gage flap, two layers 0.125
inch ceramic fiber on top side with locking clip.

G. Horizontal Dampers: Galvanized steel, 22 gage frame, stainless steel closure spring,
and lightweight, heat retardant non-asbestos fabric blanket.

H. Curtain Type Dampers: Galvanized steel with interlocking blades. Provide stainless
steel closure springs and latches for horizontal installations and closure under air flow
conditions. Configure with blades out of air stream.

I. Fusible Links: Listed for 165 degrees F unless higher or lower temperature rating is
required. Contractor shall verify usages and ratings for fusible link temperature rating.

2.12 VOLUME CONTROL DAMPERS.

A. Provide balancing dampers on all duct take-offs to diffusers, grilles and registers; at
points on supply, return and exhaust systems where branches take off from larger
ducts, as required for air balancing (install damper a minimum of 2 duct widths from
take-off; as required by balancing agency; and where indicated on drawings. Where
access to dampers cannot be achieved, access panels shall be installed. If access
panels are not preferred, remote dampers shall be installed. Fabricate in accordance
with SMACNA HVAC Duct Construction Standards - Metal and Flexible as a minimum.
Where requirements are specified in this specification, or noted on drawings above the
minimum SMACNA Standards, the more stringent specified and noted requirements
and practices shall be followed. All dampers shall have a locking device per SMACNA
Standards, to hold the damper in a fixed position without vibrating.

B. Splitter Dampers:
1. Material: Same gage as duct to 24 inches size in either direction, and two gages
heavier for sizes over 24 inches.
2. Blade: Fabricate of single thickness sheet metal to streamline shape, secured
with continuous hinge or rod.
3. Operator: Minimum ¼ inch diameter rod in self aligning, universal joint action,
flanged bushing with set screw.

C. Single Blade Dampers: Fabricate for duct sizes up to 6 x 30 inch.

D. Multi-Blade Damper: Fabricate of opposed blade pattern with maximum blade sizes 8
x 72 inch. Assemble center and edge crimped blades in prime coated or galvanized
channel frame with suitable hardware.
E. End Bearings: Except in round ductwork 12 inches and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon or sintered bronze bearings.

F. Quadrants:
1. Provide locking, indicating quadrant regulators on single and multi-blade dampers.
2. On insulated ducts mount quadrant regulators on stand-off mounting brackets, bases, or adapters.
3. Where rod lengths exceed 30 inches provide regulator at both ends.

2.13 ROOF CURBS

A. The mechanical trades shall be responsible for furnishing and setting in place all mechanical equipment, roof curbs and piping/duct roof curbs. The general trade shall be responsible for the roof work and associated flashing. The mechanical trade shall furnish and install treated wood base blocking as required to level curb and to match roof insulation thickness. Curb shall be as specified, or if not specified should be similar to Pate or Thy-curb with heavy gauge galvanized steel, insulated and with wood nailer. Height of curb scheduled or specified shall be height required to top of curb above finished roof. If height is not specified or noted, a minimum 12” high above finished roof will be required. (pipe support units shall be at height required). Rooftop units will be shipped knocked down with the mechanical trade responsible for assembly on site. Roof curb shall mate with unit and provide support and a watertight installation.

2.14 ROOF AIR INTAKE HOODS OR RELIEF AIR HOODS

A. See schedules on drawings and furnish all.

2.15 EXHAUST FANS

A. See schedules on drawings and furnish all.

2.16 DIFFUSERS AND GRILLES

A. See schedules on drawings and furnish all.

2.17 LOUVERS

A. See schedule on drawings and furnish all.

PART 3 EXECUTION

3.1 DUCT INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install and seal ducts in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible as a minimum. Where requirements are specified in this specification, or noted on drawings above the minimum SMACNA Standards, the more stringent specified and noted requirements and practices shall be followed. Note: All ductwork joints, fittings, etc. shall be sealed.

C. Duct Sizes are inside clear dimensions. For lined ducts, maintain sizes inside lining.
D. Provide openings in ductwork for pitot tube where required for testing of systems, complete with metal can with spring device or screw to ensure against air leakage. Where openings are provided in insulated ductwork, install insulation material inside a metal ring.

E. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

F. Use crimp joints with bead for joining round duct sizes 8 inch and smaller with crimp in direction of air flow.

G. Use double nuts and lock washers on threaded rod supports.

H. Connect flexible ducts to metal ducts mechanically without adhesives. Connect outlets to low pressure ducts with flexible duct held in place with strap or clamp.

I. Coordinate duct locations with available space, route ducts around obstructions as required, and review duct changes with Engineer, all before starting construction.

J. Set plenum doors 6 to 12 inches above floor. Arrange door swings so that fan static pressure holds door in closed position.

K. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.

L. Install manual balancing dampers in ductwork at all branch take-offs, all diffuser and grille take offs, etc.

M. Install roof exhaust fans on minimum 18” high roof curbs but not less than 12” higher than parapet walls within 10'-0” of fan.

3.2 DUCT CLEANING

A. Clean duct system and force air at high velocity through duct to remove accumulated dust. To obtain sufficient air, clean half the system at a time. Protect equipment which may be harmed by excessive dirt with temporary filters, or bypass during cleaning.

3.3 SMOKE AND FIRE DAMPER PREPARATION

A. Verify that electric power is available and of the correct characteristics.

3.4 FIRE DAMPER, ACCESS DOOR AND FLEXIBLE DUCT INSTALLATION

A. Install accessories in accordance with manufacturer’s instructions, NFPA 90A, and follow SMACNA HVAC Duct Construction Standards - Metal and Flexible for 6” pressure duct system as a minimum. Where requirements are specified in this specification, or noted on drawings above the minimum SMACNA Standards, the more stringent specified and noted requirements and practices shall be followed.

B. Provide backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.

C. Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at fire dampers, combination fire and smoke dampers, and elsewhere as indicated. Provide for cleaning kitchen exhaust ductwork in accordance
with NFPA 96. Provide minimum 12x12 inch size for hand access, 18 x 18 inch size for shoulder access, and as indicated unless limited by duct size.

D. Provide duct test holes where indicated and required for testing and balancing purposes.

E. Provide fire dampers, combination fire and smoke dampers and smoke dampers at locations indicated, where ducts and outlets pass through fire rated components, and where required by authorities having jurisdiction. Install with required perimeter mounting angles, sleeves, breakaway duct connections, corrosion resistant springs, bearings, bushings and hinges in accordance with NFPA 92A and the latest edition of “SMACNA State Fire Marshal, Fire and Smoke Damper Clarification” manual as published by SMACNA.

F. Demonstrate re-setting of fire dampers to Owner’s representative.

G. Provide flexible connections immediately adjacent to equipment in ducts associated with fans and motorized equipment.

H. Provide balancing dampers at points on supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing. Install minimum 2 duct widths from duct take-off.

I. Use splitter dampers only where indicated.

J. Provide balancing dampers on duct take-off to diffusers, grilles, and registers, regardless of whether dampers are specified as part of the diffuser, grille, or register assembly.

K. Provide balancing dampers where recommended by balancing agency.

3.5 DIFFUSER AND GRILLE INSTALLATION

A. Install in accordance with manufacturer’s instructions.

B. Check location of outlets and inlets and make necessary adjustments in position to conform with architectural features, symmetry, and lighting arrangement.

C. Install diffusers to ductwork with air tight connection.

D. Provide balancing dampers on duct take-off to diffusers, grilles and registers, whether dampers are specified as part of the diffuser, grille or register assembly.

E. Paint ductwork visible behind air outlets and inlets matte black.

F. Diffuser/grille color shall be selected from the full range of manufacturer available colors and finishes.

END OF SECTION

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ROOFTOP HVAC UNIT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Rooftop HVAC unit and accessories.

1.2 REFERENCES: Material and/or equipment specified in this section shall meet or exceed one or more of the property requirements or installation requirements of the following specifications/publications as applicable to the specific product or end use:

A. ARI 210 - Unitary Air-Conditioning Equipment.
B. ARI 270 - Sound Rating of Outdoor Unitary Equipment.
C. NFPA 70 - National Electric Code
D. NFPA 90A - Installation of Air Conditioning and Ventilation Systems.
E. ANSI/ASHRAE 90A - Energy Conservation in New Building Design
F. ARI 370 - Sound Rating of Large Outdoor Refrigerating and Air Conditioning Equipment.

1.3 QUALITY ASSURANCE

A. Air Handling Units: Product of manufacturer regularly engaged in production of components who issues complete catalog data on product offering.
B. ISO 9001 Certification. The air handling manufacturer shall be ISO 9001 Certified by a third party registrar, such as HSB Registration Services, that is accredited by an accreditation body such as ANSI-RAB and / or RvC Dutch Council for Accreditation.
C. Constant Volume Air Handling Units: Certify air volume, static pressure, fan speed, brake horsepower and selection procedures in accordance with ARI 430. If air handling units are not certified in accordance with ARI 430, contractor shall be responsible for expenses associated with testing of units after installation to verify performance of fan(s). Any costs incurred to adjust fans to meet scheduled capacities shall be the sole responsibility of the contractor.
D. Variable Air Volume Air Handling Units with Variable Inlet Vanes: Certify air volume, static pressure, fan speed, brake horsepower and selection procedures in accordance with ARI 430. Certify units with inlet vanes in wide-open position. If air handling units are not certified in accordance with ARI 430, contractor shall be responsible for expenses associated with testing of units after installation to verify performance of fan(s). Any costs incurred to adjust fans to meet scheduled capacities shall be the sole responsibility of the contractor.
E. Air Coils: Certify capacities, pressure drops and selection procedures in accordance with ARI 410-91.

1.4 ENVIRONMENTAL REQUIREMENTS
A. Do not operate units for any purpose, temporary or permanent, until ductwork is clean, filters are in place, bearings lubricated, and fan has been test run under observation.

1.5 ACOUSTICS

A. Manufacturer of packaged rooftop equipment shall provide Noise Criteria (NC) sound level data across all octave band center frequencies for cataloged operating range of unit at gross cooling capacity range. Data shall be obtained in conformance with ANSI S1.32-1980, American National Standard Methods for the Determination of Sound Power Levels of Discrete Frequency and Narrow Band Noise Sources in Reverberation Rooms and per AMCA Standard 300-85 test code “Sound Rating Air Moving Devices”.

1.6 REGULATORY REQUIREMENTS

A. Unit shall conform to ANSI/UL 465 for construction of packaged air conditioner and shall have U.L. label affixed to rooftop unit package. In the event the unit is not UL approved, the manufacturer shall, at his expense, provide for a field inspection by a UL representative to verify conformance to UL standards. If necessary, contractor shall perform required modifications to the unit to comply with UL, as directed by the UL representative, at no additional expense to the Owner.

1.7 EXTRA MATERIALS

A. Install new clean filters at end of project. Provide one extra set of filters for future use by Owner at completion of project.

B. Furnish one extra complete set of fan motor drive belts.

1.8 WARRANTY

A. A parts warranty for one year from date of start-up or 18 months from date of shipment, whichever comes first, shall be provided at no additional cost.

PART 2 PRODUCTS

2.1 ROOFTOP H.V.A.C. UNIT (Trane packaged Voyager 6 1/4 thru 25 tons)

A. General

1. Units shall be dedicated downflow or horizontal airflow. Operating range shall be between 115°F and 0°F cooling as standard from the factory for all units. Cooling performance shall be rated in accordance with DOE and/or ARI testing procedures. All units shall be factory assembled, internally wired, fully charged with R-410A and 100 percent run-tested before leaving the factory. Wiring internal to the unit shall be colored and numbered for simplified identification. Units shall be UL listed and labeled, classified in accordance to ANSI Z21.47 for gas fired central furnaces and UL 1995/CAN/CSA No. 236-M90 for central cooling air conditioners.

B. Casing

1. Unit casing shall be constructed of zinc coated, heavy gauge galvanized steel. Exterior surfaces shall be cleaned, phosphatized and finished with a weather-resistant baked enamel finish. Unit’s surface shall be tested 500 hours in a slat spray test in compliance with ASTM B117. Cabinet construction shall allow for
all maintenance on one side of the unit. Service panels shall have lifting handles and be removed and reinstalled by removing only a single fastener on the 3-7½ ton units and not more than three screws on the 8½-25 ton units while providing a water and air tight seal. The downflow unit’s base plan shall have no penetrations within the perimeter of the curb other than the raised 1 1/2” high supply/return openings to provide an added water integrity precaution, if the condensate drain backs up. The base of the unit shall have provisions for forklift and crane lifting.

C. Unit Top

1. The top cover shall be one piece or where seams exist, it shall be double hemmed and gasket sealed to prevent water leakage.

D. Filters

1. Filters shall be of the throwaway type and shall have two inch thick fiberglass media contained in a rigid frame. Filters shall have a rigid supporting maze across both the entering and leaving faces of the media.

2. Filters installed at completion of project shall be new, clean, and free of construction dirt and dust.

3. Provide one additional set of filters to Owner at completion of the project. this filter set shall be used as a replacement set for future use by Owner.

4. Filters shall be rated UL class 2.

E. Compressors

1. All 6¼ -17½ ton standard and 6¼ - 10 ton high efficiency units shall be direct-drive hermetic reciprocating type compressor(s) with centrifugal oil pump providing positive lubrication to moving parts. Motor shall be suction gas-cooled and shall have a voltage utilization range of plus or minus 10 percent of unit nameplate voltage. Crankcase heater, internal temperature and current-sensitive motor overloads shall be included for maximum protection. Shall have internal spring isolation and sound muffling to minimize vibration transmission and noise. External high pressure cutout shall be provide on 15 and 17½ ton models. Low pressure switches shall be standard.

8½, 12½ and 17½ ton high efficiency units and all 20 and 25 ton units shall have direct-drive, hermetic, scroll type compressors with centrifugal type oil pumps.

