PROJECT MANUAL

PROJECT

No. 220240

RENOVATIONS TO PEOPLE'S STATE BANK FOR

TUSCOLA COUNTY OFFICES

171 N State Street
Caro, MI 48723

OWNER

Tuscola County
125 W Lincoln
Caro, MI 48723

ARCHITECTS

NJB ARCHITECTS
105 1/2 Main Street
Flushing, MI 48433
(810) 659-7118
Fax (810) 659-7224

M&E Engineers

MacMillan Associates, Inc.
Consulting Engineers
714 East Midland Street
Bay City, MI 48706

May 26, 2023

Seal:

Contract Signatories:

Owner

Contractor

NJB Architects

MacMillian Associates

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SECTION 00010 - ADVERTISEMENT FOR BIDS

PART 1 - GENERAL

1.1 Project Identification:

A. Project: No. 220240 – Renovations to People's State Bank for Tuscola County Offices
171 N State Street
Caro, MI 48723

B. Owner: Tuscola County
125 W Lincoln Street
Caro, MI 48723

C. Architect: NJB Architects Inc
105 1/2 Main Street
Flushing, MI 48433
Phone: (810) 659-7118
Email: terryg@njb-architects.com

1.2 General Description of Work:

Complete interior renovation of approximately 9,600 square feet, including a 640 square foot stairway addition with minor exterior façade upgrades. Work includes completely new HVAC systems, lighting, electrical, data, communications and control systems.

1.3 Time and Place of Bid Reception:

Bids shall be submitted on a single lump sum basis in accordance with Instruction to Bidders. Sealed Bids will be received by the Owner until 12:00 p.m. (noon) on Friday, June 23, 2023, at County Controller's office, 125 W Lincoln Street, Caro, MI. Bids will be opened and read publicly beginning at 1:15 p.m. that afternoon. Bids received after this time will not be accepted.

1.4 Examination and Procurement of Documents:

Drawings and specifications may be obtained at the Design Professional's office. Prime Bidders may obtain documents in accordance with the Instruction to Bidders.

A pre-bid conference will be conducted for Prime Bidders and other interested parties on Thursday, June 15, 2023, beginning at 1:00 p.m. Bidders shall assemble on site at 171 N State Street, Caro, MI. Enter building from rear parking lot located behind the site.

1.5 Security:

Bid security, in the amount of five percent (5%) of the total proposal, must accompany each bid in the form of a Bid Bond (certified check acceptable). Performance and payment bonds will be required of the successful bidder.

1.6 Labor Standards:

Applicable state and federal laws regarding the "Conditions of Employment" apply to work under this contract.

1.7 Owner's Right to Reject Bids:
The Owner reserves the right to waive irregularities and to accept and/or reject any or all Bids.

END OF SECTION

SECTION 00100 - INSTRUCTIONS TO BIDDERS

PART 1 - GENERAL

1.1 Project Identification:

A. Project: No. 22040 – Renovations to People's State Bank for Tuscola County Offices
171 N State Street
Caro, MI 48723

B. Owner: Tuscola County
125 W Lincoln Street
Caro, MI 48723

1.2 Examination of Documents:

A. Documents may be examined at the following locations:
1. The offices of NJB Architects.
2. McGraw Hill Dodge Plan Room, McGraw Hill Construction Co., 21415 Civic Center Drive, Suite 115, Southfield, MI 48076
3. Construction Association of Michigan, 43636 Woodward, P.O. Box 3204, Bloomfield Hills, MI 48302
4. Tri-City Builders & Traders Exchange, 334 West Water Street, Saginaw, MI 48607

1.3 Procurement of Documents:

A. Prime Bidders may obtain drawings and specifications from the Design Professional in accordance with the following:
1. Electronic files (PDF's) of the Contract Documents will be issued at no charge.
2. Paper copies of the Contract Documents will be issued upon payment of $150.00, non-refundable, per each set for printing costs.

B. Bidders requesting bid documents be mailed to them must submit an additional check for $25.00, non-refundable, for postage and handling. Bid documents will be sent out, only upon receipt of both checks. Bidders accept all responsibility for bid documents, once documents are placed in the mail.

C. Deposit check shall be made payable to: NJB Architects.

1.4 Pre-Bid Conference:

A. A pre-bid conference will be conducted at the time, date and location indicated in Advertisement For Bids, Section 00010 - 1.4.

B. The Design Professionals will be present to answer questions regarding the intent of the documents.

1.5 Time for Completion of Work:

A. It is the intent of the Owner to award a contract within thirty (30) days after opening bids and that the project will start immediately.

B. Substantial Completion for Work of this contract shall be achieved on or before the time for completion stated on the Bidder's proposal form.

1.6 Bid Receipt:

A. Bid proposals will be received by: County Controller's Office, 125 W Lincoln Street, Caro, MI 48723.

PART 2 - MATERIALS

2.1 Ownership of Documents:

A. All drawings and specifications remain the property of the Design Professional and shall be returned within thirty days after bid date.

PART 3 - EXECUTION

3.1 Examination of Documents and Site:

A. It is the Bidder's responsibility to study the drawings and specifications, visit the construction site and examine existing conditions to correlate site observations with requirements of contract documents.

B. No "EXTRA" payment or allowance will be made to cover obvious discrepancies or changes required due to existing site conditions not visually determined and addressed in writing to the Design Professional before bid opening, or by reason of any error or oversight on the Contractor's part.

3.2 Interpretations and Corrections of Documents:

A. Bidders and sub-bidders shall submit a written request to the Design Professional a minimum five (5) days before receipt of bids for clarification or interpretation of errors, inconsistencies or ambiguities found in contract documents.

B. An addendum will be issued to Prime Bidders to clarify the subject or request a minimum three (3) days before receipt of bids and will become part of the Contract Documents.

C. Only interpretations, corrections or changes made by addendum will be binding.

3.3 Substitutions:

A. To obtain approval to use unspecified products, Bidders and sub-bidders shall submit a written request to the Design Professional a minimum ten (10) days before receipt of bids, in accordance with Section 00801 - 2.1 and Division 1. Requests received after this time will not be considered.

B. Submit, with the request, all necessary samples and substantiating data to prove equal quality and performance to that product specified.

C. If proposed product is accepted, an addendum will be issued to Prime Bidders a minimum four (4) days before receipt of bids and will become part of the Contract Documents.

D. Only substitutions made by addendum will be binding.

3.4 Codes, Ordinances and Regulations:

A. Furnish and install all labor and material according to latest codes, ordinances and regulations for all governing bodies having project jurisdiction.

B. The quality of labor and material shall be as required by drawings and specifications except when exceeded by local codes, ordinances, or regulations.

C. Contracts for work under this bid will require the Contractor and subcontractors to maintain policies of employment as described in Supplementary General Conditions, Section 00801.

3.5 Taxes, Permits and Fees:

A. Contractor shall include and be deemed to have included in his bid proposal all sales, consumers, use and similar taxes currently imposed by legislative enactment.

B. Contractor shall secure and pay for the building permit and other permits, governmental fees, licenses, and inspections necessary for proper execution and completion of the Work.

3.6 Basis of Bid:

A. The Summary of Work for each Base Bid listed on the proposal form is described in General Requirements, Division 1.

B. For Base Bid listed on the proposal form, a single lump sum bid will be received for all work of that project.

C. The Bidder shall include all alternates and all unit cost items shown on the Proposal Form. Bids which are incomplete, conditional, obscure or which contain additions not asked for, will be subject to rejection.

3.7 Preparation and Submittal:

A. Bids will be opened at the stated time, date and location in accordance with the Advertisement for Bids, Section 00010.

B. Bids shall be submitted on unaltered Proposal Forms furnished within. The Bidder shall fill in all blanks by typing or lettering in ink. Sums are to be given both numerically and written, with the amount written in words to govern in case of discrepancy. Bid shall give legal name of Bidder and shall be signed by a person legally authorized to bind the Bidder to a contract.

C. All addenda received by Bidder shall be acknowledged by placing all identifying addendum numbers and dates on bid proposal form and on face of sealed envelope.

E. The Bidder shall submit on the bid proposal form the number of calendar days necessary to complete all the work required of the contract documents.

F. Two copies of the Bid Proposal Form are included. The Bidder shall fill in and submit the proposal form in duplicate.

G. Submit copies of bid proposal form, bid security, and other required documents enclosed in sealed, opaque envelope, addressed to party receiving bids. Identify envelope with project name and number and Bidder's name and address. For mailing, place sealed envelope inside separate mailing envelope marked **'Sealed Bid Enclosed for No. 220240 – Renovations to People's State Bank for Tuscola County Offices'**.

H. Bid proposals transmitted by **FAX MACHINE OR BY EMAIL WILL NOT BE ACCEPTED**.

3.8 Bid Modification and Withdrawal:

A. Bid may **NOT** be modified, withdrawn, or canceled for thirty (30) days after date of opening bids.

B. Prior to bid date and time, Bidder may modify, cancel, withdraw and/or resubmit his bid by signed, written notice. Notice must be mailed to party receiving bids, in confirming envelope, post-marked before date and time of receipt of bids. Modification of bids may require modification of bid security.

3.9 Bid Security:

A. Bid Security, in the amount of five percent (5%) of base bid in the form of a cashier's check or bid bond, made payable to the Owner and insured by licensed surety doing business in the state of Michigan, is required to accompany each bid.

B. Failure to furnish Bid Bond by time of bid opening may be cause for rejection of bid.

C. Bid Bonds will be returned to unsuccessful Bidders after bid opening. Bond will be returned to successful Bidder after execution of further documents and bonds required by the specifications.

D. Owner reserves the right to retain security of the three lowest Bidders until entered into contract with one of the Bidders; or until thirty days (30) after bid opening date. If any Bidder refuses to enter into a contract, Owner will retain his bond as liquidated damage.

3.10 Guaranty Bonds and Insurance:

A. Performance Bond and Payment Bond are required on this project.

B. Performance Bond, Payment Bond and Insurance requirements are described in Supplementary General Conditions, Section 00801.

3.11 Selection of Successful Bidder and Contract Award:

A. Owner reserves the right to waive bid irregularities, to accept the bid in Owner's best interest and to accept alternates in any order or combination to determine low Bidder on basis of the sum of base bid and accepted alternates.

B. Owner reserves the right to reject any or all bids where incomplete or irregular, lacking bid bond, data required by bidding documents, or where proposals exceed funds available.

C. The Owner will consider the qualification and experience of the Bidder, the amount of the bid and the completion date when determining the award of the contract.

D. A complete list of all subcontractors, material and equipment suppliers shall be furnished to Design Professional by the successful bidder within 24 hours after bid opening and before contracts are ready for signing.

F. Before award of contract, considered Bidder will be notified in writing if the Owner or Design Professional has reasonable objection to a person or entity proposed by Bidder. Bidder may then withdraw bid or submit substitute person or entity together with adjustment in base bid for Owner's acceptance or disqualification. In event of withdrawal by Bidder or disqualification by Owner, bid security will not be forfeited.

G. Sub-contracts, material and equipment contract shall not be awarded until they have been accepted by the Design Professional and the Owner.

END OF SECTION

SECTION 00300 - PROPOSAL FORM

Project: No. 220240 – Renovations to People's State Bank – Tuscola County Offices

Name of Bidder:

Address:

Telephone: Date:

Email:

To: Tuscola County Board of Commissioners

I, the undersigned, have received the drawings and specifications for the Construction Work on the above named project prepared by NJB Architects Inc. I have also received the Addenda acknowledged below and have included all their provisions and costs in my Bid. Having carefully considered and examined all Contract Documents, having visited the site and examined all conditions affecting the work, I submit the following Bid and hereby agree:

1. To furnish all labor, services, material, equipment and coordination of trades required to perform all work in strict conformance with the Contract Documents, including all commissions, overhead, taxes, fees and profit.
2. To complete the work by the time stipulated on the Proposal Form and under the conditions as outlined in the Contract Documents.
3. To accept the provisions of the Instruction to Bidders regarding disposition of Bid Security.
4. To hold my Bid open for a maximum period of thirty (30) days.

BASE BID: Proposal for the Work of all trades required for the renovation of the former People's State Bank building, 171 N State Street, for the use of Tuscola County Offices.

Amount in Words

_____$_____._____

Addenda

I, the undersigned, hereby acknowledge receipt of the following addenda:

Addendum	Date
_____	_____
_____	_____

Time for Completion

I, the undersigned, hereby agree to complete all the work and improvements, as specified in the contract documents within _____ calendar days from the date of execution of the contract between the Owner and Contractor.

Bid Evaluation

To assist the Owner in reviewing bid proposals please list the dollar amount associated with the following scopes of work:

Architectural Trades: $ _____

Mechanical Trades: $ _____

Fire Protection: $ _____

Electrical Trades: $ _____

Of the dollar amount listed for electrical trades how much is for the generator and emergency power distribution system: $ _____

Acceptance

I, the undersigned, upon notification of the acceptance of the proposal, agree to execute a contract for the above work, for the above stated compensation. Further I agree, if awarded the contract, to execute and deliver to the Design Professional within 10 days after the signing of the contract, satisfactory bonds, in the form of 100% "Performance Bond" and 100% "Labor and Material Payment Bond", according to the laws of the State of Michigan governing this construction work, in an amount equal to the contract sum.

I have enclosed the required Bid Security, in the form of a _____ in the amount of five percent (5%) of the Base Bid.

Respectfully submitted,

BY: _____
Signature

_____
Printed Name and Title

END OF PROPOSAL FORM

Enclose the following with sealed bid proposal:

Familial Disclosure Form
Iran Business Relationship Affidavit

The Bidder, if under consideration for award of contract, shall complete and submit to the Design Professional, within 24 hours after bid opening, the following list of major subcontractors and site superintendent to be employed on the project (subject to final approval by the Owner and the Design Professional):

Subcontractors

Excavation

Concrete

Masonry

Structural Steel

Carpentry

Roofing

Windows

Doors

Drywall

Acoustical Ceilings

Ceramic Tile

Painting

Plumbing

HVAC

Electrical

Fire Protection

FAMILIAL DISCLOSURE FORM

Project: 220240 – Renovations to People's State Bank – Tuscola County Offices

All bidders must complete the following familial disclosure form in compliance with MCL 380.1267 and attach this information to the bid.

By the attached sworn and notarized statement we are disclosing the following familial relationship(s) that exists between the owner or any employee of the bidder and any member of the Tuscola County Board of Commissioners, other elected official of Tuscola County, or any department head.

Disclose any familial relationship and complete this form in its entirety:

The following are familial relationships as described above (provide employee name, family contact name, family contact position and familial relationship **or** NONE.)

_____

_____

_____

_____

_____

Signature(s): _____ Title: _____

Name of Firm: _____

STATE OF MICHIGAN)
) SS
COUNTY OF)

On this _____day of _____, 20_____, before me a Notary Public in and for said county personally appeared _____, agent of the said firm _____, and who acknowledged the same to be his free act and deed as such agent.

_____

Notary Public

IRAN BUSINESS RELATIONSHIP AFFIDAVIT

Project:

Effective April 1, 2013, all bids, proposals, and/or qualification statements received in the State of Michigan must comply with the “Iran Economic Sanctions Act”. The following certification is to be signed and included at time of submittal.

CERTIFICATION

Pursuant to the Michigan Iran Economic Sanctions Act, 2012 P.A. 517, by submitting a bid, proposal or response, Respondent certifies, under civil penalty for false certification, that it is fully eligible to do so under law and that it is not an “Iran linked business,” as that term is defined in the Act.

Signature	Title
Company	Date

SECTION 00801 - SUPPLEMENTARY GENERAL CONDITIONS AIA A201

PART 1 - GENERAL

1.1 Agreement Forms:

A. The contract form of agreement between the Owner and Contractor shall be: AIA Standard Form of Agreement Between Owner and Contractor, as amended ... (AIA Document A101 - 2007 Edition).

1.2 Related Documents:

A. Standard AIA Forms: The General Conditions of the Contract for the Construction of buildings "Standard Form of the American Institute of Architects" 2007 Edition, AIA Document A201, Articles 1 through 15 inclusive, are hereby made an integral part of this specification.

B. Where any Article of the "AIA General Conditions" is supplemented hereby, the AIA Provisions of such Article shall remain in effect. All supplemental provisions shall be considered as added thereto.

C. Where any such Article is amended, voided, or superseded the provisions of such Article not so specifically amended, voided, or superseded shall remain in effect.

D. The AIA Document A201 may be reviewed at the office of the Design Professional and/or may be obtained from the American Institute of Architects, 1735 New York Avenue, Northwest, Washington, D.C. 20006; or from the Michigan Society of Architects, 455 W. Fort St., Detroit, MI 48226.

E. The following Articles of the General Conditions are modified herein:

1. Article 1 - General Provisions
2. Article 3 - Contractor
3. Article 7 - Changes in the Work
4. Article 8 - Time
5. Article 9 - Payments and Completion
6. Article 10 - Protection of Persons and Property
7. Article 11 - Insurance and Bonds
8. Article 16 - Equal Opportunity

PART 2 - CHANGES AND ALTERATIONS

2.1 ARTICLE 1 - GENERAL PROVISIONS:

A. 1.1 BASIC DEFINITIONS; add the following subparagraphs:

1.1.9 OR EQUAL

The words "or equal" or "approved equivalent" shall mean any material, system or article which, as finally determined by the Design Professional is equal in quality, durability, appearance, strength, and design to the material, system, or article specified and will perform adequately the functions imposed by the general design.

1. The Contractor shall have the burden of proving, at his own cost and expense, to the satisfaction of the Design Professional, that the proposed product is equal to the specified product.