F. Refrigerant Circuits

1. Each refrigerant circuit shall have independent fixed orifice expansion devices, service pressure ports and refrigerant line filter dryers factory installed as standard. an area shall be provided for replacement suction line dryers.

G. Evaporator and Condenser Coils

1. Internally finned 3/8” copper tubes mechanically bonded to configured aluminum plate fin shall be standard. Coils shall be leak tested at the factory to ensure pressure integrity. The evaporator coil and condenser coil shall be leak tested to 200 psig and pressure tested to 450 psig.
H. Hot Water Heating Section.

I. Outdoor Fans

1. The outdoor fans shall be direct-drive statically and dynamically balanced, draw through in the vertical discharge position. The fan motor(s) shall be permanently lubricated and have built-in thermal overload protection.

J. Indoor Fan

1. Units shall have belt driven FC centrifugal fans with adjustable motor sheaves. Units over 7½ tons shall have an adjustable idler-arm assembly for quick-adjustment to fan belts and motor sheaves. All motors shall be thermally protected. Oversized motors shall be available for high static operations.

K. Controls

1. Unit shall be completely factory wired with necessary controls and contactor pressure lugs or terminal block for power wiring. Units shall provide external location for mounting fused disconnect device. Micro-processor controls shall be provided for all 24 volt control functions. The resident control algorithms shall make all heating, cooling and/or ventilating decisions in response to electronic signals from sensors measuring indoor and outdoor temperatures. The control algorithm maintains accurate temperature control, minimizes drift from setpoint and provides better building comfort. A centralized Micro-processor shall provide anti-short cycle timing and time delay between compressors to provide a higher level of machine protection.

L. Roof Curb

1. The mechanical trades shall be responsible for furnishing and setting in place all mechanical equipment, roof curbs and piping/duct roof curbs. The general trade shall be responsible for the roof work and associated flashing. The mechanical trade shall furnish and install treated wood base blocking as required to level curb and to match roof insulation thickness. Curb shall be as specified, or if not specified should be similar to Pate or Thy-curb with heavy gauge galvanized steel, insulated and with wood nailer. Height of curb scheduled or specified shall be height required to top of curb above finished roof. If height is not specified or noted, a minimum 12” high above finished roof will be required. (pipe support units shall be at height required). Rooftop units will be shipped knocked down with the mechanical trade responsible for assembly on site. Roof curb shall mate with unit and provide support and a watertight installation.

M. Economizer

1. For downflow units - Economizer shall be either field or factory installed. The assembly includes - fully modulating 0-100 percent motor and dampers, barometric relief, minimum position setting, preset linkage, wiring harness with plug and fixed dry bulb control. Solid state enthalpy and differential enthalpy control shall be a factory supplied, field installed accessory. The factory-installed economizer arrives in the shipping position and shall be moved to the operating position by the installing contractor.

N. Economizer
1. For horizontal units - Economizers shall be field-installed only. The horizontal economizer shall contain the same features as the downflow economizer with the exception of barometric relief.

O. Remote Potentiometer

1. The minimum position setting of economizer shall be adjusted with this accessory.

P. Powered Exhaust

1. The powered exhaust for 6¼ - 25 ton downflow units shall assist the barometric relief damper in the economizer in relieving building pressurization.

Q. Motorized Outside Air Dampers

1. Manually set outdoor air dampers shall provide up to 50 percent outside air. Once set, outdoor air dampers shall open to set position when indoor fan starts. The damper shall close to the full closed position when indoor fan shuts down. This option shall be available for the 6¼-25 ton models.

R. Oversized Motors

1. Furnish factory installed oversized motors for high static applications.

S. Zone Sensors

1. Shall be provided to interface with the Micro equipped Voyagers and shall be available in either manual, automatic programmable with night setback, with system malfunction lights or remote sensor options.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that roof is ready to receive work and opening dimensions are as indicated on shop drawings.

B. Verify that proper power supply is available.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Mount units on factory built roof mounting frame providing watertight enclosure. Install roof mounting curb level.

3.3 MANUFACTURER'S FIELD SERVICES & WARRANTY

A. Manufacturer shall furnish a factory trained service engineer without additional charge to start the unit.

B. The manufacturer shall furnish complete submittal wiring diagrams of the package unit as applicable for field maintenance and service.
C. Furnish complete service and maintenance of units for one year from date of substantial completion.

D. Furnish initial start-up and shut-down during first year of operation, including routine servicing and check-out. Furnish Owner’s personnel training on operation and maintenance of rooftop unit.

E. Provide a full parts warranty for one year from start-up or 18 months from shipment, whichever occurs first.

F. Submit copy of service call work order on report to the Owner, and include description of work performed.

G. The Sheetmetal Trade shall be responsible for installation and wiring of all rooftop unit manufacturer furnished accessories such as the economizer, power exhaust fan, roof curb, etc. The Sheetmetal Trade shall verify all work required during bidding and include all costs in their bid.

END OF SECTION

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PART 1 GENERAL

1.1 SECTION INCLUDES

A. Cabinet unit heaters
B. Variable air volume box with hot water heating coil.

1.2 REGULATORY REQUIREMENTS

A. Conform to applicable code for internal wiring of factory wired equipment.

PART 2 PRODUCTS

2.1 CABINET UNIT HEATERS

A. Coils: Evenly spaced aluminum fins mechanically bonded to copper tubes, designed for 100 psi and 200 degrees F.

B. Cabinet: 16 gage steel with exposed corners and edges rounded, easily removed panels, glass fiber insulation, and integral air outlet and inlet grilles.

C. Finish: Factory applied baked enamel of color as selected by Architect/Engineer on visible surfaces of enclosure or cabinet.

D. Fans: Centrifugal forward-curved double width wheels, statically and dynamically balanced, direct driven.

E. Motor: Sleeve bearings, resiliently mounted.

F. Control: Multiple speed switch, factory wired, located in cabinet.

G. Filter: Easily removed one inch thick glass fiber throw-away type, located to filter air before coil.

H. Mixing Dampers: Where indicated, mixing sections with dampers.

I. See schedules and drawings.

2.2 VARIABLE AIR VOLUME BOXES WITH HOT WATER HEATING COIL

A. Manufacturers - Trane, Titus or Price.

B. Casing - 22 gauge galvanized steel.

C. Insulation - The interior surface of the unit casing is acoustically and thermally lined with a 1-inch, 1.55 lb/cubic foot density glass fiber with high density facing. The insulation R-value is 3.8. The insulation is UL listed and meets NFPA-90A and UL 181 standards.
The insulation is covered by an interior liner made of 26-gauge galvanized steel. All wire penetrations are covered by grommets. There are no exposed edges of insulation (complete metal encapsulation).

D. Primary Air Valve: Nominal sizes 300, 600, 1100, 1700, 2400, 3200, and 4200 CFM on all unit types. The Trane air valve is a cylindrical flow control device with an integral electric actuator. Valve inlet is die cast aluminum and tapered to fit standard round ductwork. Maximum leak rate is 1 percent at 4 inches wg. inlet static pressure. Integral multiple point, averaging flow sensing ring to provide primary air flow measurement within \( \pm 5 \) percent of unit rated airflow with 1 1/2 diameters of straight duct upstream of unit. Integral flow taps and calibration chart provided on each unit.

E. Access Panel - Furnish an access panel in the bottom of the unit to provide access to the air valve.

F. Outlet Connection - Straight flange, flanged, slip and drive, or integral outlet - Sheet metal connection at unit discharge to facilitate ductwork installation. Straight flange outlet connection.

G. Agency Listing - All units are UL Listed and CSA approved.

H. Hot Water Coil - Standard and high capacity hot water coils are factory mounted. Full fin collars provided for accurate fin spacing and maximum fin-tube contact. 3/8 inches O.D. seamless copper tubes mechanically expanded into the fin collars. Coils are leak tested at 300 psig air pressure under water. Female sweat-type water connections provided. Available as right or left hand connections with all coils having same end water connections.

I. Monitoring - VAV boxes shall be monitored and controlled by the B.A.S. control system. CFM readings shall be monitored and changed through the B.A.S. control system.

J. Each VAV box shall have a flow sensor/ring to allow reading of cfm through the B.A.S.

K. The volume box shall be selected with a maximum air pressure drop of 0.4” w.c. No volume boxes with a higher APD of greater than 0.4” will be accepted.

PART 3  EXECUTION

3.1  EXAMINATION

A. Verify that surfaces are ready to receive work and opening dimensions are as indicated on shop drawings and instructed by the manufacturer.

B. Verify that required utilities are available, in proper location, and ready for use.

C. Beginning of installation means installer accepts existing surfaces.

3.2  INSTALLATION
A. Install all equipment and accessories in accordance with manufacturer's instructions.

B. Locate baseboard radiation on outside walls and run cover continuously wall-to-wall unless otherwise indicated. Center elements under windows. Where multiple windows occur over units, divide element into equal segments centered under each window. Install end caps where units butt against walls.

C. Locate finned tube radiation on outside walls and run cover wall-to-wall unless otherwise indicated. Center elements under windows. Where multiple windows occur over units, divide element into equal segments centered under each window. Align cabinet joints with window mullions. Install wall angles where units butt against walls.

D. Install convectors as indicated. Coordinate to assure correct recess size for recessed convectors.

E. Hang unit heaters from building structure, with pipe hangers anchored to building, not from piping. Mount as high as possible to maintain greatest headroom unless otherwise indicated.

F. Install cabinet unit heaters, fan-coil units as indicated. Coordinate to assure correct recess size for recessed units.

G. Locate unit ventilators as indicated, level and shim units, and anchor to structure. Coordinate exact location of wall louvers. Install shelving and auxiliary cabinetry. Provide wall trim pieces for continuous wall-to-wall installation if required for this project.

H. Protect units with protective covers during balance of construction.

I. Provide hydronic units with shut-off valve on supply and lockshield balancing valve on return piping. If not easily accessible, extend vent to exterior surface of cabinet for easy servicing. For cabinet unit heaters, fan coil units, and unit heaters, provide float operated automatic air vents with stop valve.

END OF SECTION
PART 1 GENERAL

1.1 SECTION INCLUDES

A. Basic electrical Requirements specifically applicable to Division 26, 27 and 28 Sections, in addition to Division 1 - General Requirements.

B. Information in this section is intended to clarify or make additions to the requirements set forth in the General Conditions, Supplementary Conditions and Division 1 of these specifications. Any conflict between Division 26, 27 and 28 and those in the General Conditions or within the Division 26 drawings, Supplementary Conditions and Division 1 shall be brought to the attention of the Architect/Engineer in writing as a request for addendum prior to the bid opening.

C. Furnish all equipment, materials, articles, items, operations or methods listed, mentioned or scheduled on drawings, these specifications, manufacturer’s installation instructions and include all labor materials, equipment and incidentals necessary for complete installation and operation.

D. All information contained in this section applies to all sections within Division 26 as it was part of each section.

E. Final walk-thru. Electrical Contractor shall submit in writing to the Architect’s office or the Construction Manager advising that all of the Division 26, 27 and 28 work has been completed in accordance with the plans and specifications. The intent is to acknowledge the Contractor is ready for a walk-thru. Open items that are part of the required construction work should be completed prior to the final walk-thru to avoid developing a so called construction completion list. The engineer reserves the right to reschedule the final walk-thru as determined accordingly.

F. Pre-bid questions. All pre-bid questions, clarifications, etc. must be submitted in writing to the Architect Office or the Construction Manager. All phone calls, faxes or e-mails from bidders and manufacturers, etc. directly received by the Engineers office during the bidding phase will be deferred back to the Architect Office or the Construction Manager.

G. Electrical Contractor shall review all of the project plans and specifications and not rely solely on the electrical drawings to establish a project bid. Refer to the structural and mechanical drawings for final mechanical equipment locations. Mechanical drawings shall govern over the electrical drawing locations.

1.2 LAYOUT OF THE WORK

A. Examine the site and all the drawings before proceeding with the layout and installation of this work. Verify all door swings and clearances to cabinets, etc., before locating switch and outlet boxes. Locate conduit, boxes, etc., essentially as shown on the drawings but in exact layout determined on the job to suit actual conditions. Confer and cooperate with the other trades on the job so all parts will be installed in proper
relationship. Precise locations of parts to coordinate with other work is the responsibility of the Contractor.

B. The Electrical Trades shall complete all cutting and patching for the electrical work, unless noted or specified otherwise.

C. Arrange exposed work as closely as practicable to wall or ceiling surfaces in an accurate alignment. Locate concealed work so fittings, connectors and other projections will clear surfaces.

D. During the bidding phase, if any design or discrepancy issues are discovered between the electrical drawings, specifications and other project plans, the contractor shall notify the Architect/Engineer. The intent is to resolve any issues during the bidding phase. For pertinent issues, addendums will be issued accordingly. After entering into a contract, it shall be considered there are no identified conflicts.

1.3 INTERFERENCE

A. The Electrical Contractor shall examine the plans of mechanical trades, the architectural and structural drawings and shall notify the Architect/Engineer to resolve such interference or discrepancy. The Electrical Contractor bid shall not be based solely on the Electrical Plans and Specifications. Contractor shall obtain and review all project documents. The Contractor, when directed, shall make such changes or off-sets as required so that the work shall be properly located and coordinated with the other trades. Failure to comply with the foregoing will not relieve contractor's responsibilities of making such changes. Such changes shall be completed at no additional cost to the Owner.

B. All changes in location of equipment, fixtures, distribution equipment, receptacles, etc., from those shown on plans, shall be made without charge when directed by the Architect/Engineer before installation. At this time, an agreement shall be made if such a change is an additional cost to the owner.