2. Requests for approval of proposed equivalents will be received by the Design Professional only from the Contractor on the "Substitution Request Form" included at end of General Requirements, Division 1.
3. Requests for approval of proposed equivalents will be considered by the Design Professional after bidding only in the following cases:
   a. The specified products cannot be obtained because of strikes, lockouts, bankruptcies, or discontinued product.
   b. The proposed equivalent is superior, or is equal to the specified product and its use is an advantage to the Owner in the opinion of the Design Professional.
   c. The proposed equivalent is guaranteed, in writing, by the Contractor for minimum of one year after final acceptance of the building or for a longer period of time equal to that required in the Contract Documents for originally specified product.
4. Where the Design Professional, pursuant to the provisions of this section, approved a contractor proposed equivalent product and upon installation such product requires a different quantity and/or arrangement of duct work, piping, wiring, conduit, or any other part of the work from that originally specified, detailed or indicated in the Contract Documents, the Contractor shall provide all additional materials and services required at his own expenditure with no additional cost added to original contract sum.

1.1.10 DESIGN PROFESSIONAL

The words "Design Professional" shall refer to the firm of NJB Architects Inc., including their employees and consultants. Included shall be the Architects, the designers, planners, engineers, and field representatives who are responsible for a particular portion of the design work.

B. 1.2 CORRELATION AND INTENT OF THE CONTRACT DOCUMENTS; add the following subparagraph

1.2.4 The Drawings are intended to show design, general arrangement and extent of the work and are partly diagrammatic. They are not intended to be scaled or used for rough-in measurements, nor to be used as Shop Drawings. Inadvertent discrepancies or the omission of notes or details on any drawing but given on another drawing shall not be cause for additional charge or claim.

2.2 ARTICLE 3 - CONTRACTOR:

A. 3.4 LABOR AND MATERIALS; add the following subparagraphs:

3.4.4 Prior to the execution of the contract, the contractor shall provide a list showing the name of the manufacturer proposed to be used for each of the products identified in the General Requirements of the Specifications (Division 1) in particular Schedule of Values and where applicable, the name of the installing subcontractor.

3.4.5 The Design Professional will promptly reply in writing to the Contractor stating whether the Owner or the Design Professional, after due investigation, has reasonable objection to any such proposal. If adequate data on any proposed manufacturer or installer is not available, the Design Professional may state that action will be deferred until the Contractor provides further data. Failure of the Owner or the Design Professional to reply promptly shall constitute

notice of no reasonable objection. Failure to object to a manufacturer shall not constitute a waiver of any of the requirements of the Contract Documents, and all products furnished by the listed manufacturer must conform to such requirements.

3.4.6 After the Contract has been executed, the Owner and the Design Professional will consider a formal request for the substitution of products in place of those specified only under the conditions set forth in the General Requirements of the Specifications (Divisions 1). By making requests for substitutions based on Subparagraph 3.4.4.1 above, the Contractor:

.1 Represents that the Contractor has personally investigated the proposed substitute product and determined that it is equal or superior in all respects to that specified.

.2 Represents that the Contractor will provide the same warranty for the substitution that the contractor would for that specified.

.3 Certifies that the cost data presented is complete and includes all related costs under this Contract but excludes costs under separate Contracts, and excludes the Design Professional's redesign costs, and waives all claims for additional costs related to the substitution subsequently become apparent.

.4 Will coordinate the installation of the accepted substitute, making such changes as may be required for the work to be complete in all respects.

3.4.7 It is hereby understood and agreed that no products or materials containing asbestos including chrysotile, amosite, crocidolite, tremolite asbestos, anthophyllite asbestos, actinolite asbestos, or any combination of these materials that have been chemically treated and/or altered, shall be installed or introduced into the building by the Contractor, his employees, agents, subcontractors, or other individuals or entities over whom the Contractor has control.

1. The Contractor will be required to sign and submit the "Contractor Certification of Asbesto-Free Product Installation Form," included at the end of General Requirements, Division 1, that all products and materials installed or introduced into the building will be asbestos-free.
2. The Contractor will also be required to furnish statements from the manufacturer verifying their products to be asbestos-free.

3.4.8 The Contractor shall comply with Section 4, Act 251, Public Acts of 1955, State of Michigan, and agree that he and his Subcontractors will not discriminate against an employee or applicant for employment to be employed in the performance of the Work, with respect to his hire, tenure, terms, conditions or privileges of employment, because of his race, sex, religion, age, national origin, color, marital status, handicap or political beliefs.

B. 3.5 WARRANTY; add the following subparagraph:

3.5.2 Each Contractor shall submit to the Design Professional, a written guarantee which shall be in accordance with Article 3, subparagraph 3.5.1 and Article 13, subparagraph 13.7.1.3 of the General Conditions, and all such additional guarantees, in writing, as are required by the specifications. All guarantees for material and workmanship shall be for a minimum one (1) year period, starting at the date of substantial completion, or for a longer period of time as specified in individual sections of specifications.

2.3 ARTICLE 7 - CHANGES IN THE WORK:

A. 7.3 CONSTRUCTION CHANGE DIRECTIVES; make the following clarification to subparagraph 7.3.6:

In the first sentence of subparagraph 7.3.6, delete the words "a reasonable allowance for overhead and profit" and substitute "an allowance for overhead and profit in accordance with the schedule set forth in subparagraph 7.3.6.6 below."

B. 7.3 CONSTRUCTION CHANGE DIRECTIVES; add the following subparagraph:

7.3.7.6 In subparagraph 7.3.6, the allowance for overhead and profit combined, included in the total cost to the Owner, shall be based on the following schedule:

.1 For the Contractor for any work performed by the Contractor's own forces, use 15% (percent) of the cost.

.2 For the Contractor, for any work performed by the Contractor's Subcontractors, use 10% (percent) of the amount due the Subcontractor.

.3 In order to facilitate checking of quotations for extras or credits, all proposals, except those so minor their propriety can be seen by inspection, shall be accompanied by a complete itemization of costs including labor, materials, and Subcontracts. Labor and materials shall be itemized in the manner prescribed above. Where major cost items are Subcontracts, they shall be itemized also. In no case will a change be approved without such itemization.

2.4 ARTICLE 8 - TIME:

A. 8.1 DEFINITIONS; add the following subparagraphs:

8.1.5 As between the Owner and the Contractor: as to all acts or failures to act occurring prior to the relevant Date of Substantial Completion, any applicable statute of limitations shall commence to run and any alleged cause of action shall be deemed to have accrued in any and all events not later than such data of substantial completion; as to all acts or failures to act occurring subsequent to the relevant Date of Substantial Completion, any applicable statute of limitations shall commence to run and any alleged cause of action shall be deemed to have accrued in any and all events not later than the date of issuance of the final Certificate for Payment.

8.1.6 It shall be understood and agreed that the time stated in the Proposal Form for the completion of the work under the Contract is reasonable, taking into consideration the average climatic conditions of the project site, conditions of the construction industry, and the labor availability in the locality.

2.6 ARTICLE 9 - PAYMENTS AND COMPLETION:

A. 9.3 APPLICATIONS FOR PAYMENT; add the following subparagraphs:

9.3.4 The Contractor will be paid monthly progress payments up to ninety percent (90%) of the value of the Work completed less retainage of ten percent (10%) upon issuance of monthly certificates of payment by the Design Professional.

9.3.5 Applications for Payment:

Applications shall be in the office of the Design Professional by the first of the month to insure proper processing and payment by the twenty fifth of the same month. Submit original and two copies of application, AIA forms G702.

9.3.6 Applications for payment received by the Design Professional after date fixed above will be paid by Owner 45 days after Design Professional receives the application.

9.3.7 Application may be made for amount of material and equipment delivered and stored at site or in approved off site storage, less ten percent (10%) retainage. Submit proof of insurance coverage for items stored off site.

9.3.8 Amounts of changes in work, not in dispute, pending final determination of cost may be applied for, less ten percent (10%) retainage, as provided for in subparagraph 9.3.1.1 of the General Conditions.

9.3.9 Final payment to the Contractor will be made thirty (30) days after the Work is complete and accepted by the Design Professional and the Owner.

9.3.10 The Contractor shall also furnish with his application his Sworn Statement that all bills up to the amount requested have been paid. Every application shall be complete with Waivers of Lien from suppliers and subcontractors.

2.7 Article 10 - PROTECTION OF PERSONS AND PROPERTY::

A. 10.2 SAFETY OF PERSONS AND PROPERTY; add the following to subparagraphs 10.2.2:

The Contractor shall comply with the General Safety Rules and Regulations for the Construction Industry as covered in the Construction Safety Act 89 of Public Acts of 1963, State of Michigan and all other applicable current State and Federal Safety Regulations now in force, or enforce at the time of performance of the work.

2.8 ARTICLE 11 - INSURANCE AND BOND:

A. 11.1 CONTRACTOR'S LIABILITY INSURANCE; add the following to the end of paragraph: In the event that liability insurance coverage is written on an occurrence basis, such coverage shall be continued at the Contractor's expense, with the additional insured endorsement also continuing, for a period of three (3) years after the date of final payment.

B. 11.1 CONTRACTOR'S LIABILITY INSURANCE; add the following subparagraph:

11.1.5 The Contractor shall maintain the following limits of insurances which will protect the Contractor from liability under Workers' Compensation Acts and other Employee Benefits acts in accordance with the law in force where the building or structure is to be built and from liability for damages because of personal injury including death and property damage, including accident claims due to motor vehicles, off road vehicles, all under Commercial General and Automobile Bodily injury and Property Damage form of policies, which may arise both out of and during work under this Contract, whether such work be by the Contractors themselves or by a Subcontractor or anyone directly employed by either of them as covered in Article 11 of General Conditions.

1. Workers' Compensation as required by the State of Michigan and Employer's Liability with minimum limits of:

$500,000 each accident
$500,000 Disease policy limit
$500,000 Disease each employee

2. Commercial General Liability with minimum limits of:
   $2,000,000 General Aggregate.
   $2,000,000 Products / Completed Operations.
   $1,000,000 Personal and Advertising Liability.
   $1,000,000 each occurrence.
   This insurance shall include coverage for damage to utilities and explosion hazards, collapse, and excavating hazards and undermining hazards (XCU).
3. The State of Michigan has a no-fault automobile insurance requirement. The Contractor shall be certain coverage is provided which conforms to any specific stipulation in the Law.
4. Automobile Personal Injury and Property Damage Liability with a combined single limit of:
   $1,000,000 each occurrence.
   To include coverage of all off road vehicles.
5. Excess Liability with minimum limits of $5,000,000.00, providing excess over all of the above liability coverages.
6. The Owner and Design Professional shall be named as an additional insured on all of the above policies, except Workers' Compensation.
7. All certificates must have the cancellation clause amended to read as follows:
   "Should any of the above policies be canceled before the expiration date there of, the issuing company will mail 30 days written notice to the certificate holders."
8. All insurance shall be carried with companies authorized to do business in the State of Michigan.

C. 11.3 PROPERTY INSURANCE; add the following subparagraphs:

11.3.1.6 Certificates of Insurance shall be provided to the Owner and Design Professional.

11.3.1.7 The Contractor and his subcontractors shall, at their option, separately insure all their respective equipment such as tools, equipment scaffolding towers, staging and other temporary buildings owned, borrowed, or rented, and all materials which do not become a part of the construction.

E. 11.4 PERFORMANCE BOND AND PAYMENT BOND; add the following subparagraph:

11.4.3 The Contractor will be required to furnish at his expense, prior to the execution of the Contract, bonds in the amount of 100% of the Total Contract Price for the faithful performance of the Contract and for the payment of all labor and material obligations arising thereunder in accordance with Article 7.5 of the General Conditions. Labor and material bonds shall comply with Michigan Public Act 213 of 1963. Performance bonds shall comply with Public Act 32 of 1956 and all amendments. Bonds containing a Statute of Limitations or time limitation will **NOT** be acceptable. All bonds shall be underwritten by companies authorized to do business in the State of Michigan.

2.9 ARTICLE 16 - EQUAL OPPORTUNITY:

A. The Contractor shall maintain policies of employment as noted in the following subparagraphs:

16.1 The Contractor and all Subcontractors shall not discriminate against any employee or applicant for employment because of race, religion, color, sex, national origin or age. The Contractor shall take affirmative action to insure that applicants are employed, and that employees are treated during employment without regard to their race, religion, color, sex, national origin, age, marital status, handicap or political beliefs.

16.2 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 setting forth the policies of non-discrimination.

16.3 The Contractor and all Subcontractors shall, in all solicitations or advertisements for employees placed by them or on their behalf, state that all qualified applicants will receive consideration for employment without regard to race, religion, color, sex, national origin, age, marital status, handicap or political beliefs.

PART 3 - FORMS AND SCHEDULES Not Applicable

END OF SECTION

SECTION 01012 - ADMINISTRATIVE PROVISIONS

PART 1 - GENERAL

1.1 Summary of Work:

A. Project No. 220240 – Renovations to People's State Bank – Tuscola County Offices.

B. The Work of this Contract comprises, but is not limited to, the following:

1. Site Work: Preparation and excavation for new stair addition; water line and storm drainage piping installation; concrete sidewalk and paving restoration; asphalt pavement restoration; vinyl screen fence installation.
2. Addition: Construction of three level stairway, consisting of poured concrete foundations; steel structural frame with metal stud framing infill.
3. Interior Building Renovation: Selective demolition; new interior partitions, ceilings, floor finishes, wall finishes, interior door and frame assemblies; casework, markerboards and tackboards, toilet room accessories; new plumbing systems, HVAC systems; lighting, electrical power, data and control systems.
4. Exterior Building Renovation: Selective demolition; new fiber cement siding and trims; new windows and exterior door assemblies; selective reroofing and roof patching work.

C. Contractor shall provide and pay for all labor, materials, equipment, tools, construction equipment and machinery, transportation, and other facilities and services necessary for the proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

D. Substantial Completion for Work of this Contract shall be achieved in accordance with Instructions to Bidders, Section 00100 - 1.6.

1.2 Work By Others:

A. Work on the Project which will be executed prior to the start of Work of this Contract, and which is excluded from this Contract, is as follows:

1. Any required asbestos abatement.

1.3 Contractor Use of Premises:

A. Contractor shall have complete and exclusive use of the premises for execution of the Work.

B. Contractor shall limit use of site for work and storage to allow:

1. Use of site by public and adjacent building owners.
2. Work by Others, including City of Caro.

C. Welfare of the adjacent building occupants is to be considered at all times, including safety, disturbance and environment. Contractor, subcontractors and all workmen shall be aware of these requirements and objectives.

D. The nature of this project is such that close coordination will be required of the Contractor with the Owner and Others having an interest in the project to assure that work on the site, access to and from the site, and the general conduct of operations is maintained in a safe and efficient manner.

E. Contractor shall arrange with Owner to sequence new construction and to make connections to utilities at such times that shall not interrupt utility services or unsatisfactory operations of the adjacent buildings.
F. Contractor shall assume full responsibility for protection and safekeeping of all products, materials, equipment, etc., under this Contract.
G. Contractor shall obtain and pay for use of additional storage or work areas needed for operations under this Contract.

1.4 Correlation and Intent of Construction Documents:
A. Anything noted in the Specifications and not shown on the Drawings or shown on the Drawings and not noted in the Specifications, is of like effect - as if shown or noted in both.
B. In case of inconsistency between Drawings and Specifications, or within either Document not clarified by addendum, the better quality or greater quantity of Work shall be provided in accordance with Design Professional interpretation.
C. On any drawings in which a portion of the Work is detailed or drawn out and the remainder is shown in outline, the parts detailed or drawn out will also apply to all other like portions of the Work.
D. When the word "similar" appears on the drawings, it has a general meaning and is not to be interpreted as meaning identical, and all details shall be worked out in relation to their location and connection to the Work.
E. In case of any discrepancy in figures, Drawings or Specifications, the Contractor shall submit a written request to the Design Professional for clarification or interpretation. Any adjustment made by the Contractor without such a determination will be at the Contractor's own risk and expense.
F. Contractor is responsible for answering Requests for Information (RFI's) submitted by sub-contractors. If subject of request is not covered on the Drawings or in the Specifications, Contractor shall forward RFI to Design Professional. Contractor is solely responsible for questions regarding coordination. RFI's received directly from sub-contractors will not be answered.

1.5 Cash Allowances:
A. Costs Included in Allowances: Cost of Product to Contractor or Subcontractor, less applicable trade discounts; delivery to site and applicable taxes.
B. Costs NOT Included in the Allowance: Product handling at the site, including unloading, uncrating, and storage; protection of Products from elements and from damage and labor for installation and finishing.
C. Funds will be drawn from Cash Allowances only by Change Order.
D. Cash Allowances:
1. Section 09520 – Acoustical Panels: Allow the stipulated sum of $24.00 per square yard for purchase of panel facing fabric.
2. Section 10402 – Exterior Signage: Allow the stipulated sum of $2500.00 for purchase, delivery and installation of exterior signage.

1.6 Schedule of Values:
A. Submit schedule on AIA Form G703. Contractor's standard form or automated printout will be considered upon request.
B. Submit Schedule of Values in duplicate within ten (10) days after date of

Owner-Contractor Agreement.

C. Schedule shall list the installed value of all components of the Work in detail to serve as a basis for computing values for progress payments.

1.7 Applications for Payments:

A. Submit three copies of each application as follows:
   1. One on an original AIA Form G702, signed and notarized.
   2. Two legible copies of original, signed and notarized.

B. Submit the following with each application:
   1. Contractor's Sworn Statement that all bills up to the amount requested have been paid.