C. The Electrical Contractor shall confer with other trades regarding location and size of pipes, equipment, fixtures, conduit, duct openings, switches, outlets, etc., in order that there may be no interference in the installation of the work of any trades or delay in the progress of any work.

D. The Electrical Contractor shall be responsible for confirming final receptacle, data, and switch heights at work stations, countertops, and casework locations with the architectural details. Architectural details shall govern final locations and mounting heights. Failure to coordinate will not relieve the contractor of making changes as required, at no cost to the owner.

E. Any changes made, necessary through failure to make proper arrangement to avoid interference, shall not be considered as extra.

F. The Electrical Contractor shall cooperate with those performing work under other divisions in his preparation of interference drawings, to the extent that the location of plumbing piping, heating piping, and/or ventilation ducts, with respect to the installation
of other trades, shall be mutually agreed on by those performing work under other divisions.

G. In the event the described work on the drawings doesn't match requirements described in the specification, the more stringent shall be provided.

H. Electrical Contractor shall review the Architectural drawings for work station, casework details and section drawings that show raceway details. Furnish the raceway as noted and detailed on the Architectural details.

I. Contractor shall carefully review the code sections pertaining to safe working clearances to avoid piping, ducts interferences and other equipment. Install the electrical equipment to meet Code requirements. Adjust the locations shown as required.

1.4 TRENCHING AND RELATED UNDERGROUND WORK

A. The Electrical Contractor shall contact “811” 72 hours prior to any excavation to locate existing underground utilities. Pay all costs to obtain the services of a specialty utility service company to locate all private utilities as required.

B. Prior to any actual trenching, Electrical Contractor shall review the utility maps; shall visually observe and review the intended routing for above and below ground obstruction; shall confer with the appointed field representative, and shall establish preliminary location for trenching.

C. After this routing is established, Contractor shall hand dig in areas of obstructions where powered equipment is non-accessible.

1.5 MATERIALS AND WORKMANSHIP

A. All materials and equipment furnished for installation on this project shall be new and in strict accordance with this specification. All packaged materials shall be delivered in the original containers which show the manufacturer’s name and the identifying designations as to size, quality, etc. Materials delivered to the job in unmarked or mutilated packages will be immediately inspected by the Contractor. Materials or equipment judged as “damaged” by the Contractor’s own inspection shall be immediately addressed with the supplier. All electrical equipment shall bear the Underwriter’s Label.

B. All work shall be performed in a professional manner under the supervision of the electrical project manager. The project manager shall be considered the main point of contact for the Architect/Owner’s daily communication.

C. Should any dispute arise as to the quality or fitness of the materials or workmanship, Architect, Owner, Engineer and Electrical Contractor shall mutually agree work is non-acceptable and shall be reworked at no additional cost to the Owner.

D. Equipment schedule descriptions shall govern if it is found that the manufacturer’s catalog numbering shown on the drawing is not current, or changed by the manufacturer without notification. Contractor shall notify the Architect/Engineer with any conflicts during the bidding phase to get clarifications. After entering into a Contract, it shall be
considered the equipment schedules provide the information to meet the intended specifications for quality and performance.

1.6 GUARANTEES

A. All equipment and work performed under Division 26 and 28 shall be guaranteed for one (1) year from time of substantial completion of project, unless directed otherwise in Division 1.

1.7 VOLUNTARY ALTERNATES

A. The Architect/Engineer will only accept voluntary alternate as a bid deduct. Alternate must maintain the same level of quality to meet the design intent. Voluntary alternates must be submitted with the bid for review by the Owner. Failure to comply will be no reason to accept any voluntary alternates after entering into a contract.

1.8 OWNERS ACCEPTANCE OF EQUIPMENT

A. Refer to Division 1.

B. Upon the Owner’s written acceptance, the Electrical Contractor’s guarantee period shall begin and the Owner shall accept the responsibility for operation and maintenance and the Contractor’s liability shall be limited to the conditions covered in the guarantee as described in these specifications.

1.9 REFERENCES


1.10 SUBMITTALS

A. Submit electronic shop drawing files.

B. Proposed Products List: Include Products specified in the following Sections:

1. Section 26 09 23 - Occupancy Sensor Controls
2. Section 26 22 13 - Dry Type Transformers
3. Section 26 24 16 - Panelboards
4. Section 26 51 13 - Interior Luminaires
5. Section 28 31 00 - Fire Alarm
6. Section 26 05 36 - Cable Tray
7. Section 26 33 19 - Emergency Inverters

C. Submit shop drawings and product data grouped to include complete submittals of related systems, products, and accessories in single submittals.

D. Mark dimensions and values in units to match those specified.
E. Shop drawings shall be reviewed and checked by the Electrical Contractor for specification compliance prior to release for the Engineer’s review. Failure to comply will be no cause or reason for additional costs to the Owner with project delays.

F. Electrical distribution submittal shall include cut sheets for each piece of equipment. Written description is not acceptable.

G. Bill of materials shall be submitted as part of O&M Manual. Bill of Materials is not considered a shop drawing.

1.11 REGULATORY REQUIREMENTS

A. Conform to applicable Building Code.


C. Equipment: U.L. tested and approved for its purpose.

D. The Electrical Contractor shall obtain and pay for all permits and inspection fees. Provide the Owner with final inspection documents from authorities having jurisdiction.


J. Plan review and inspections by the Bureau of Fire Services for Fire Alarm and Emergency Lighting.

K. Electrical plan review and inspections by the City of Midland.

1.12 PROJECT/SITE CONDITIONS

A. Install Work in locations shown on drawings, unless prevented by project conditions.

B. All bidders shall personally inspect the site and acquaint themselves with all existing conditions involved in execution of this contract, and make all necessary measurements. No “extra” will be considered for additional work required because of bidder’s failure to do so.

C. Provide PPE arc flash warning labels as specified with arc flash/short circuit coordination study.
1.13 TEMPORARY SERVICES

A. Division 26 Trades shall provide and maintain wiring for all interior construction lighting and power to meet OSHA Standards. Division 26 Trade shall provide and maintain all required lamps and guards. Contractor’s power tools, cords, etc shall be in strict accordance with National Electrical Code 2017, Article 590.

B. Electrical Contractor shall pay for all temporary internet and power for their office and or construction trailer.

C. Electrical Contractor shall be responsible to review Division 1 requirements to provide project temporary lighting and power requirements for the construction and demolition phases.

1.14 RECORD DRAWINGS

A. The Electrical Contractor shall furnish as-constructed drawings, including all Addendums, Bulletins and associated Field Directed Changes included as part of the record drawings.

1.15 OPERATION AND MAINTENANCE MANUALS

A. Verbal instruction and written operational instructions are to be given on all equipment and systems under this contract. A time is to be scheduled with the Architect/Engineer and Owner for these instructions and a time submitted in writing for instructions at the facility.

B. Two (2) bound sets of Operating and Maintenance Manuals are to be submitted to the Architect/Engineer for approval. Manuals are to include complete parts list and maintenance procedures as well as operating instructions on all equipment supplied under Division 26 and 28.

END OF SECTION

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SECTION 26 02 00
MINOR ELECTRICAL DEMOLITION FOR REMODELING

PART 1 GENERAL

1.1 SECTION INCLUDES
A. Electrical demolition per plans and specifications.

1.2 RELATED SECTIONS
A. All drawings and specification sections apply to work in this section. Furnish all items, articles, materials, equipment, operations or methods that are mentioned, listed or scheduled on drawings or are in this specification including all labor, equipment, materials and miscellaneous incidentals necessary and/or required for the completion of this project. The work covered under this section of the specifications is in no way complete within itself but is supplementary to the entire specification and drawings.

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT
A. Materials and equipment for patching and extending work: As specified in individual Sections.

PART 3 EXECUTION

3.1 EXAMINATION
A. Electrical Contractor shall examine the project documents and visit the site as they deem necessary prior to submitting a bid. Do not rely solely on the Electrical Plans for all demolition requirements. Review all Project Documents prior to submitting a bid.

B. The demolition information is provided to assist with labor costs associated with the electrical systems removal. The Electrical Contractor shall be responsible to confirm all quantities and the information provided.

3.2 PREPARATION
A. Confirm with the Architect’s Office and/or Construction Manager Project Schedules and review the Architectural, Structural and Mechanical drawings prior to commencing demolition.

3.3 DEMOLITION
A. As part of the recent dam failure and building flooding, the Owner has completed electrical demolition with exception of mechanical equipment power circuits and temporary lighting and power as shown and noted.
B. Mechanical trades or BAS Contractor shall remove all associated temperature components, and associated conduit and wiring.

C. Electrical Trades shall remove all existing fire alarm devices and associated conduits and surface mounted raceways. Provide blank stainless steel cover plates for all fire alarm devices removed. Backboxes shall be abandoned in place.

D. Electrical Trades shall remove all of the existing power and branch panelboards as noted and shown on the drawings. Confirm all outages with the Owner to starting the replacement work.

E. Remove all unused conduits and wiring serving lighting and power. Remove all abandoned low voltage cables in accordance with NEC Sections 760.25(A), 640(A), 645.3(A), 725.3(B), 770.3(A), 800.3(C), 820.3(A) and 830.3(A).

F. Electrical Contractors are responsible to confirm all demolition quantities. Make pre-bid site visit arrangements as deemed necessary.

G. All security system removal and reinstallation shall be completed by the Owner.

END OF SECTION

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SECTION 26 05 19
BUILDING WIRE AND CABLE

PART 1 GENERAL

1.1 SECTION INCLUDES
A. Building wire and cable.
B. MC cable.

1.2 RELATED SECTIONS
A. All drawings and specification sections apply to work in this section. Furnish all items, articles, materials, equipment, operations or methods that are mentioned, listed or scheduled on drawings or are in this specification including all labor, equipment, materials and miscellaneous incidentals necessary and/or required for the completion of this project. The work covered under this section of the specifications is in no way complete within itself but is supplementary to the entire specification and drawings.

1.3 REFERENCES

1.4 PROJECT CONDITIONS
A. Conductor sizes are based on copper.

1.5 COORDINATION
A. Determine required separation between cable and other work.
B. Determine cable routing to avoid interference with other work.

1.6 REGULATORY REQUIREMENTS
B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and indicated.

PART 2 PRODUCTS

2.1 BUILDING WIRE AND CABLE
A. Description: Single conductor insulated wire.
B. Conductor: Copper.

C. Insulation Voltage Rating: 600 volts.

D. Insulation: ANSI/NFPA 70, Type THW, THHN/THWN, XHHW-2.

2.2 MC CABLE

A. Factory assembled multiple insulated conductors enclosed in armor of interlocking metal corrugated sheath.

B. Provide all clips and supports.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that interior of building has been protected from weather.

B. Verify that mechanical work likely to damage wire and cable has been completed.

3.2 INSTALLATION

A. Install products in accordance with manufacturer’s instructions.

B. Use conductor size not smaller than 12 AWG for power and lighting circuits.

C. Use 10 AWG conductors for 20 ampere, 120 volt branch circuits longer than 100 feet.

D. Protect exposed cable from damage.

E. Use suitable cable fittings and connectors.

F. Neatly train and lace wiring inside boxes, equipment, and panelboards.

G. Clean conductor surfaces before installing lugs and connectors.

H. Splices are not permitted unless noted otherwise.

I. All power wiring shall be installed in conduit. Low-voltage wiring shall utilize cable tray. Provide conduit drops for wall mounted fire alarm devices and data outlets. Electrical Trades shall be responsible for coordinating with the Owner’s low-voltage system.

J. Refer to Section 26 09 23 for Occupancy Sensors wiring.

K. Refer to Section 28 31 00 for Fire Alarm wiring.

L. If the Electrical Trades Contractor elects, at their option, to combine homerun circuits installed in a single conduit, the derating 2017 NEC 310.15(b) Table must be utilized for allowable conductor ampacity values. If the derating method is utilized, then furnish and install properly derated cables and properly sized conduits to meet Code. Electrical
Trades Contractor shall be responsible to obtain inspection from the Electrical Inspector and pay all supplemental inspection and/or requested plan review fees.

M. Shared neutrals for lighting and power circuits are not permitted.

N. MC cable shall only be acceptable as the final connection to light fixtures installed in accessible ceilings. Maximum cable length shall not exceed 6 feet.

O. MC cable shall not be used for homeruns or feeders.

P. MC cable is not permitted for this project as a daisy chain type connection between light fixture to light fixture installed in accessible ceilings.

3.3 INTERFACE WITH OTHER PRODUCTS

A. Identify each conductor with its circuit number or other designation indicated on Drawings.

3.4 FIELD QUALITY CONTROL

A. Perform field inspection and testing to assure proper operation.

B. Inspect wire and cable for physical damage and proper connection.

C. Measure tightness of bolted connections and compare torque measurements with manufacturer's recommended values.

D. Verify continuity of each branch circuit conductor.

END OF SECTION

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PART 1  GENERAL

1.1  SECTION INCLUDES

A. Equipment grounding conductors.
B. Bonding.

1.2  RELATED SECTIONS

A. All drawings and specification sections apply to work in this section. Furnish all items, articles, materials, equipment, operations or methods that are mentioned, listed or scheduled on drawings or are in this specification including all labor, equipment, materials and miscellaneous incidentals necessary and/or required for the completion of this project. The work covered under this section of the specifications is in no way complete within itself but is supplementary to the entire specification and drawings.

1.3  REFERENCES


1.4  REGULATORY REQUIREMENTS


B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and indicated.

PART 2  PRODUCTS

PART 3  EXECUTION

3.1  INSTALLATION

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

B. Provide bonding to meet Regulatory Requirements.

C. Equipment Grounding Conductor: Provide a separate grounding conductor for lighting and power circuits as noted or specified on the drawings.