C. Content and Format: Utilize Schedule of Values for listing items in Application for Payment.

D. List each authorized Change Order, as an extension on continuation sheet, listing Change Order number and dollar amount as for as original item of Work.

1.8 Change Procedures:

A. In accordance with Article 7 - Changes in the Work; AIA Document A201, 1987 Edition and Section 00801 - Supplementary General Conditions AIA A201.

B. Change Order Forms: AIA G701.

C. Construction Change Directive:
   1. When Owner and Contractor are not in total agreement on terms of a Change Order Proposal Request, Design Professional may issue a Construction Change Directive on AIA Form G714, instructing Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
   2. Construction Change Directive will contain a complete description of change in the Work and designate method to be followed to determine change in Contract Sum and/or Contract Time.
   3. Contractor shall maintain detailed records on a time and material basis of work required by Construction Change Directive.
   4. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustment to Contract.

1.9 Conferences:

A. Design Professional will schedule a preconstruction conference after Notice of Award for all affected parties.

B. When deemed necessary by Owner, Design Professional or Contractor convene a pre-installation conference at project site prior to commencing Work of individual specification Section.

1.10 Progress Meetings:

A. Contractor shall schedule and administer meetings throughout progress of the Work at minimum two (2) week intervals.

B. Contractor shall preside at meetings, record minutes, and distribute copies within two days to participants and those affected by decisions made.

C. Attendance of meetings shall be required of the following:
   1. Contractor and job superintendent.

2. Subcontractors and suppliers as appropriate to agenda.
3. Owner, Design Professional and professional consultants may attend as appropriate.

D. All meetings shall start promptly at the arranged time. Design Professional will record any additional time, including travel time and mileage, required by late start of, or missed meetings scheduled by Contractor, sub-contractor or Design Professional, and notify Contractor of charges. Owner shall deduct any such expenses of Design Professional from Contractor's monthly or periodic pay requests.

PART 2 - PRODUCTS Not Applicable

PART 3 - EXECUTION Not Applicable

END OF SECTION

PART 1 - GENERAL

1.1 Coordination:

A. Coordinate scheduling, submittals, and Work of the various Sections of specifications to assure efficient and orderly sequence of installation of interdependent construction elements.

B. Verify utility requirement characteristics of operating equipment are compatible with building utilities.

C. Coordinate space requirements and installation of mechanical and electrical work which are indicated diagrammatically on Drawings for efficient use of available space, for proper sequence of installation and to resolve conflicts. Follow routing shown for pipes, ducts, and conduit, as closely as practicable.

D. In finished areas, conceal pipes, ducts, and wiring within the construction.

E. Coordinate requirements for all blocking, backing and grounds necessary for the proper installation of Work of the various Sections of specifications.

F. Provide all access panels required by Work of the various Sections of specifications, whether specifically shown on the Drawings or not.

1.2 Field Engineering:

A. Maintain on-site surveying equipment to establish elevations, lines, levels, and location of the Work in accordance with Contract Documents.

B. Establish elevations, lines, and levels and certify that elevations and locations of the Work conform with Contract Documents.

1.3 Cutting and Patching:

A. Employ a skilled and experienced installer to perform cutting and patching Work; restore Work with new Products.

B. Submit written request in advance of cutting or altering structural or building enclosure elements not indicated on Drawings.

C. Use construction industry recognized and acceptable cutting methods to avoid damage to other work or finishes to remain and which will provide proper surfaces for patching and finishing.

D. Fit Work tight to adjacent elements. Maintain integrity of wall, ceiling, or floor construction; completely seal voids.

E. Refinish surfaces to match adjacent finishes.

1.4 Alteration Procedures:

A. Prepare surfaces by removing existing surface finishes, unsuitable or damage material to provide for proper installation of new work and new finishes.

B. Where new work abuts or aligns with existing, make a smooth and even transition. Patch work shall match existing adjacent work in texture and appearance.

C. When finish surfaces are cut so that a smooth transition with new work is not possible, terminate existing surface along a straight line at natural line of division.

D. Where removal of partitions results in adjacent spaces becoming one, rework

floors, walls, and ceilings to a smooth plane without breaks, steps, or bulkheads.

E. Repair substrate prior to patching finish.

F. Finish patches to produce uniform finish and texture over entire area. When finish cannot be matched, refinish entire surface to nearest intersection.

1.5 Quality Assurance/Control of Installation:

A. Monitor quality control over suppliers, manufacturers, Products, services, site conditions, and workmanship, to produce Work of specified quality.

B. Comply fully with manufacturers' instructions.

C. Comply with specified standards as a minimum quality for the Work except when more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

1.6 Manufacturer's Field Services:

A. When specified in individual specification Sections, require manufacturer to provide qualified personnel to observe field conditions, conditions of surfaces and installation, quality of workmanship, and to make appropriate recommendations.

B. Representative shall submit written report to Design Professional listing observations and recommendations.

PART 2 - PRODUCTS Not Applicable

PART 3 - EXECUTION Not Applicable

END OF SECTION

SECTION 01342 - SUBMITTALS

PART 1 - GENERAL

1.1 Submittal Procedures (Shop Drawings, Product Data and Samples):

A. Submittal format to identify Project, Contractor, Subcontractor or supplier; and pertinent Contract Document references.

B. Apply Contractor's stamp, signed or initialed, certifying that review, verification of Products required, field dimensions, adjacent construction Work, and coordination of information is in accordance with the requirements of the Work and Contract Documents.

C. Identify variations from Contract Documents and Product or system limitations which may be detrimental to successful performance of the completed Work.

D. Revise and resubmit submittals as required; identify all changes made since previous submittal.

E. Distribute copies of reviewed shop drawings to subcontractors, suppliers and other concerned entities.

F. Furnish all submittals indicated in individual specification Sections.

G. Design Professional will review up to two (2) submissions, original and one (1) resubmission of all submittals made by Contractor. Thereafter, additional reviews will be at Contractor's expense. Design Professional will record time required reviewing and approving submissions in excess of original and one resubmission, and notify Contractor of charges. Owner will deduct any such expenses of Design Professional from Contractor's monthly or periodic pay requests.

1.2 Contractor's Review:

A. Contractor shall review, approve and submit, with reasonable promptness and in such sequence as to cause no delay in the Work or in the work of any separate contractor, all Shop Drawings, Product Data and Samples required by the Contract Documents.

B. By approving and submitting Shop Drawings, Product Data and Samples, Contractor represents that he has determined and verified all materials, field measurements, and field construction criteria related thereto, or will do so, and that he has checked and coordinated information contained within such submittals with requirements of the Work and Contract Documents.

C. Contractor shall not be relieved of responsibility for any deviation from the requirements of the Contract Documents by the Design Professional's approval of Shop Drawings, Product Data or Samples unless the Contractor has specially informed the Design Professional in writing of such deviation at the time of submission and the Design Professional has given written approval to the specified deviation. Contractor shall not be relieved from responsibility for errors or omissions in the Shop Drawings, Product Data or Samples by the Design Professional's approval thereof.

D. Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data or Samples, to revisions other than those requested by Design Professional on previous submittals.

1.3 Shop Drawings:

A. Submit in accordance with paragraph 1.1 Submittal Procedures.
B. Submit three (3) sets of Shop Drawings. Two (2) copies will be retained by Design Professional, remaining copy will be returned to Contractor.
C. Direct copies of Contract Drawings shall not be used for Shop Drawings.
D. Shop Drawings submitted without being **REVIEWED**, stamped and signed by the Contractor will **NOT** be reviewed.

1.4 Product Data:

A. Submit in accordance with paragraph 1.1 Submittal Procedures.
B. Submit four (4) copies of Product Data. Two (2) copies will be retained by Design Professional and two (2) copies will be returned to Contractor.
C. Mark each copy to identify applicable products, models, options, performance characteristics, and other data. Note applicable standards, such as ASTM or Federal Specifications. Supplement manufacturers' standard data to provide information unique to this project.
D. Contractor shall submit material safety data sheets (MSDA) on all products requiring these sheets.
E. Product Data submitted without being **REVIEWED**, stamped and signed by the Contractor will **NOT** be reviewed.

1.5 Samples:

A. Submit in accordance with paragraph 1.1 Submittal Procedures.
B. Submit samples to illustrate functional and aesthetic characteristics of the Product.
C. Submit samples of finishes from the full range of manufacturers' standard colors, textures, and patterns for Design Professional selection.
D. Contractor shall store one set of samples on site for comparison to field work.

1.6 Manufacturers' Certificates:

A. When specified in individual specification Sections, submit manufacturers' certificate to Design Professional for review, in quantities specified for Product Data.
B. Indicate material or Product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.

1.7 Construction Progress Schedules:

A. Submit initial progress schedule in duplicate within ten (10) days after date established in Notice to Proceed for Design Professional review.
B. Submit revised schedules with each Application for Payment, identifying changes since previous version. Indicate estimated percentage of completion for each item of Work at each submission.
C. Submit a horizontal bar chart with separate line for each major section of Work or operation, identifying first workday of each week.
D. Show submittal dates required for shop drawings, product data and samples.

PART 2 - PRODUCTS Not Applicable

PART 3 - EXECUTION Not Applicable

END SECTION

SECTION 01412 - TESTING

PART 1 - GENERAL

1.1 Inspection and Testing Laboratory Services:

A. Contractor will employ, and pay for services of an independent firm to perform inspection and testing. Proposed firm shall meet the approval of the Design Professional, Owner and the Contractor.

B. The independent firm will perform inspections, tests, and other services as required by individual specification sections.

C. Cooperate with independent firm; furnish samples as requested.

D. Re-testing required because of non-conformance to specified requirements will be charged to the Contractor.

E. Submit minimum of two copies of written report of each test and inspection to the Design Professional.

F. The testing laboratory is not authorized to release, revoke, alter or enlarge on requirements of Contract Documents, approve or accept any portion of the Work, or stop Work.

1.2 Testing, Adjusting and Balancing:

A. Contractor will employ, and pay for services of an independent firm to perform testing, adjusting, and balancing.

B. Reports will be submitted by the independent firm to the Design Professional indicating observations and results of tests and indicating compliance or non-compliance with specified requirements and with the requirements of the Contract Documents. Submit a minimum of two copies of each report.

C. Cooperate with independent firm; furnish assistance as requested.

D. Re-testing required because of non-conformance to specified requirements will be charged to the Contractor.

PART 2 - PRODUCTS Not Applicable

PART 3 - EXECUTION Not Applicable

END OF SECTION

SECTION 01502 - TEMPORARY CONTROLS

PART 1 - GENERAL

1.1 Temporary Electricity:
- A. Coordinate with Basic Electrical Requirements.
- B. Connect to existing power service. Power consumption shall not disrupt Owner's need for continuous service. Owner shall pay for power consumed.
- C. Provide power outlets for construction operations, branch wiring, distribution boxes, and flexible power cords as required.

1.2 Temporary Lighting:
- A. Coordinate with Basic Electrical Requirements.
- B. Provide and maintain temporary lighting for construction operations.
- C. Provide branch wiring from power source to distribution boxes with lighting conductors, pigtails, and lamps as required.
- D. Permanent building lighting may be utilized during construction. Repair and clean fixtures, lens, diffusers, and replace all bulbs and lamps at end of construction.

1.3 Temporary Heat:
- A. Provide heat as required to maintain specified conditions for construction operations, to protect materials and finishes from damage due to temperature or humidity.
- B. New heating system may be utilized, with Owner's agreement, when system is operable and new construction is totally enclosed with permanent building envelop.
- C. Contractor shall pay cost of energy used by temporary units. When and if, permanent system is utilized, Owner will pay cost of energy used by permanent system.
- D. Existing gas lines, above or below ground, shall **NOT** be tapped for use by temporary heating units.

1.4 Temporary Ventilation:
- A. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, and gases.
- B. Utilize existing ventilation equipment. Extend and supplement equipment with temporary fan units as required to maintain clean air for construction operations.

1.5 Telephone Service:
- A. Maintain cellular phone service during project's duration.

1.6 Temporary Water Service:
- A. Connect to existing water source for construction operations. Owner shall pay for water used.
- B. Extend branch piping as required so that water is available by use of hoses.

1.7 Temporary Sanitary Facilities:

A. Provide and maintain required facilities and enclosures in compliance with governing laws and regulations.

B. Maintain in clean and sanitary condition.

1.8 Barriers and Fencing:

A. Provide as required to prevent unauthorized entry to construction areas and to protect existing facilities and adjacent properties from damage.

1.9 Water Control:

A. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.

B. Grade site to drain. Site grading shall be in such a way as to not drain detrimentally on adjacent property.

C. Do not discharge silt laden drainage water into municipal sewers without municipal approval.

D. Dumping of debris laden water (containing sand, mortar, joint compounds, etc.) into drains becomes the responsibility of the Contractors. Contractor shall clean all drains and drainage lines, and shall verify that all lines are fully functional at completion of project.

1.10 Exterior Enclosures:

A. Provide temporary (insulated when necessary) weather-tight closures of exterior openings to permit acceptable working conditions and protection of the Work.

B. Contractor shall maintain required egress from existing building throughout construction period.

1.11 Protection of Installed Work:

A. Protect installed Work and provide special protection where specified in individual specification Sections.

B. Prohibit traffic or storage upon waterproofed or roofed surfaces, and on lawn and landscaped areas.

1.12 Security:

A. Secure as required to protect Work, materials, equipment, tools, etc., and existing facilities from unauthorized entry, vandalism, or theft.

1.13 Construction Cleaning:

A. Maintain areas under Contractors' control free of waste materials, debris, and rubbish. Maintain site in clean and orderly conditions.

B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to closing space.

C. Periodically clean interior areas to provide suitable conditions for work.

D. Clean interior areas prior to start of surface finishing and continue cleaning on an as needed basis.

E. Control cleaning operations so that dust and other particles will not adhere to wet or newly coated surfaces.

PART 2 - PRODUCTS Not Applicable

PART 3 - EXECUTION Not Applicable

END OF SECTION

SECTION 01602 - MATERIAL AND EQUIPMENT

PART 1 - GENERAL

1.1 Products:

A. No materials or products containing asbestos in manufacturer or application may be used. All products must be asbestos free.

B. Products: Means new material, machinery, components, equipment, fixtures, and systems forming the Work, but does not include machinery and equipment used for preparation, fabrication, conveying and erection of the Work. Products may also include existing materials or components specifically identified for re-use.

C. Do not use materials and equipment removed from existing premises, except as specifically identified or allowed by the Contract Documents.

D. Use interchangeable components of the same manufacture for similar components.

1.2 Transportation, Handling, Storage and Protection:

A. Transport, handle, store and protect Products in accordance with manufacturer's instructions.

B. Transport products by methods required to avoid product damage; deliver in undamaged condition in manufacturer's unopened containers or packaging, dry.

C. Provide equipment and personnel to handle products by methods to prevent soiling or damage.

D. Promptly inspect shipments to assure that products comply with requirements, quantities are correct, and products are undamaged.

1.3 Product Options:

A. Products Specified by Reference Standards or by Description Only: Any Product meeting those standards or description.

B. Products Specified by Naming Only One Manufacturer: No options or substitutions allowed.

C. Products Specified by Naming One or More Manufacturers: Products of manufacturers named and meeting specifications, no options or substitutions allowed.

D. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named on Substitution Request Form included at end of Division 1.

1.4 Substitutions:

A. Instructions to Bidders, Section 00100 specifies the time for submitting requests for substitutions during the bidding period to requirements specified in this Section.

B. After Award of Contract substitutions will only be considered when a Product becomes unavailable through no fault of the Contractor.

C. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents.

D. Submit requests for proposed substitution on Substitution Request Form included at end of Division 1. When substitution is not accepted, provide specified product. Limit each request to one proposed substitution.

E. Should a substitution be approved and then prove to be defective or otherwise unsatisfactory for its intended service, the Contractor shall, replace same with the material originally specified without cost to Owner or obligation on the part of the Design Professional. (i.e., all substitutions must carry a warranty guaranteeing they are equal to specified items.)

1.5 Starting Systems:

A. Ensure that each piece of equipment or system is ready for operation.

B. Execute start-up under supervision of responsible persons in accordance with manufacturers' instructions.

C. Submit two copies of a written report that equipment or system has been properly installed and is functioning correctly.

1.6 Demonstration and Instructions:

A. Demonstrate operation and maintenance of Products to Owner's personnel prior to date of Substantial Completion.

B. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.

C. Demonstrate start-up, operation, control, adjustment, troubleshooting, servicing, maintenance, and shutdown of each item of equipment at agreed-upon times, at equipment location.

1.7 Spare Parts and Maintenance Materials:

A. Provide Products, spare parts, maintenance, and extra materials in quantities specified in individual specification Sections.

B. Deliver to and place in location as directed; obtain receipt prior to final payment as directed by the Owner.

PART 2 - PRODUCTS Not Applicable

PART 3 - EXECUTION Not Applicable

END OF SECTION

SECTION 01700 - CONTRACT CLOSEOUT

PART 1 - GENERAL

1.1 Contract Closeout Procedures:

A. Submit written certification that Contract Documents have been reviewed, Work has been inspected, and Work is complete in accordance with Contract Documents and ready for the Design Professional's final inspection.

B. Submit final Application for Payment identifying total adjusted Contract Sum, previous payments, and amount remaining due.

C. Submit with final Application for Payment a minimum of two copies of each of the following:

1. Certificate of Occupancy.
2. Certificate of Inspection from Governing Authorities for mechanical and electrical systems.
3. Consent of Surety to Final Payment.
4. Warranties and Guarantees.
5. Operation and Maintenance Data.