D. Bond wire mesh cable tray to the basement electrical distribution. Provide #6 bare copper conductor for the entire length of cable tray.
3.2 FIELD QUALITY CONTROL

A. Inspect grounding and bonding system conductors and connections for tightness and proper installation.

END OF SECTION

MAI: 2021-1520
PART 1 GENERAL

1.1 SECTION INCLUDES
A. Conduit and equipment supports.
B. Anchors and fasteners.
C. Steel framed access platform.

1.2 RELATED SECTIONS
A. All drawings and specification sections apply to work in this section. Furnish all items, articles, materials, equipment, operations or methods that are mentioned, listed or scheduled on drawings or are in this specification including all labor, equipment, materials and miscellaneous incidentals necessary and/or required for the completion of this project. The work covered under this section of the specifications is in no way complete within itself but is supplementary to the entire specification and drawings.

1.3 REFERENCES

1.4 REGULATORY REQUIREMENTS
B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and indicated.

PART 2 PRODUCTS

2.1 PRODUCT REQUIREMENTS
A. Materials and Finishes: Provide adequate corrosion resistance.
B. Provide materials, sizes, and types of anchors, fasteners and supports to carry the loads of equipment and conduit. Consider weight of wire in conduit when selecting products.
C. Anchors and Fasteners:
   1. Concrete Structural Elements: Use expansion anchors.
   2. Steel Structural Elements: Use beam clamps.
5. Solid Masonry Walls: Use expansion anchors.

PART 3 EXECUTION

3.1 INSTALLATION

A. Attachments of electrical equipment to structural members are the responsibility of the installing trade. Structural members shall not be field cut, welded or otherwise modified without approval of the Architect/Engineer. Attachment to steel joist shall be made at panel points whenever possible. Structural members shall not be overloaded as a result of attachments. Attachment/equipment loading for all trades resulting in total load greater than an equivalent uniform 5 psf for any member shall be submitted to the Architect/Engineer for review. Electrical Trades are still responsible for design, layout, and fabrication and installation of electrical supports and support attachment methods. Electrical Trades shall submit attachment methods to the Structural Engineer for review.

B. Install products in accordance with manufacturer's instructions.

C. Do not fasten supports to pipes, ducts, mechanical equipment, and conduit.

D. Do not use spring steel clips and clamps.

E. Do not use powder-actuated anchors.

F. Do not drill or cut structural members without permission from Architect/Engineer.

G. Fabricate supports from structural steel or steel channel. Rigidly weld members or use hexagon head bolts to present neat appearance with adequate strength and rigidity. Use spring lock washers under all nuts.

H. Install surface-mounted panelboards with minimum of four anchors.

I. Steel framed access platform shall be utilized for new electrical distribution shown in the basement mechanical room. See structural drawings for details.

END OF SECTION

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PART 1 GENERAL

1.1 SECTION INCLUDES

A. Metal conduit.
B. Liquidtight flexible non-metallic conduit.
C. Electrical metallic tubing.
D. Nonmetal conduit.
E. Fittings and conduit bodies.
F. MC Cable.
G. Conduit seals (foundation walls).

1.2 REGULATORY REQUIREMENTS

B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and indicated.

1.3 RELATED SECTIONS

A. All drawings and specification sections apply to work in this section. Furnish all items, articles, materials, equipment, operations or methods that are mentioned, listed or scheduled on drawings or are in this specification including all labor, equipment, materials and miscellaneous incidentals necessary and/or required for the completion of this project. The work covered under this section of the specifications is in no way complete within itself but is supplementary to the entire specification and drawings.

1.4 REFERENCES

A. ANSI C80.1 - Rigid Steel Conduit, Zinc Coated.
B. ANSI C80.3 - Electrical Metallic Tubing, Zinc Coated.
C. ANSI/NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.

E. NEMA TC 3 - PVC Fittings for Use with Rigid PVC Conduit and Tubing.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect, and handle Products to site.

B. Accept conduit on site. Inspect for damage.

C. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.

D. Protect PVC conduit from sunlight.

1.6 PROJECT CONDITIONS

A. Verify routing and termination locations of conduit prior to rough-in.

B. Conduit routing shown is diagrammatic, field route conduit to avoid interferences.

1.7 REGULATORY REQUIREMENTS


B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and indicated.

PART 2 PRODUCTS

2.1 CONDUIT REQUIREMENTS

A. Minimum Size: ¾ inch unless otherwise specified.

B. Underground Installations:
   1. Use Schedule 40 PVC conduit for general underground installation.

C. Outdoor Locations, Above Grade: Use rigid steel conduit.

D. Exterior location: Use liquid-tight non-metallic flexible conduit as final connection to mechanical equipment.

E. Dry Locations:
   2. Exposed: Use electrical metallic tubing.
   3. Use minimum ¾” conduit.
   4. Use minimum 1” conduit for data wiring.
2.2 METAL CONDUIT
A. Rigid Steel Conduit: ANSI C80.1.
B. Fittings and Conduit Bodies: ANSI C80.5.
C. Fittings and Conduit Bodies: ANSI/NEMA FB 1; material to match conduit.

2.3 LIQUID-TIGHT NON-METALLIC FLEXIBLE METAL CONDUIT
A. Description: Type NM. Manufacturer with a spiral of rigid PVC embedded reinforcement with a flexible PVC wall.
B. Compatible fittings.
C. Use for exterior location as final wiring connections to mechanical equipment.
D. Use as final wiring connection to the new dry type transformer.

2.4 ELECTRICAL METALLIC TUBING (EMT)
A. Description: ANSI C80.3; galvanized tubing.
B. Fittings and Conduit Bodies: ANSI/NEMA FB 1; set screw type.

2.5 NONMETALLIC CONDUIT
A. Description: NEMA TC 2; Schedule 40 PVC.
B. Fittings and Conduit Bodies: NEMA TC 3.

2.7 MC CABLE
A. Corrugated steel tubing with integral conductors.
B. Use MC cable as noted on the drawings and specified in Building Wire and Cable Specification 26 05 19.
C. MC cable is not permitted for homeruns or feeders or branch device drops.

2.8 CONDUIT SEALS (FOUNDATION WALLS)

PART 3 EXECUTION

3.1 INSTALLATION
A. Install nonmetallic conduit in accordance with manufacturer's instructions.
B. Arrange supports to prevent misalignment during wiring installation.

C. Support conduit using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.

D. Group related conduits; support using conduit rack. Construct rack using steel channel; provide space on each for 25 percent additional conduits.

E. Fasten conduit supports to building structure and surfaces under provisions of Section 26 05 29.

F. Do not support conduit with wire or perforated pipe straps. Remove wire used for temporary supports.

G. Do not attach conduit to ceiling support wires.

H. Arrange conduit to maintain headroom and present neat appearance.

I. Route conduit parallel and perpendicular to walls or building centerlines.

J. Maintain adequate clearance between conduit and piping.

K. The control system contractor shall be responsible to adhere to the mechanical plans and/or temperature control system drawings to establish conduit routes.

L. All power, lighting, and circuits installed in exposed and concealed spaces shall be installed in conduit.

3.2 INTERFACE WITH OTHER PRODUCTS

A. Install conduit to preserve fire resistance rating of partitions and other elements, using materials and methods consistent with facility standards or this project specification.

END OF SECTION

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PART 1 GENERAL

1.1 SECTION INCLUDES

A. Wall and ceiling outlet boxes.
B. Pull and junction boxes.
C. Fire alarm device boxes.
D. Data boxes.
E. Occupancy sensor boxes.

1.2 RELATED SECTIONS

A. All drawings and specification sections apply to work in this section. Furnish all items, articles, materials, equipment, operations or methods that are mentioned, listed or scheduled on drawings or are in this specification including all labor, equipment, materials and miscellaneous incidentals necessary and/or required for the completion of this project. The work covered under this section of the specifications is in no way complete within itself but is supplementary to the entire specification and drawings.

1.3 REFERENCES

A. NEMA FB 1 - Fittings and Supports for Conduit and Cable Assemblies.
B. NEMA OS 1 - Sheet-steel Outlet Boxes, Device Boxes, Covers, and Box Supports.
C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

1.4 REGULATORY REQUIREMENTS

B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and indicated.

PART 2 PRODUCTS

2.1 BRANCH DEVICE BOXES
A. Sheet Metal Outlet Boxes: Use 4” square stamped steel box with single gang device ring as general project requirement.

B. Nonmetallic Outlet Boxes: Not permitted for this project.

C. Cast Aluminum Boxes: for exterior location use a single gang shallow box with thread hub connection. Provide gasketed cover by box manufacturer.

2.2 PULL AND JUNCTION BOXES

A. Sheet Metal Boxes
   1. NEMA 1 enclosure for interior location.
   2. NEMA 3R for exterior location.

2.3 OCCUPANCY SENSORS

A. Refer to the manufacturer for box requirements.

2.4 DATA BOXES

A. Provide empty 4” square stamped steel box with a single gang device.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in locations as shown on Drawings, and as required for wire pulling, equipment connections and compliance with regulatory requirements.

B. Maintain headroom and present neat mechanical appearance.

C. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.

D. Inaccessible Ceiling Areas: Install outlet and junction boxes no more than 6 inches from ceiling access panel or from removable recessed luminaire.

E. Install boxes to preserve fire resistance rating of partitions and other elements.

F. Coordinate mounting heights and locations of outlets for counters, casework, and workstations.

G. Align adjacent wall mounted outlet boxes for switches, etc.

H. Use flush mounting outlet box in finished areas.

I. Do not install flush mounting box back-to-back in walls; provide minimum 6 inches separation. Provide minimum 24 inches separation in acoustic rated walls.
J. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.

K. Use stamped steel bridges to fasten flush mounting outlet box between studs.

L. Install flush mounting box without damaging wall insulation or reducing its effectiveness.

M. Use adjustable steel channel fasteners for hung ceiling outlet box.

N. Do not fasten boxes to ceiling support wires.

O. Support boxes independently of conduit.

P. Use gang box where more than one device is mounted together. Do not use sectional box.

Q. Use gang box with plaster ring for single device outlets.

3.2 INTERFACE WITH OTHER PRODUCTS

A. Coordinate installation of outlet box for equipment connected under other sections.

B. Refer to Section 28 31 00 for fire alarm mounting height.

END OF SECTION

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PART 1 GENERAL

1.1 SECTION INCLUDES

A. Wire mesh tray.

1.2 RELATED SECTIONS

A. All drawings and specification sections apply to work in this section. Furnish all items, articles, materials, equipment, operations or methods that are mentioned, listed or scheduled on drawings or are in this specification including all labor, equipment, materials and miscellaneous incidentals necessary and/or required for the completion of this project. The work covered under this section of the specifications is in no way complete within itself but is supplementary to the entire specification and drawings.

1.3 REFERENCES


B. ASTM A 123 - Specification for Zinc (Hot-Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars, and Strip.

C. ASTM A 525 - General Requirements for Steel Sheet, Zinc-Coated Galvanized by the Hot-Dip Process.

D. NEMA VE 1 - Metallic Cable Tray Systems.

1.4 SUBMITTALS

A. Provide submittals as listed in Section 26 01 00.

B. Shop Drawings: Indicate tray type, dimensions, support points, and finishes.

C. Product Data: Provide data for fittings and accessories.

1.5 REGULATORY REQUIREMENTS


B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and indicated.

PART 2 PRODUCTS
2.1 MANUFACTURERS
A. Cablofil.

2.2 WIRE MESH CABLE TRAY
A. Electroplated zinc galvanized steel wire.
B. Width and side rail height as scheduled on the drawings.
C. Provide all components, fittings, etc. for a complete installation above those specified.

PART 3 EXECUTION

3.1 INSTALLATION
A. Install in accordance with manufacturer's instructions.
B. Install metallic cable tray in accordance with NEMA VE 1.
C. Support trays in accordance with Section 26 05 29. Provide supports at each connection point, at the end of each run, and at other points to maintain spacing between supports of 10 ft maximum.
D. Use expansion connectors where required.
E. Ground and bond cable tray under provisions of Section 26 05 26.
   1. Provide continuity between tray components.
   2. Use anti-oxidant compound to prepare aluminum contact surfaces before assembly.
   3. Provide #6 AWG bare copper equipment grounding conductor through entire length of tray; bond to each component.
   4. Connections to tray may be made using mechanical or exothermic connectors.
F. Install the wire mesh tray above the finished accessible ceiling space and as shown on the drawings. Avoid piping, duct interferences. Set up trade coordination meeting prior to installation to avoid construction conflict.
G. Cable tray shall only be used for low-voltage cable systems. Divisions 25, 26, 27, and 28 shall use the tray to manage the various low-voltage system wiring called for in the specifications and drawings. The low voltage system vendor, who is in a direct contract with the Owner, shall also use the cable tray as field determined by the installing vendor. Contractors shall install the cables equally on both of the tray's center support for an even weight distribution.
H. Provide a center support rod for the tray support hanger. Provide all hardware, mounting brackets.
I. Where cable tray passes thru fire rated walls, the following firestop methods are acceptable.

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END OF SECTION
SECTION 26 05 53
ELECTRICAL IDENTIFICATION

PART 1  GENERAL

1.1  SECTION INCLUDES

A. Nameplates and labels.
B. Wire and cable markers.
C. Labeling methods and standards.
D. Panelboard directory.
E. Arc flash warning labels.
F. Electrical distribution equipment.

1.2  RELATED SECTIONS

A. All drawings and specification sections apply to work in this section. Furnish all items, articles, materials, equipment, operations or methods that are mentioned, listed or scheduled on drawings or are in this specification including all labor, equipment, materials and miscellaneous incidentals necessary and/or required for the completion of this project. The work covered under this section of the specifications is in no way complete within itself but is supplementary to the entire specification and drawings.