D. Advise Owner of pending insurance changeover requirements.

E. Design Professional will make up to two (2) inspections of final Work. Thereafter, additional re-inspections will be at Contractor's expense. Design Professional will record time, including travel time and mileage, required in making re-inspections and notify Contractor of charges. Owner will deduct any such expenses of Design Professional from Contractor's final pay request.

1.2 Operation and Maintenance Data:

A. Submit two (2) sets prior to final payment, bound in 8-1/2 x 11 inch text pages, three D side ring binders with durable plastic hardback covers and suitable index.

B. Prepare binder cover with printed title "OPERATION AND MAINTENANCE INSTRUCTIONS", and title of project.

C. Internally subdivide the binder contents with permanent page dividers, logically organized, with tab titling clearly printed under reinforced laminated plastic tabs.

D. Contents:

1. Directory, listing names, addresses, and telephone numbers of Contractor, Subcontractors, and major equipment suppliers.
2. Operation and maintenance instructions, arranged by system.
3. Project documents, certificates and test data.
4. Warranties and Guarantees.

E. Arrange for each installer of equipment that requires regular maintenance to meet with Owner's personnel to provide instruction in proper operation and maintenance. If installers are not experienced in procedures, provide instruction by manufacturer's representatives. Provide detailed review of the following:

1. Maintenance manuals.
2. Spare parts and materials.
3. Tools.
4. Lubricants.
5. Identification systems.

6. Control sequences.
7. Hazards.
8. Cleaning.
9. Warranties and maintenance agreements.

F. As part of instruction for operating equipment, demonstrate the following:
1. Start-up and shutdown.
2. Emergency operations.
3. Noise and vibration adjustments.
4. Safety procedures.
5. Economy and efficiency adjustments.
6. Effective energy utilization.

1.3 Project Record Documents:

A. Maintain on site, one set of Contract Documents to be utilized for record documents; including all Drawings, Specifications, Addenda, Change Orders and other Modifications, approved Shop Drawings, Product Data, and Samples.

B. Record actual revisions to the Work. Record information concurrent with construction progress.

C. Specifications: Legibly mark and record at each Product Section a description of actual Products installed.

D. Record Documents and Shop Drawings: Legibly mark each item to record actual construction.

E. Submit set of record documents to Design Professional with final Application for Payment.

F. Maintain on site, manufacturer's certifications, inspection certifications, field test reports, and other documents required by individual specification sections.

PART 2 - PRODUCTS Not Applicable

PART 3 - EXECUTION Not Applicable

END OF SECTION

SECTION 01712 - CLEANING AND ADJUSTING

PART 1 - GENERAL

1.1 Final Cleaning:

A. Execute final cleaning prior to final inspection. Provide all necessary general "house cleaning" to provide a ready to move into facility without additional cleaning being required by the Owner.

B. Clean interior and exterior surfaces exposed to view. Vacuum carpeted and soft surfaces. Damp mop and buff resilient and hard surface floors. Clean transparent, glossy and reflective surfaces to a clear shine.

C. Clean debris from site, roofs, gutters, downspouts, and drainage systems. Sweep paved areas clean. Rake landscaped areas clean.

D. Clean permanent filters and surfaces of operating equipment.

E. Clean light fixtures and lamps.

F. Remove waste and surplus materials, rubbish, and construction facilities from the site.

G. If Contractor fails to clean up at completion of the Work, the Owner may do so and the cost thereof shall be charged to the Contractor.

1.2 Adjusting:

A. Adjust operating Products and equipment to ensure smooth and unhindered operation.

PART 2 - PRODUCTS Not Applicable

PART 3 - EXECUTION Not Applicable

END OF SECTION

SECTION 01742 - WARRANTIES

PART 1 - GENERAL

1.1 Warranties:

A. Provide duplicate copies.

B. Execute and assemble documents from Subcontractors, suppliers, and manufacturers.

C. Submit prior to final Application for Payment.

D. Warranty Requirements:

1. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of the warranty on Work that incorporates produces, nor does it relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with Contractor.

2. Related Damages and Losses: When correcting warranted work that has failed, remove, and replace other work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted work.

3. Reinstatement of Warranty: When work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. Reinstated warranty shall be equal to original warranty with an equitable adjustment for depreciation.

4. Replacement Cost: Upon determination that Work covered by a warranty has failed, replace or rebuild work to an acceptable condition complying with requirements of Contract Documents. Contractor is responsible for cost of replacing or rebuilding defective work regardless of whether Owner has benefitted from use of work through a portion of its anticipated useful service life.

5. Owner's Recourse: Written warranties made to Owner are in addition to implied warranties, and shall not limit the duties, obligations, rights and remedies otherwise available under the law, nor shall warranty periods be interpreted as limitations on time in which Owner can enforce such other duties, obligations, rights, or remedies.

E. Furnish all warranties indicated in individual specification Sections and as summarized in Appendix A at end of General Requirements, Division 1.

PART 2 - PRODUCTS Not Applicable

PART 3 - EXECUTION Not Applicable

END OF SECTION

SECTION 01001 - SUBSTITUTION REQUEST FORM

A. Contract Award Date: _____

Contractor: _____

Project: _____

B. We hereby submit for your consideration the following product instead of the specified item for the above project:

Drawings	Spec. Section No.	Paragraph	Specified Item
_____	_____	_____	_____

Proposed Substitution: _____

_____

C. Attach complete information on changes to Drawings and/or Specifications which proposed substitution will require for its proper installation.

D. Submit with request, all necessary samples and substantiating data to prove equal quality and performance to that which is specified. Clearly mark manufacturer's literature to indicate equality in performance.

E. Fill in the blanks:

1. Does the substitution affect dimensions shown on the Drawings?
   Yes____ No____ If yes, clearly indicate changes:_____
   _____

2. Will the undersigned pay for changes to the building design, including engineering and detailing costs caused by the requested substitution?
   Yes____ No____ If no, fully explain:
   _____

3. What affect does substitution have on other Contracts or other trades?
   _____

4. What affect does substitution have on construction schedule?
   _____

5. Manufacturer's warranties of the proposed and specified items are:

   Same____ Different_____ (explain on an attachment)

6. Reason for Request: _____

7. Itemized comparison of specified item(s) with the proposed substitution:

_____

8. Accurate cost data comparing proposed substitution with product specified:

_____

9. Designation of Maintenance Services and Sources: _____

_____

F. Certification of Equal Performance and Assumption of Ability for Equal Performance:

The undersigned states that the function, appearance and quality are equivalent or superior to the specified item.

_____ Submitted by	_____ Firm
_____ Title	_____ Address
_____ Date	_____ Telephone

Signatures above shall be by person having authority to legally bind his firm to the above terms. Failure to provide legally binding signature will result in retraction of approval.

For use by Design Professional

_____ Accepted	By: _____
_____ Accepted as Noted	Date: _____
_____ Not Accepted	Remarks: _____
_____ Received Too Late	_____

END OF REQUEST FORM

SECTION 02065 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 Section Includes:

A. Demolition and removal of designated building components, including but not limited to the following:
   1. Exterior vinyl siding and furring strips.
   2. Exterior and interior wall assemblies for new door openings.
   3. Ballasted rubber roof membrane, rigid insulation, and flashings.
   4. Interior partitions and door and frame assemblies.
   5. Stair assemblies.
   6. Exterior door and window assemblies.
   7. Suspended acoustical tile ceilings systems.
   8. Wood paneling wall finishes and vinyl wallcoverings.
   9. Counters and designated cabinets.
   10. Floor finishes.

B. Coordination with Plumbing, Mechanical and Electrical Divisions for disconnection and removal of the following designated items:
   1. Plumbing fixtures and associated piping systems.
   2. Fin tube baseboard radiation, boiler and all associated piping.
   3. HVAC ductwork.
   4. Lighting fixtures, switches, receptacles, data, electrical heaters, fans, conduit and associated wiring.

C. Disconnection, capping and removal of designated utilities.

D. Protection of existing components to remain.

E. Removal and legal disposal of materials from site.

PART 2 - PRODUCTS Not Applicable

PART 3 - EXECUTION

3.1 Preparation and Protection:

A. Provide, erect, and maintain temporary barriers and security devices.

B. Prevent movement or settlement of adjacent structures. Provide bracing and shoring.

C. Protect existing landscaping materials and building components which are not to be demolished or removed. Should any destruction or damage occur to these elements the Contractor will be responsible for repairs and replacement at no added cost to the Owner.

D. Erect and maintain weather-tight (insulated when necessary) closures for exterior openings. Secure closures in manner to prevent entry of unauthorized persons.

E. Erect and maintain temporary partitions as required to prevent spread of dust, odors and noise to neighboring buildings. Conduct demolition to minimize interference with adjacent building areas.

F. Conduct operations with minimum interference to public or private accesses.

G. Maintain egress and access at all times. Do not close or obstruct roadways or sidewalks without permits.

3.2 Demolition Execution:

A. Drawings show general intent of demolition required. Remove all incidental items, (re: trims, fasteners, wiring, conduit, mounting plates, etc.) not required by and/or interfering with new construction or finishes, whether specifically shown or not.