1.3  REFERENCES


1.4  REGULATORY REQUIREMENTS


B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

PART 2  PRODUCTS

2.1  NAMEPLATES AND LABELS

A. Nameplates:
1. Engraved three-layer laminated plastic, white letters on red background for emergency power.

B. Locations:
1. Each new electrical distribution and branch circuit panelboard.
2. Each new VFD.
3. New transformer.

C. Nameplate size minimum 1”x3”.

2.2 WIRE MARKERS

A. Manufacturers:
1. Brady or equal.

B. Description: Tape type wire markers.

C. Locations: Each conductor at panelboard gutters, pull boxes, outlet and junction boxes, and each load connection.

D. Legend:
1. Power and Lighting Circuits: Branch circuit or feeder number indicated on drawings.

2.3 LABELING METHODS AND STANDARDS

A. Engraved Labels

1. All electrical panels.

2. Lettering sizes may vary due to space constraints or to distinguish between main versus branch systems. Sizes should be consistent throughout the project, use the following guidelines:

   Panelboard Main Label: 1” high minimum
   Panelboard Branches: 1/2” high minimum
   VFDs: 1/2” high minimum

3. All labels shall identify where panel or equipment is fed from. Ex (panel A fed from MDP)

B. Adhesive Tape Labels

1. Receptacles shall have the circuit number identified on the device cover plate using clear adhesive tape labels with 1/4” high printed block characters in black.

2. Provide circuit identification on junction or pull box covers for all circuits within.
3. Conductors in branch circuit panelboards shall have phase conductors, neutrals and grounds identified with adhesive labels within the panel at junction or pull boxes and at the device outlet box. Refer also to conductor color coding with respect to operating voltage.

2.4 PANELBOARD DIRECTORY

A. Provide typed directory. Handwritten is not acceptable.

PART 3 EXECUTION

3.1 PREPARATION

A. Degrease and clean surfaces to receive nameplates and labels.

3.2 APPLICATION

A. Install nameplate and label parallel to equipment lines.

B. Secure nameplate to inside surface of door on panelboard.

C. Contractor shall review the drawings to confirm all label schemes or ID requirements listed or noted on the drawings. Review mechanical drawings for equipment ID designation to provide a ID tag that corresponds to the mechanical equipment.

D. Provide PPE arc flash warning labels as specified with arc flash/short circuit coordination study.

E. Panelboard, switchboards, transformers, etc. shall include their source of power included in nameplate label. (i.e. LPA feed from PP2)

END OF SECTION

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SECTION 26 05 73

OVERCURRENT PROTECTIVE DEVICE COORDINATION STUDY
(Performance Specification)

PART 1 GENERAL

1.1 SCOPE

A. The contractor shall furnish short-circuit and protective device coordination study prepared by the Electrical Distribution Manufacturer.

B. The contractor shall furnish an Arc Flash Hazard Analysis Study per the requirements set forth in the current version of NFPA 70E - Standard for Electrical Safety in the Workplace. The arc flash hazard analysis shall be performed according to the IEEE Standard 1584 – 2018, the IEEE Guide for Performing Arc-Flash Calculations.

C. The scope of the studies shall include existing emergency generator distribution serving Miner Hall. All new distribution equipment shown within the basement level scope limits.

1.2 RELATED SECTIONS

A. Drawings and general provisions of the Contract.

1.3 REFERENCES

A. Institute of Electrical and Electronics Engineers, Inc. (IEEE):

2. IEEE 242 – Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems.

B. American National Standards Institute (ANSI):

1. ANSI C57.12.00 – Standard General Requirements for Liquid-Immersed Distribution, Power, and Regulating Transformers.
4. ANSI C 37.41 – Standard Design Tests for High Voltage Fuses, Distribution Enclosed Single-Pole Air Switches, Fuse Disconnecting Switches and
Accessories.

C. The National Fire Protection Association (NFPA)


1.4 SUBMITTALS

A. The results of the short-circuit, protective device coordination and arc flash hazard analysis studies shall be summarized in a final report. A minimum of five (5) bound copies of the complete final report shall be submitted.

B. The report shall include the following sections:

1. Executive Summary including Introduction, Scope of Work and Results/Recommendations.
2. Short-Circuit Methodology Analysis Results and Recommendations.
3. Short-Circuit Device Evaluation Table.
4. Protective Device Coordination Methodology Analysis Results and Recommendations.
5. Protective Device Settings Table.
7. Arc Flash Hazard Methodology Analysis Results and Recommendations including the details of the incident energy and flash protection boundary calculations, along with Arc Flash boundary distances, working distances, Incident Energy levels and Personal Protection Equipment levels.
8. Arc Flash Labeling section showing types of labels to be provided. Section will contain descriptive information as well as typical label images.
9. One-line system diagram that shall be computer generated and will clearly identify individual equipment buses, bus numbers used in the short-circuit analysis, cable and bus connections between the equipment, calculated maximum short-circuit current at each bus location, device numbers used in the time-current coordination analysis, and other information pertinent to the computer analysis.

1.5 QUALIFICATIONS

A. The short-circuit, protective device coordination and arc flash hazard analysis studies shall be conducted under the responsible charge and approval of a Registered Professional Electrical Engineer skilled in performing and interpreting the power system studies.

B. The Registered Professional Electrical Engineer shall be an employee of the equipment manufacturer or an approved engineering firm.

C. The Registered Professional Electrical Engineer shall have a minimum of five (5) years of experience in performing power system studies.

1.6 COMPUTER ANALYSIS SOFTWARE
A. The studies shall be performed using “E-tap”.

PART 2 PRODUCT

2.1 STUDIES

A. The contractor shall furnish an Arc Flash Hazard Analysis Study per NFPA 70E - Standard for Electrical Safety in the Workplace, reference Article 130.3 and Annex D. This study shall also include short-circuit and protective device coordination studies. All studies to be prepared by Electrical Distribution Manufacturer.

2.2 DATA

A. Contractor shall furnish all data as required for the power system studies. The Engineer performing the short-circuit, protective device coordination and arc flash hazard analysis studies shall furnish the Contractor with a listing of required data immediately after award of the contract. The Contractor shall expedite collection of the data to assure completion of the studies as required for final approval of the distribution equipment shop drawings and/or prior to the release of the equipment for manufacturing.

B. Source combination may include present and future motors and generators.

C. Load data for loads obtained from Contract Documents provided by Owner, or Contractor.

D. If applicable, include fault contribution for motors in the study. The Contractor shall obtain required equipment data, if necessary, to satisfy the study requirements.

2.3 SHORT-CIRCUIT ANALYSIS

A. Transformer design impedances shall be used when test impedances are not available.

B. Provide the following:

1. Calculation methods and assumptions.
2. Selected base per unit quantities.
3. One-line diagram of the system being evaluated that clearly identifies individual equipment buses, bus numbers used in the short-circuit analysis, cable and bus connections between the equipment, calculated maximum short-circuit current at each bus location and other information pertinent to the computer analysis.
4. The study shall include input circuit data including electric utility system characteristics, source impedance data, conductor lengths, number of conductors per phase, conductor impedance values, insulation types, transformer impedances and X/R ratios, motor contributions, and other circuit information as related to the short-circuit calculations.
5. Tabulations of calculated quantities including short-circuit currents, X/R ratios, equipment short-circuit interrupting or withstand current ratings and notes regarding adequacy or inadequacy of the equipment rating.
6. Results, conclusions, and recommendations. A comprehensive discussion section evaluating the adequacy or inadequacy of the equipment must be
provided and include recommendations as appropriate for improvements to the system.

C. For solidly-grounded systems, provide a bolted line-to-ground fault current study for applicable buses as determined by the engineer performing the study.

D. Protective Device Evaluation:

1. Evaluate equipment and protective devices and compare to short circuit ratings.
2. Adequacy of switchgear, motor control centers, and panelboard bus bars to withstand short-circuit stresses.
3. Square D, GE, Siemens or Eaton shall notify Owner in writing, of any circuit protective devices improperly rated for the calculated available fault current.

2.4 PROTECTIVE DEVICE TIME-CURRENT COORDINATION ANALYSIS

A. Protective device coordination time-current curves (TCC) shall be displayed on log-log scale graphs.

B. Include on each TCC graph, a complete title with descriptive device names.

C. Terminate device characteristic curves at a point reflecting maximum symmetrical or asymmetrical fault current to which the device is exposed.

D. Identify the device associated with each curve by manufacturer type, function, and, if applicable, tap, time delay, and instantaneous settings recommended.

E. Plot the following characteristics on the TCC graphs, where applicable:

1. Electric utility’s overcurrent protective device.
2. Medium voltage equipment overcurrent relays.
3. Medium and low voltage fuses including manufacturer’s minimum melt, total clearing, tolerance, and damage bands.
4. Low voltage equipment circuit breaker trip devices, including manufacturer’s tolerance bands.
5. Transformer full-load current, magnetizing inrush current, and ANSI through-fault protection curves.
6. Medium voltage conductor damage curves.
7. Ground fault protective devices, as applicable.
8. Pertinent motor starting characteristics and motor damage points, where applicable.
9. Pertinent generator short-circuit decrement curve and generator damage point.
10. The largest feeder circuit breaker in each motor control center and applicable panelboard.

F. Provide adequate time margins between device characteristics such that selective operation is provided, while providing proper protection.

G. Provide the following:

1. A One-line diagram shall be provided which clearly identifies individual
equipment buses, bus numbers, device identification numbers and the maximum available short-circuit current at each bus when known.

2. A sufficient number of log-log plots shall be provided to indicate the degree of system protection and coordination by displaying the time-current characteristics of series connected overcurrent devices and other pertinent system parameters.

3. Computer printouts shall accompany the log-log plots and will contain descriptions for each of the devices shown, settings of the adjustable devices, and device identification numbers to aid in locating the devices on the log-log plots and the system one-line diagram.

4. The study shall include a separate, tabular printout containing the recommended settings of all adjustable overcurrent protective devices, the equipment designation where the device is located, and the device number corresponding to the device on the system one-line diagram.

5. A discussion section which evaluates the degree of system protection and service continuity with overcurrent devices, along with recommendations as required for addressing system protection or device coordination deficiencies.

6. Square D shall notify Owner in writing of any significant deficiencies in protection and/or coordination. Provide recommendations for improvements.

2.5 ARC FLASH HAZARD ANALYSIS

A. The arc flash hazard analysis shall be performed according to the IEEE 1584 – 2018 equations that are presented in NFPA70E-2009, Annex D. The arc flash hazard analysis shall be performed in conjunction with the short-circuit analysis (Section 2.03) and the protective device time-current coordination analysis (Section 2.04).

B. The flash protection boundary and the incident energy shall be calculated at significant locations in the electrical distribution system (switchboards, switchgear, motor-control centers, panelboards, busway and splitters) where work could be performed on energized parts.

C. Circuits 240V or less fed by single transformer rated less than 125 kVA may be omitted from the computer model and will be assumed to have a hazard risk category 0 per NFPA 70E.

D. Working distances shall be based on IEEE 1584 - 2018. The calculated arc flash protection boundary shall be determined using those working distances.

E. When appropriate, the short circuit calculations and the clearing times of the phase overcurrent devices will be retrieved from the short-circuit and coordination study model. Ground overcurrent relays should not be taken into consideration when determining the clearing time when performing incident energy calculations.

F. The short-circuit calculations and the corresponding incident energy calculations for multiple system scenarios must be compared and the greatest incident energy must be uniquely reported for each equipment location in a single table. Calculations must be performed to represent the maximum and minimum contributions of fault current magnitude for normal and emergency operating conditions. The minimum calculation will assume that the utility contribution is at a minimum. Conversely, the maximum
calculation will assume a maximum contribution from the utility. Calculations shall take into consideration the parallel operation of synchronous generators with the electric utility, where applicable as well as any stand-by generator applications.

The Arc-Flash Hazard Analysis shall be performed utilizing mutually agreed upon facility operational conditions, and the final report shall describe, when applicable, how these conditions differ from worst-case bolted fault conditions.

G. The incident energy calculations must consider the accumulation of energy over time when performing arc flash calculations on buses with multiple sources. Iterative calculations must take into account the changing current contributions, as the sources are interrupted or decremented with time. Fault contribution from motors should be decremented as follows:

1. Fault contribution from induction motors should not be considered beyond 5 cycles.

H. For each piece of ANSI rated equipment with an enclosed main device, two calculations shall be made. A calculation shall be made for the main cubicle, sides, or rear; and shall be based on a device located upstream of the equipment to clear the arcing fault. A second calculation shall be made for the front cubicles and shall be based on the equipment’s main device to clear the arcing fault. For all other non-ANSI rated equipment, only one calculation shall be required and it shall be based on a device located upstream of the equipment to clear the arcing fault.

I. When performing incident energy calculations on the line side of a main breaker (as required per above), the line side and load side contributions must be included in the fault calculation.

J. Mis-coordination should be checked amongst all devices within the branch containing the immediate protective device upstream of the calculation location and the calculation should utilize the fastest device to compute the incident energy for the corresponding location.

K. Arc Flash calculations shall be based on actual overcurrent protective device clearing time. A maximum clearing time of 2 seconds will be used based on IEEE 1584-2018 section B.1.2. Where it is not physically possible to move outside of the flash protection boundary in less than 2 seconds during an arc flash event, a maximum clearing time based on the specific location shall be utilized.

L. Provide the following:

1. Results of the Arc-Flash Hazard Analysis shall be submitted in tabular form, and shall include device or bus name, bolted fault and arcing fault current levels, flash protection boundary distances, working distances, personal-protective equipment classes and AFIE (Arc Flash Incident Energy) levels.
2. The Arc-Flash Hazard Analysis shall report incident energy values based on recommended device settings for equipment within the scope of the study.
3. The Arc-Flash Hazard Analysis may include recommendations to reduce AFIE levels and enhance worker safety.
PART 3 EXECUTION

3.1 FIELD ADJUSTMENT

A. Contractor shall adjust relay and protective device settings according to the recommended settings table provided by the coordination study.

B. Contractor shall make minor modifications to equipment as required to accomplish conformance with short circuit and protective device coordination studies.

3.2 ARC FLASH LABELS

A. Provide a 6" x 4" Brady or equal thermal transfer type label of high adhesion polyester for each work location analyzed.

B. The labels shall be designed according to the following standards:

2. ANSI Z535.4 – Product Safety Signs and Labels.
3. NFPA 70 (National Electric Code) – Article 110.16.

C. The label shall include the following information:

1. System Voltage.
2. Flash protection boundary.
3. Personal Protective Equipment category.
4. Arc Flash Incident energy value (cal/cm²).
5. Limited, restricted, and prohibited Approach Boundaries.
6. Study report number and issue date.

D. Labels shall be printed by a thermal transfer type printer, with no field markings.

E. Arc flash labels shall be provided for equipment as identified in the study and the respective equipment access areas per the following:

1. Floor Standing Equipment - Labels shall be provided on the front of each individual section. Equipment requiring rear and/or side access shall have labels provided on each individual section access area. Equipment line-ups containing sections with multiple incident energy and flash protection boundaries shall be labeled as identified in the Arc Flash Analysis table.
2. Wall Mounted Equipment - Labels shall be provided on the front cover or a nearby adjacent surface, depending upon equipment configuration.

END OF SECTION

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PART 1 GENERAL

1.1 SECTION INCLUDES
A. Mechanical equipment.
B. Lighting controls.
C. Blank feed thru GFI.
D. Fire alarm.

1.2 RELATED SECTIONS
A. All drawings and specification sections apply to work in this section. Furnish all items, articles, materials, equipment, operations or methods that are mentioned, listed or scheduled on drawings or are in this specification including all labor, equipment, materials and miscellaneous incidentals necessary and/or required for the completion of this project. The work covered under this section of the specifications is in no way complete within itself but is supplementary to the entire specification and drawings.

1.3 REFERENCES
A. NEMA WD 1 - General Purpose Wiring Devices.
B. NEMA WD 6 - Wiring Device Configurations.

1.4 COORDINATION
A. Obtain and review shop drawings, product data, and manufacturer's instructions for equipment furnished under other sections.
B. Determine connection locations and requirements.
C. Sequence rough-in of electrical connections to coordinate with installation schedule for equipment.
D. Sequence electrical connections to coordinate with start-up schedule for equipment.
E. Mechanical Trades shall be responsible to furnish and install all temperature control components, associated conduit, wiring and 120 volt power supplies.
F. All VFD programming shall be completed as part of the Mechanical Trades work.
G. Where equipment will cover a GFI outlet, provide a blank feed thru GFI test station.

1.5 REGULATORY REQUIREMENTS


B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and indicated.

PART 2 PRODUCTS

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that equipment is ready for electrical connection, wiring, and energization.

3.2 ELECTRICAL CONNECTIONS

A. Make electrical connections in accordance with equipment manufacturer's instructions.

B. Use liquid tight non-metallic flexible conduit with watertight connectors to all mechanical equipment and as final connection to the new dry type transformer.

C. Make wiring connections using wire and cable with insulation suitable for temperatures encountered in heat producing equipment.

D. Complete all lighting controls as scheduled, noted and shown on the drawings.

E. Electrical Contractor shall complete all main power wiring to the mechanical equipment shown and noted.

F. VFD control wiring and programming shall be completed as part of the Mechanical Trades bid. VFD shall be factory installed with the equipment unless noted or specified otherwise.

3.3 BLANK FEED THRU GFI

A. Install a remote blank feed thru GFI that blocks access to a 15 or 20 amp receptacle.

END OF SECTION

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SECTION 26 09 23
OCCUPANCY SENSOR CONTROLS

PART 1 GENERAL

1.1 SECTION INCLUDES
A. Occupancy sensor.
B. Lighting control panel.
C. Low voltage digital push button stations.
D. CAT 5E wiring.
E. Room controllers.
F. Bridge connector.

1.2 RELATED SECTIONS
A. All drawings and specification sections apply to work in this section. Furnish all items, articles, materials, equipment, operations or methods that are mentioned, listed or scheduled on drawings or are in this specification including all labor, equipment, materials and miscellaneous incidentals necessary and/or required for the completion of this project. The work covered under this section of the specifications is in no way complete within itself but is supplementary to the entire specification and drawings.

1.3 REFERENCES
A. ASHRAE 90.1 2013 Energy Code.

1.4 SUBMITTALS
A. Provide submittal as listed in Section 26 01 00.
B. Shop Drawings: Occupancy sensor cut sheets, control panel layouts, wiring connections, diagrams, and dimensions. Cut sheets shall either be marked or arrowed components with catalog numbers. Failure to comply will be cause to return the submittals for corrections at no delays or extra costs to the Owner.

1.5 REGULATORY REQUIREMENTS
A. ASHRAE 90.1 2013.


PART 2 PRODUCTS – Acceptable manufacturer’s – as scheduled on the drawings.

2.1 OCCUPANCY SENSORS
   A. As scheduled on the drawings.

2.2 CEILING MOUNTED OCCUPANCY SENSORS
   A. As scheduled on the drawings.

2.3 WALL SWITCH TYPE OCCUPANCY SENSORS
   A. As scheduled on the drawings.

2.4 CAT 5E WIRING
   A. Green jacketed cable color.

2.5 ROOM CONTROLLERS
   A. As scheduled on the drawings.

2.6 LOW VOLTAGE DIGITAL SWITCH STATION
   A. As scheduled on the drawings.

2.7 LIGHTING CONTROL PANEL
   A. As scheduled on the drawings.

PART 3 EXECUTION

3.1 INSTALLATION
   A. Install in accordance with manufacturer’s instructions and wiring diagrams.
   B. Contractor shall provide all components, etc. above those specified or shown for a complete installation.

3.2 SYSTEM TRAINING
A. Include (1) 2 hour of training with the bid. The training shall take place at the Owner’s facility.

3.3 FUNCTIONAL TESTING

A. Provide functional testing with 2013 ASHRAE.

B. Provide certified documents that lighting controls were tested for programming and working conditions.

END OF SECTION

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PART 1 GENERAL

1.1 SECTION INCLUDES
A. Dry type two winding transformers.

1.2 RELATED SECTIONS
A. All drawings and specification sections apply to work in this section. Furnish all items, articles, materials, equipment, operations or methods that are mentioned, listed or scheduled on drawings or are in this specification including all labor, equipment, materials and miscellaneous incidentals necessary and/or required for the completion of this project. The work covered under this section of the specifications is in no way complete within itself but is supplementary to the entire specification and drawings.

1.3 REFERENCES
A. NEMA ST 1 - Specialty Transformers
B. NEMA ST 20 - Dry Type Transformers for General Applications.

1.4 SUBMITTALS
A. Provide submittal as listed in Section 26 01 00.
B. Product Data: Provide outline and support point dimensions of enclosures and accessories, unit weight, voltage, kVA, and impedance ratings and characteristics, tap configurations, insulation system type, and rated temperature rise.
C. Test Reports: Indicate loss data, efficiency at 25, 50, 75 and 100 percent rated load, and sound level.
D. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.
E. Manufacturer's Certificate: Certify that Products meet or exceed specified requirements.

1.5 REGULATORY REQUIREMENTS
B. Furnish products listed and classified by UL as suitable for purpose specified and shown.

C. Department of Energy 2016 ruling 10 CFR Part 431 for transformer efficient levels.


1.6 DELIVERY, STORAGE, AND HANDLING

A. Store, protect, and handle products to site.

B. Deliver transformers individually wrapped for protection and mounted on shipping skids.

C. Accept transformers on site. Inspect for damage.

D. 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.

E. Handle in accordance with manufacturer's written instructions. Lift only with lugs provided for the purpose. Handle carefully to avoid damage to transformer internal components, enclosure, and finish.

PART 2 PRODUCTS

2.1 TWO-WINDING TRANSFORMERS

A. Manufacturers:
   1. As scheduled on the drawings.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that surfaces are suitable for installing transformer supports.

3.2 INSTALLATION

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

B. Set transformer plumb and level.

C. Use flexible conduit for the final wiring connection to the transformer. Make conduit connections to side panel of enclosure.

D. Provide grounding and bonding in accordance with Section 26 05 26.

3.3 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed to assure proper operation.
B. Check for damage and tight connections prior to energizing transformer.

C. Measure primary and secondary voltages and make appropriate tap adjustments.

END OF SECTION

MAI: 2021-1520
PART 1 GENERAL

1.1 SECTION INCLUDES

A. Branch circuit panelboards.
B. Distribution panelboards.

1.2 RELATED SECTIONS

A. All drawings and specification sections apply to work in this section. Furnish all items, articles, materials, equipment, operations or methods that are mentioned, listed or scheduled on drawings or are in this specification including all labor, equipment, materials and miscellaneous incidentals necessary and/or required for the completion of this project. The work covered under this section of the specifications is in no way complete within itself but is supplementary to the entire specification and drawings.

1.3 REFERENCES

A. NEMA AB 1 - Molded Case Circuit Breakers.
B. NEMA ICS 2 - Industrial Control Devices, Controllers, and Assemblies.
C. NEMA KS 1 - Enclosed Switches.
D. NEMA PB 1 - Panelboards.
E. NEMA PB 1.1 - Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.

1.4 SUBMITTALS

A. Provide submittal as listed in Section 26 01 00.
B. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, integrated short circuit ampere rating, circuit breaker and fusible switch arrangement and sizes.
C. Manufacturer’s Installation Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.
D. Panelboard submittal shall match drawing schedule arrangement. Submittal shall custom edit schedules to match design drawings.

E. Manufacturer and Contractor shall verify the overcurrent protective device to match wire size as shown and noted in the bid documents.

1.5 OPERATION AND MAINTENANCE DATA

A. Maintenance Data: Include spare parts data listing; source and current prices of replacement parts and supplies; and recommended maintenance procedures and intervals.

1.6 REGULATORY REQUIREMENTS


B. Furnish products listed and classified by UL as suitable for purpose specified and indicated.

PART 2 PRODUCTS

2.1 BRANCH CIRCUIT PANELBOARDS

A. As scheduled on the drawings.

2.2 DISTRIBUTION PANELBOARDS

A. As scheduled on the drawings.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install panelboards in accordance with NEMA PB 1.1.

B. Height: 6 ft to top of panelboard; install panelboards taller than 6 ft with bottom no more than 4 inches above floor.

C. Provide filler plates for unused spaces in panelboards.

D. Provide typed circuit directory for each branch circuit panelboard. Revise directory to reflect circuiting changes required to balance phase loads.

E. Provide engraved plastic nameplates under the provisions of Section 26 05 53.

3.2 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed to assure proper operation.
B. Measure steady state load currents at each panelboard feeder; rearrange circuits in the panelboard to balance the phase loads to within 20 percent of each other. Maintain proper phasing for multi-wire branch circuits.

C. Visual and Mechanical Inspection: Inspect for physical damage, proper alignment, anchorage, and grounding. Check proper installation and tightness of connections for circuit breakers, fusible switches, and fuses.

END OF SECTION

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PART 1 GENERAL

1.1 SECTION INCLUDES
A. Floor boxes.
B. Receptacles.
C. Device plates.

1.2 RELATED SECTIONS
A. All drawings and specification sections apply to work in this section. Furnish all items, articles, materials, equipment, operations or methods that are mentioned, listed or scheduled on drawings or are in this specification including all labor, equipment, materials and miscellaneous incidentals necessary and/or required for the completion of this project. The work covered under this section of the specifications is in no way complete within itself but is supplementary to the entire specification and drawings.

1.3 REFERENCES
A. NEMA WD 1 - General Requirements for Wiring Devices.
B. NEMA WD 6 - Wiring Device -- Dimensional Requirements.
D. ADA - Americans with Disabilities Act - As amended.

1.4 REGULATORY REQUIREMENTS
B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and indicated.

PART 2 PRODUCTS

2.1 RECEPTACLES
A. Manufacturers:
   1. Hubbell, Pass & Seymour, Leviton, or equal
B. Description: NEMA WD 1, Heavy-duty specification grade duplex receptacle.
C. Device Body: Color to be determined from standard colors by the Architect.
D. Configuration: NEMA WD 6, type as specified and indicated.
E. Convenience Receptacle: Type 5-20.
F. GFCI Receptacle: Convenience duplex receptacle with integral ground fault circuit interrupter to meet regulatory requirements.
G. Damp and wet location receptacles shall be rated “WR”.

2.2 WALL PLATES
A. Use stainless steel cover for receptacles.
B. Use “in use” weather proof metallic covers at exterior locations as indicated on the drawings to meet 2017 NEC Section 406.
C. Use cover plates furnished with low-voltage switch station.
D. Use blank stainless steel cover plates for all abandoned back boxes left in place.

2.3 FLOOR BOXES
A. As scheduled on the drawings.

PART 3 EXECUTION

3.1 EXAMINATION
A. Verify that outlet boxes are installed at proper height.
B. Verify that wall openings are neatly cut and will be completely covered by wall plates.
C. Verify that floor boxes are adjusted properly.
D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.

3.2 PREPARATION
A. Provide extension rings to bring outlet boxes flush with finished surface.
B. Clean debris from outlet boxes.

3.3 INSTALLATION
A. Install devices plumb and level.
B. Install receptacles with grounding pole on bottom.
C. Connect wiring device grounding terminal to outlet box with bonding jumper or branch circuit equipment grounding conductor where specified.

D. Install plates on switch, receptacle, and blank outlets in finished areas.

E. Connect wiring devices by wrapping conductor around screw terminal.

F. Shared neutral are not permitted for lighting and power circuits.

3.4 INTERFACE WITH OTHER PRODUCTS

A. Confirm with architectural drawings for counter casework, etc. details for wiring devices mounting heights.

B. Install wall switch 48 inches to top of box above finished floor.

C. 18” mounting height is lieu of the 16” minimum specified is acceptable pending masonry course lines.

D. Electrical Trades shall review 2009 ANSI 117.1 for ADA requirements. Obtain a copy as required.

E. Refer to all other sections of the specification, drawings, and Architectural drawing for specific mounting requirements for receptacles shown in counters, work stations. Do not rely solely on the electrical drawings for this information. Division 26 & 28 Contractor shall be responsible to review all project documentation.

3.5 FIELD QUALITY CONTROL

A. Inspect each wiring device for defects.

B. Verify that each receptacle device is energized.

C. Test each receptacle device for proper polarity.

D. Test each GFCI receptacle device for proper operation.

3.6 ADJUSTING

A. Adjust devices and wall plates to be flush and level.

END OF SECTION

MAI: 2021-1520
PART 1 GENERAL

1.1 SECTION INCLUDES
A. Emergency Inverter.

1.2 RELATED SECTIONS
A. All drawings and specification sections apply to work in this section. Furnish all items, articles, materials, equipment, operations or methods that are mentioned, listed or scheduled on drawings or are in this specification including all labor, equipment, materials and miscellaneous incidentals necessary and/or required for the completion of this project. The work covered under this section of the specifications is in no way complete within itself but is supplementary to the entire specification and drawings.

1.3 REFERENCES

1.4 SCOPE
A. Furnish and install emergency inverters to serve emergency lighting in accordance with plans and specifications.

1.5 OPERATION AND MAINTENANCE DATA
A. Operation Data: Include instructions for operation.
B. Maintenance Data: Include UPS drawings, interconnecting wiring diagrams, routine maintenance requirement and procedures. Include O & M manuals.

1.6 REGULATORY REQUIREMENTS

1.7 DELIVERY, STORAGE AND HANDLING
A. Contractor shall accept, unload, store, protect, set and install the inverter.

1.8 SUBMITTALS
A. Provide submittals as listed in Section 26 01 00.
B. Shop Drawings: Indicate electrical characteristics and connection requirements. Provide dimensions; battery type, size, dimensions, and weight; detailed equipment outlines, weight, and dimensions; location of conduit entry and exit; single-line diagram indicating metering, control, and external wiring requirements.

C. Product Data: Provide catalog sheets and technical data sheets to indicate physical data and electrical performance, electrical characteristics, and connection requirements.

PART 2 PRODUCTS

2.1 EMERGENCY INVERTER INPUT

A. Input
1. Input voltage as scheduled on the drawings.
2. Input frequency 60 hz.
3. Input rating as scheduled on the drawings.
4. Harmonic distortion 10% or less for restrictive load.

B. Output
1. Output voltage as scheduled on the drawings
2. Static voltage +/- 2%
3. Harmonic distortion 3% THD
4. Output types normally on, normally off or switch.

C. Wattage Rating
1. As noted on the drawings.

2.2 TRANSFER TIME

A. 2-10 milliseconds.

2.3 BATTERY OPERATION

A. Minimum 90 minutes.

2.4 INVERTER COMPATIBILITY

A. Compatible to LED lighting.

2.5 UL LISTED

A. UL 924 listed

2.6 SINE WAVES

A. Pure sine technology.

2.7 ENCLOSURE

A. Indicator lights for charge, ready and test switch.
2.8 BATTERY
   A. Lead acid type.

2.9 ACCEPTABLE MANUFACTURER
   A. Iota or Bodine.

PART 3 EXECUTION

3.1 SOURCE QUALITY CONTROL
   A. Factory tested to ensure proper operation.

3.2 FIELD QUALITY CONTROL
   A. Onsite testing.
   B. Onsite start-up/commissioning.

3.3 WARRANTY
   A. Battery 1 year.
   B. Electronics 3 years.

3.5 SYSTEM TRAINING
   A. Onsite training at the commissioning, at the end of 12 month operation, and the end of warranty period.

END OF SECTION

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PART 1 - GENERAL

1.1 SECTION INCLUDES
A. Surge protective device.

1.2 REGULATORY REQUIREMENTS
A. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and indicated.

1.3 RELATED SECTIONS
A. All drawings and specification sections apply to work in this section. Furnish all items, articles, materials, equipment, operations or methods that are mentioned, listed or scheduled on drawings or are in this specification including all labor, equipment, materials and miscellaneous incidentals necessary and/or required for the completion of this project. The work covered under this section of the specifications is in no way complete within itself but is supplementary to the entire specification and drawings.

1.4 REFERENCES
B. ANSI/IEEE C62.41/62.45 certified documentation of performance testing.
C. ANSI/NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.

1.5 SUBMITTALS
A. Provide submittals as listed in Section 26 01 00.

PART 2 - PRODUCTS

2.1 MANUFACTURERS
A. As scheduled on the drawings.

B. SERVICE ENTRANCE, MDP AND PANELBOARD SURGE PROTECTIVE DEVICES

SPD Description: Units shall have the following features and accessories:

1. Engineered solid state arrays of nonlinear voltage dependent individually fused and thermally protected metal oxide varistors with matched operating characteristics.
2. The suppression system shall not utilize silicon avalanche diodes (SADs), selenium cells or other components which might short circuit the line, leading to interruption of normal power.
3. Short circuit current rating: 200 kAIC.
5. Internal connections: All full magnitude transient currents shall be conducted utilizing low impedance copper bus bars.
6. Fabrication using bolted compression lugs for internal wiring.
7. Redundant suppression circuits.
8. Red and green LED indicator lights for power and protection status.
9. Audible alarm to indicate when protection has failed.
10. Surge event operations counter (Service Entrance device requirement only).
11. Form C contacts; one normally open and one normally closed for remote monitoring of protection status. Contacts shall reverse on failure of any surge diversion module or on opening of any current-limiting device. Coordinate with building power monitoring and control system.

C. Peak Surge Current Rating for Distribution Panel devices: 150 kA per phase.

D. Peak Surge Current Rating for Branch Panelboard devices: 100kA per phase.

E. UL 1449 4th Edition Voltage Protection Rating (VPR) shall be as follows:
   1. Line to Neutral:
      a. 480Y/277: 1200V
      b. 208Y/120: 700V
   2. Line to Ground:
      a. 480Y/277: 1200V
      b. 208Y/120: 700V
   3. Neutral to Ground:
      a. 480Y/277: 1200V
      b. 208Y/120: 700V
   4. Line to Line:
      a. 480Y/277: 2000V
      b. 208Y/120: 1200V

2.2 SERVICE CONDITIONS

A. Rate SPDs for continuous operation under the following conditions unless otherwise indicated:

B. Maximum Continuous Operating Voltage per UL 1449 4th edition:
   1. 480Y/277: 15% allowable fluctuation, 320V
   2. 208Y/120: 25% allowable fluctuation, 150V

C. Operation Temperature: 0 to 120 deg F

D. Humidity: 0 to 95%, non-condensing.

E. Altitude: Less than 10,000 feet above sea level.
2.3 ENCLOSURES

A. The specified system shall be provided in a NEMA-rated enclosure suitable for the environment.

PART 3 - EXECUTION

3.1 INSTALLATION OF SURGE PROTECTIVE DEVICES

A. Conductors between suppressor and point of attachment to service equipment shall be sized in accordance with manufacturer’s recommendations and conductor lengths shall be as short as possible, not to exceed 18 inches for Distribution and Branch Panels. Do not bond neutral and ground.

3.2 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer’s published torque tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.3 FIELD QUALITY CONTROL

A. Verify that electrical wiring installation complies with manufacturer's installation requirements.

END OF SECTION

MAI: 2021-1520
PART 1  GENERAL

1.1  SECTION INCLUDES
A.  Interior luminaires per schedule.

1.2  RELATED SECTIONS
A.  All drawings and specification sections apply to work in this section. Furnish all items, articles, materials, equipment, operations or methods that are mentioned, listed or scheduled on drawings or are in this specification including all labor, equipment, materials and miscellaneous incidentals necessary and/or required for the completion of this project. The work covered under this section of the specifications is in no way complete within itself but is supplementary to the entire specification and drawings.

1.3  REFERENCES
A.  NEMA WD 6 - Wiring Devices-Dimensional Requirements.


F.  LED Standards LM 79 and LM 80.

1.4  SUBMITTALS FOR REVIEW
A.  Provide submittal as listed in Section 26 01 00.

B.  Shop Drawings: Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.

C.  Product Data: Provide dimensions, ratings, and performance data.

1.5  REGULATORY REQUIREMENTS

B.  Conform to requirements of NFPA 101.
C. Products: Listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.


PART 2 PRODUCTS

2.1 LUMINAIRES

A. Furnish Products as scheduled on the drawings.

2.2 LED DRIVERS

B. LED drivers shall include a factory disconnecting means in accordance with 2017 NEC 410-130G.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install suspended luminaires using pendants. Provide pendant length required to suspend luminaire at indicated height.

B. Support luminaires independent of ceiling framing.

C. Locate recessed ceiling luminaires as indicated on reflected ceiling plan.

D. Install surface mounted luminaires and exit signs plumb and adjust to align with building lines and with each other. Secure to prevent movement.

E. Exposed Grid Ceilings: Provide auxiliary members spanning ceiling grid members to support surface mounted luminaires. Fasten surface mounted luminaires to ceiling grid members using bolts, screws, rivets, or suitable clips at a minimum of (4) points of attachment to prevent movement.

F. Install recessed luminaires to permit removal from below.

G. Install clips to secure recessed grid-supported luminaires in place at a minimum of (4) points of attachment to prevent movement.

H. Install wall mounted luminaires at height as indicated on Drawings and/or architectural drawings.

I. Install accessories furnished with each luminaire.

J. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within luminaire.

K. Bond products and metal accessories to branch circuit equipment grounding conductor.

L. Luminaires specified with factory installed battery drivers shall be wired as noted and shown on the drawings.
3.2 FIELD QUALITY CONTROL
A. Operate each luminaire after installation and connection. Inspect for proper connection and operation.

3.3 ADJUSTING
A. Position exit sign directional arrows as indicated.

3.4 CLEANING
A. Contract Closeout: Cleaning installed work.
B. Clean electrical parts to remove conductive and deleterious materials.
C. Remove dirt and debris from enclosures.
D. Clean photometric control surfaces as recommended by manufacturer.
E. Clean finishes and touch up damage.

3.5 DEMONSTRATION AND INSTRUCTIONS
A. Replace non-working LED’s.

END OF SECTION

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PART 1 GENERAL

1.1 SECTION INCLUDES
A. Data raceway.

1.2 RELATED SECTIONS
A. All drawings and specification sections apply to work in this section. Furnish all items, articles, materials, equipment, operations or methods that are mentioned, listed or scheduled on drawings or are in this specification including all labor, equipment, materials and miscellaneous incidentals necessary and/or required for the completion of this project. The work covered under this section of the specifications is in no way complete within itself but is supplementary to the entire specification and drawings.

1.3 REFERENCES

1.4 SYSTEM DESCRIPTION
A. Voice/Data wiring: By Owner.

1.5 REGULATORY REQUIREMENTS

B. Furnish Products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and indicated.

PART 2 PRODUCTS

Section Not Used

PART 3 EXECUTION

3.1 INSTALLATION
A. Support raceways.
B. Data outlet minimum mounting heights shall match duplex receptacles.

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END OF SECTION
SECTION 28 31 00
FIRE ALARM SYSTEM

PART 1 GENERAL

1.1 SECTION INCLUDES
A. Extend existing “National Time” fire alarm.
B. Fire alarm system shall not be limited to: Manual pull stations, duct smoke detectors, ceiling smoke detectors, audio/visual devices and visual devices. Include all associated code mandated components, wiring for a complete operating system.
C. Fire alarm ADA signaling devices.
D. Fire alarm wiring.

1.2 RELATED SECTIONS
A. All drawings and specification sections apply to work in this section. Furnish all items, articles, materials, equipment, operations or methods that are mentioned, listed or scheduled on drawings or are in this specification including all labor, equipment, materials and miscellaneous incidentals necessary and/or required for the completion of this project. The work covered under this section of the specifications is in no way complete within itself but is supplementary to the entire specification and drawings.

1.3 REFERENCES
B. NFPA 72 - Current adopted code.
C. State of Michigan – Bureau of Fire Services for Fire Alarm Plan Review and Inspections.
D. Local authorities having jurisdiction.
E. Underwriters Laboratories Inc.
F. National Fire Protection Association Standards
G. All equipment shall be approved by Underwriters Laboratories Inc. (UL) for its intended purpose for the following standards as applicable.

1. UL864 UOJZ - Control units for fire protective signaling systems local signaling unit.
   a. Central station signaling protected premises unit.
   b. Remote signaling protected premises unit.
2. UL2075 - CO detectors connected to face.
3. UL864 SYZV - Releasing device control unit (water release only).
4. UL268 - Smoke detectors for fire protective signaling systems.
5. UL268A - Smoke detectors for duct application.
6. UL217 - Smoke detectors for single stations.
7. UL521 - Heat detectors for fire protective signaling systems.
8. UL228 - Door holders for fire protective signaling systems.
10. UL1638 - Visual signaling appliances.
11. UL38 - Manually activated signaling boxes.
12. UL346 - Waterflow indicators for fire protective signaling systems.
13. UL1481 - Power supplies for fire protective signaling systems.

1.4 AMERICANS WITH DISABILITIES ACT (ADA)

A. All visual notification appliances and manual pull stations shall comply with the requirements with ADA.

1.5 SUBMITTALS

A. Provide submittal as listed in Section 26 01 00. Submittal cut sheets shall be arrowed or marked with catalog numbers. Failure to comply will be cause for returning submittal for corrections at no delays or extra cost to the Owner.

1. Plan drawings showing the locations (with room names and numbers) of the system components, including any adjustments in the quantities and locations of initiating devices and notification appliances to meet code requirements.
2. Riser diagram showing system components, interconnecting wiring and connections to other building systems and equipment.
3. Wiring diagrams showing manufacturer and field connections at component terminals, complete with conductor color codes and wire numbers.
4. System configuration list showing inputs, outputs, device addresses and custom location labels, device configurations and program logic.
5. Submit bill of materials, and not part of the submittal, with O&M Manuals.
6. Catalog pages showing system components.
7. System battery sizing calculations.
8. Power supply, amplifier and circuit sizing calculations.

B. Shop Drawings: Provide control panel layout and system wiring diagram showing each device and wiring connection required.

1.6 PROJECT RECORD DOCUMENTS

A. Record actual locations for complete fire alarm system.
1.7 OPERATION AND MAINTENANCE DATA

A. Submit as specified.

B. Operation Data: Operating instructions.

C. Maintenance Data: Maintenance and repair procedures.

1.8 REGULATORY REQUIREMENTS


D. State of Michigan, Bureau of Fire Services for Plan Review and Inspections.

E. Local authorities having jurisdiction.


I. All equipment shall be approved by Underwriters Laboratories Inc. (UL) for its intended purpose for the following standards as applicable.
   1. UL864 UOJZ - Control units for fire protective signaling systems local signaling unit.
      a. Central station signaling protected premises unit.
      b. Remote signaling protected premises unit.
   2. UL2075 - CO detectors connected to face.
   3. UL864 SYZV - Releasing device control unit (water release only).
   4. UL268 - Smoke detectors for fire protective signaling systems.
   5. UL268A - Smoke detectors for duct application.
   6. UL217 - Smoke detectors for single stations.
   7. UL521 - Heat detectors for fire protective signaling systems.
   8. UL228 - Door holders for fire protective signaling systems.
   10. UL1638 - Visual signaling appliances.
   11. UL38 - Manually activates signaling boxes.
   12. UL346 - Waterflow indicators for fire protective signaling systems.
   13. UL1481 - Power supplies for fire protective signaling systems.

1.9 SCOPE OF WORK

A. This bid package shall include fire alarm devices, associated wiring, and system certification ready for interconnection to the existing main fire alarm control panel.
B. Provide fire alarm wiring and a 120 volt circuit to any combination smoke/fire dampers as shown on the Mechanical drawings. Electrical Trades shall be responsible to review the Mechanical drawings in addition to the Electrical plans. Mechanical plans shall govern damper location. Interwire to the associated duct smoke detector in accordance with the manufacturer’s wiring instructions. Duct smoke detector shall be provided and wired by Electrical Trades, unless specifically listed on the damper schedules.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. National Time.

B. Extend existing fire alarm system. National Time shall be responsible to assess the existing system capacity.

2.2 OPERATION

A. The operation of any manual pull station, flow switch, tamper switch, smoke detector, duct smoke detector, shall cause the sounding of all alarm horns on a temporal pattern basis, sequential flashing of system strobes, activate common alarm relay contacts on the control panel and indicate on the control panel’s LCD display the zone and type of device sounding the alarm.

In addition, the operation of any duct smoke detector shall shut down its associated fan or damper motor. Complete interwiring between detector and mechanical equipment control panel.

B. The operation of the panel mounted alarm silencing switch will turn off all horns but the strobes will continue to flash until the device actuating the alarm is reset to its normal position and the panel mounted system reset button is operated, at which time the system will return to its normal stand by (supervisory) mode.

C. Any system trouble condition such as an open circuit or ground condition will activate a common trouble LED and indicate on the control panel LCD display the exact zone, circuit or internal panel condition causing the trouble condition. Correction of the trouble source will return the panel to its normal standby mode.

D. Initiating device circuits shall be two-wire style B, and horn or strobe circuits shall be two-wire style Y utilizing end of line resistors for circuit supervision. All wiring to initiating and signaling devices shall be looped and continuous to the end of line resistor on its respective circuit. T-tapping is not permissible.

E. The fire alarm control panel shall communicate with each addressable initiating and control divide individually via shielded twisted pair signaling line circuits.

F. Each signaling line circuit shall be capable of accessing up to 127/250 addressable devices.

G. Each signaling line circuit shall allow up to 10,000 feet of wire length to the furthest addressable device.
H. Communications shall be completely digital and shall include parity data bit error checking routines for address codes and check sum routines for the data transmission protocol.

I. Each device shall be uniquely identified by the device address.

J. There shall be no limit to the number of initiating devices which may be activated simultaneously.

K. Each device shall be individually annunciated at the panel. Annunciation shall include the following conditions for each device.
   1. Alarm, supervisory or trouble condition.
   2. Open, short or ground.
   3. Device failure or incorrect device installed.

2.3 DEVICES (all point addressable type that is compatible to the main panel)

A. Manual Pull Stations: Individually addressable, suitable for two wire operation, with a high impact red Lexan body and raised white lettering. Stations shall include an ADA compliant single action operating mechanism with a mechanical latch to hold an operated station open until reset.
   1. Reset shall be accomplished through use of a key common to the panel or a small flat-blade screwdriver. Stations which use allen wrenches or special tools to reset are not acceptable. The point of reset shall be front accessible so stations with tamper-resistant covers can be reset easily.

B. Smoke Detectors: Provide photoelectric type with two wire base for mounting to a 4” octagon box. Furnish smoke detectors for control of the magnetic door holder as shown and noted on the plans. Refer to the current adopted NFPA 72 Fire Alarm Code for the allowable detector for locations.

C. Duct Smoke Detectors: Individually addressable and consist of a housing, sampling tubes, a baffle and a detachable detector head. Duct detectors shall include an alarm LED, a local test switch, and an auxiliary SPDT relay for ventilation system control. Duct detectors shall be resettable by actuating the panel reset pushbutton. The sampling tubes shall be capable of being cleaned through the housing cover.
   1. The detector heads shall be photoelectric as specified above, but shall be capable of accepting ionization detector heads.
   2. Duct detectors shall include remote alarm indicators and test switches shall be installed in readily accessible locations.

D. Audio/Visual Units: Provide horn and strobe units with 24VDC horn and ADA approved strobe for mounting to a 4” square box.

E. Strobes: As shown for proper illuminance, clear Lexan lens with red "FIRE" or international fire symbol lettering, capable of being synchronized, and capable of wall or ceiling mounting.

F. Audio/Visual and Visual Units: For ceiling installation shall include vertical lettering. Horizontal lettering is not acceptable.
2.4 FIRE ALARM WIRING
A. Use (1) pair #18/2 twisted shielded for initiating devices unless directed otherwise by the manufacturer.
B. Use (1) pair #14 for power duct smoke detectors as directed by the manufacturer.
C. Use (1) pair #14 for horn/strobe circuits as directed by the manufacturer.
D. Use (2) pair #18 for control to remote alarm and test station with duct smoke detector.
E. All fire alarm wiring shall be in compliance with NEC Article 760.
F. Fire alarm supplier to provide circuiting to comply with voltage drop and load calculations per Code requirements.
G. All wire sizes indicated are minimum.

2.5 NAC PANEL
A. Node and NAC panels shall be modular with solid state, microprocessor based electronics, operator interfaces, power supplies, audio generators, amplifiers, battery chargers and batteries as required. All components shall be supervised.
B. Fire alarm vendor/manufacturer shall be responsible for determining the required quantity and location.

2.6 POWER SUPPLIES
A. Fire alarm vendor shall furnish and install power supplies as required for a complete operating system. Electrical Trades shall field select the location as advised by the fire alarm vendor.

PART 3 EXECUTION

3.1 INSTALLATION
A. Install fire alarm wiring in conduit.
B. All junction boxes for fire alarm raceway system shall be painted red labeled “FIRE ALARM”.
C. Provide and install the fire alarm system in strict accordance with the plans and specifications, codes and manufacturer’s instructions.
D. Fully test the fire alarm system in accordance with NFPA 72, Chapter 7.
E. Fire alarm vendor shall be responsible to certify the sound coverage for the entire facility.
F. Audio/visual and visual units shall be installed in accordance with Michigan Building Code under the fire protection system section or NFPA 72 Fire Alarm Code wall mounted appliance shall be mounted such that the entire lens is not less than 80 inches, and not greater than 96 inches above the finished floor. Ceiling mounted device is an acceptable method. Ceiling mounting devices are designated with a C subscript letter.

G. Manual pull stations shall be mounted a maximum of 48" from the floor level to the activating handle or to the lever. The current adopted Michigan Building Code edition fire protection system Section 907 shall govern over NFPA 72 Fire Alarm Code for mounting heights.

H. Electrical Trades shall complete the entire fire alarm system in accordance with plans and specifications.

I. Ceiling mounted fire alarm device locations are shown diagrammatic. The design requirement shall be to install the device centered in the classrooms, corridor, offices, etc. Confirm the location with lighting, speaker, HVAC diffusers, to avoid interferences.

J. NAC panel(s) require a dedicated 120 volt power source. The Contractor shall be responsible for coordinating NAC panel quantities and locations with their fire alarm vendor and include all power circuit costs in the bid.

K. Electrical Trades and their respective fire alarm vendor shall field determine the remote duct detector test station location to maintain easy access for the Owner usage. The test station locations are not shown on the drawings.

3.2 MANUFACTURER/DISTRIBUTOR SERVICES

A. The following supervision shall be provided by a factory trained service technician from the distributor of the fire alarm equipment.

B. A pre-installation visit to the job site to review equipment submittals and to verify the method by which the system is to be wired.

C. Upon completion of wiring, final checkout and certification of the system shall be made under supervision of this technician.

D. At that time of the formal checkout, technician shall give operational instructions to the Owner.

3.3 WARRANTY

A. Provide a one-year guarantee from date of system acceptance by the Owner.

3.4 CLOSE-OUT

A. Provide O&M manuals, warranty letter, as-built drawings and inspection sign-off.

END OF SECTION

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A. Install metal lockers and accessories level, plumb, rigid, and flush according to manufacturer's written instructions.
B. Assemble knocked-down lockers with standard fasteners, with no exposed fasteners on door faces and face frames.
C. Connect groups of all-welded lockers together with standard fasteners, with no exposed fasteners on face frames.
D. Anchor lockers to floors and walls at intervals recommended by manufacturer, but not more than 36 inches o.c. Install anchors through backup reinforcing plates where necessary to avoid metal distortion, using concealed fasteners.
E. Fit exposed connections of trim, fillers, and closures accurately together to form tight, hairline joints, with concealed fasteners and splice plates.
   1. Attach recess trim to recessed lockers with concealed clips.
   2. Attach sloping top units to lockers, with closures at exposed ends.
F. Attach finished end panels with fasteners only at perimeter to conceal exposed ends of nonrecessed lockers.

3.3 ADJUSTING, CLEANING, AND PROTECTION
A. Adjust doors and latches to operate easily without binding. Verify that integral locking devices operate properly.
B. Clean interior and exposed exterior surfaces and polish stainless-steel and nonferrous-metal surfaces.
C. Protect lockers from damage, abuse, dust, dirt, stain, or paint. Do not permit locker use during construction.
D. Touch up marred finishes, or replace locker units that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by locker manufacturer.

END OF SECTION 105113
SECTION 312000 - EARTH MOVING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Excavating and filling for rough grading the site.
   2. Preparing subgrades for slabs-on-grade, walks, pavements, turf and grasses and plants.
   3. Proofrolling and repair of site.
   4. Excavating and backfilling for buildings and structures.
   5. Drainage course for concrete slabs-on-grade.

1.2 QUALITY ASSURANCE

A. Pre-excavation Conference: Conduct conference at Project site.

1.3 PROJECT CONDITIONS

A. Utility Locator Service: Notify utility locator service for area where Project is located before beginning earth moving operations.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. General: Provide soil materials when sufficient satisfactory soil materials are not available from excavations.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth moving operations.

B. Protect and maintain erosion and sedimentation controls during earth moving operations.

C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

3.2 PROOFROLLING

A. All areas to receive slab on grade, and other site improvements are to be thoroughly proofrolled after stripping and clearing.

3.3 EXCAVATION, GENERAL

A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may
include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.

1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.

3.4 SUBGRADE INSPECTION

A. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect, without additional compensation.

3.5 UNAUTHORIZED EXCAVATION

A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi (17.2 MPa), may be used when approved by Architect.

1. Fill unauthorized excavations under other construction, pipe, or conduit as directed by Architect.

3.6 STORAGE OF SOIL MATERIALS

A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.7 SOIL FILL

A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.

B. Place and compact fill material in layers to required elevations as follows:

1. Under grass and planted areas, use satisfactory soil material.

3.8 SOIL MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.

1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.

2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.9 COMPACTION OF SOIL BACKFILLS AND FILLS

A. Place backfill and fill soil materials in layers not more than 12 inches (300 mm) in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches (100 mm) in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.
3.10 GRADING

A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.

B. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:
   1. Turf or Unpaved Areas: Plus or minus 1 inch (25 mm).

3.11 DRAINAGE COURSE UNDER CONCRETE SLABS-ON-GRADE

A. Place drainage course on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place and compact drainage course under cast-in-place concrete slabs-on-grade as follows:
   1. Place drainage course that exceeds 6 inches (150 mm) in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches (150 mm) thick or less than 3 inches (75 mm) thick.
   2. Compact each layer of drainage course to required cross sections and thicknesses to not less than 95 percent of maximum dry unit weight according to ASTM D 1557.

3.12 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
   1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.13 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner’s property.

END OF SECTION 312000