B. Coordinate with appropriate trade to disconnect, remove, cap and identify designated utilities within demolition areas. Utilities encountered within walls designated to be demolished shall be removed back to mains and/or junctions boxes whenever possible. Utilities feeding fixtures designated to remain shall be rerouted as required.

C. Demolish and remove components indicated in an orderly and careful manner.

D. Protect existing supporting structural members, non-structural components, equipment, materials and finishes to remain.

E. Cease operations immediately if adjacent structures appear to be in danger. Notify Design Professional and discontinue work in affected area until notified to resume work.

F. Should any environmentally hazardous materials be uncovered or discovered on site, Contractor shall immediately inform the Owner and negotiate terms of dealing with said materials.

3.3 Clean Up:

A. Remove and legally dispose of demolished materials from site as work progresses. Leave area of work in clean condition.

B. Do not burn or bury material on site.

3.4 Schedule of Products to be Removed and Retained:

A. Existing Bricks: Salvage and retain bricks from areas of demolition for new wall openings, to use for infill and repair of existing brick wall construction required elsewhere within this project. At completion of all masonry work, dispose of remaining bricks.

B. Owner shall have the "Right of First Refusal" on any item removed during demolition. If Owner does not exercise that right, Contractor shall dispose of all items off site in a legal manner.

END OF SECTION

SECTION 02110 - SITE DEMOLITION AND CLEARING

PART 1 - GENERAL

1.1 Section Includes:

A. Removal rear (north) entry canopy structure, concrete stoop, ramp and foundations.
B. Removal of designated surface pavings, parking wheel stops, and other surface elements.
C. Removal of any sub-surface debris encountered.
D. Protection of existing site elements designated to remain.
E. Coordination of work with utility companies.

PART 2 - PRODUCTS

PART 3 - EXECUTION

3.1 Preparation and Protection:

A. Identify and protect utilities from damage. Coordinate with utility companies.
B. Protect features designated to remain, as final landscaping.

3.2 Clearing:

A. Clear areas required for access to site and execution of Work.
B. Remove surface paving other surface debris.

3.3 Clean Up:

A. Remove and legally dispose of debris, rock and extracted materials from site.
B. Do not burn or bury material on site.

END OF SECTION

SECTION 02200 - EARTHWORK

PART 1 - GENERAL

1.1 Section Includes:
- A. Earthwork, including but not limited to the following;
  1. Stairway / entry addition excavation.
  2. Utility trenches.
  3. Fill materials; backfilling and compacting.
- B. Protection of existing site elements to remain.
- C. Coordination of work with utility companies and the City of Caro.

1.2 Submittals:
- A. Submit all testing laboratory results in accordance with General Requirements, Division 1.

1.3 Testing Requirements:
- A. Testing and analysis shall be performed by firm appointed in accordance with General Requirements, Division 1.
- B. Frequency of Tests:
  1. Footing Excavations: Minimum two (2) tests to verify soil bearing capacity.
  2. Compacted Fill Areas: Minimum one test per layer per 1000 square feet of surface to verify percent compaction.
- C. All questionable areas of installation shall be tested to verify compliance with Specifications. All corrective work required to replace defective work and additional testing will be at the Contractor's expense.

PART 2 - PRODUCTS

2.1 Fill Materials:
- A. Coarse Gravel: Pit run, natural stone; free of shale, clay, friable material, sand, debris; graded within the following limits:
  1. Minimum Size: 1/2 inch
  2. Maximum Size: 1-3/4 inch
- B. Sand: Natural river or bank sand; washed, free of silt, clay, loam, friable or soluble materials, and organic matter.
- C. Subsoil: Free of rock larger than 1-1/2 inches, roots, debris, alkali, salt and petroleum products. Use excavated subsoil from site only if conforming to specified requirements. Excavated subsoil from site may be used as fill under building pad only with approval from soils Engineer.

PART 3 - EXECUTION

3.1 Examination and Preparation:
- A. Identify required lines, levels, contours, and datum.
- B. Notify Design Professional of unexpected subsurface conditions and discontinue affected work in area until notified to resume work.

C. Identify and flag known utility locations. Notify utility company to remove or relocate utilities as required.
D. Maintain and protect existing utilities to remain.

3.2 Protection of Adjacent Work:
A. Underpin and protect adjacent structures which may be damaged by excavation work, including service utilities and pipe chases.
B. Protect existing surface pavings, walks and curbs designated to remain.
C. Prevent surface water run-off into excavation or to adjacent properties or public thorough-fares.

3.3 Subsoil Excavation:
A. Excavate subsoil required for building foundations, construction operations, surface paving, and other Work.
B. Excavation shall not interfere with 45 degree bearing splay of any foundation.
C. Correct unauthorized excavation at no extra cost to Owner.
D. Fill over-excavated areas under structure bearing surfaces in accordance with direction by Design Professional.
E. Excavated reusable subsoil cannot be stockpiled and stored on site.

3.4 Trenches:
A. Excavate for utility pipe trenches, building foundations and other work.
B. Cut trenches sufficiently wide to enable installation of utilities and allow inspection.
C. Hand trim excavation and leave free of loose matter, lumped subsoil and rock.
D. Correct unauthorized excavation at no cost to Owner.
E. Fill over-excavated areas in accordance with direction by Design Professional.
F. Support pipe and conduit during placement and compaction of bedding fill.
G. Backfill trenches to required contours and elevations.
H. Place and compact fill materials as for Backfilling.

3.5 Dewatering:
A. Keep excavations dry. Provide necessary equipment including pumps, piping and temporary drains.
B. Do not discharge silt laden drainage water into municipal sewers without municipal approval.

3.6 Backfilling:
A. Remove soils in any weak area and replace with similar drier soils and provide compaction.
B. Backfill areas to contours and elevations. Use unfrozen and unsaturated materials.
C. Backfill systematically, as early as possible, to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen, or spongy subgrade surfaces.
D. Place and compact fill and soil materials in continuous layers not exceeding 8 inches loose depth.
E. Employ a placement method so not to disturb or damage foundations and utilities in trenches.

F. Maintain optimum moisture content of backfill materials to attain required compaction density.

G. Backfill against supported foundation walls. Backfill simultaneously on each side of unsupported foundation walls.

3.7 Tolerances:

A. Top Surface of Exposed Subgrade: Plus or minus one inch.

3.8 Schedule of Fill Materials:

A. Interior Slab-On-Grade: Contractor may use either of the following:

1. Sand, compacted to 95 percent modified procter.
2. Coarse gravel with minimum 6 inches thick cover of sand, compacted to 95 percent modified procter.
3. Approved subsoil with minimum 6 inch sand thick cover of sand, compacted to 95 percent modified procter.

B. Exterior Side of Foundation Walls: Subsoil, to subgrade elevation, each layer compacted to 90 percent modified procter.

C. Fill Under Landscaped Areas: Subsoil, to 12 inches below finish grade, compacted to 85 percent modified procter.

D. Fill Under Sidewalks: Coarse gravel to underside of sand leveling bed, compacted to 95 percent modified procter.

END OF SECTION

SECTION 02515 - PORTLAND CEMENT CONCRETE PAVING

PART 1 - GENERAL

1.1 Section Includes:
- A. Concrete sidewalks and paved site surfaces complete with reinforcement.
- B. Paving surface finish and curing.

1.2 System Description:
- A. Paving and Base: Thicknesses and reinforcement shall conform to the following:
  1. Sidewalks: 4 inch thick concrete slab with 6 x 6 - W1.4 x W1.4 W.W.F. on minimum 4 inch compacted sand leveling bed.
  2. Generator Pad: 12 inch thick concrete slab with #5 bars at 8 inch on center each way on compacted sand leveling bed.

1.3 Submittals:
- A. Submit all testing laboratory results in accordance with General Requirements, Division 1.

1.4 Quality Assurance:
- A. Perform Work in accordance with ACI 301.
- B. Conform to standards of applicable governing municipalities for paving work on public property or within public right-of-way.

1.5 Environmental Requirements:
- A. Concrete shall be poured only when the ambient temperature is 40 degrees F and rising and the temperature at night does not fall below 32 degrees F for a minimum of 48 hours after placement.

1.6 Testing Requirements:
- A. Testing and analysis shall be performed by firm appointed in accordance with General Requirements, Division 1.
- B. Frequency of Tests:
  1. Concrete: Three (3) test cylinders for every 50 cubic yards of concrete placed.
  2. Slump: One test for each set of concrete test cylinders taken.
- C. All questionable areas of installation shall be cored and tested to verify compliance with Specifications. All corrective work required to replace defective paving and additional tests will be at the Contractor's expense.

PART 2 - PRODUCTS

2.1 Materials:
- A. Forms: Wood or steel material, profiled to suit conditions.
- B. Joint Filler: Asphalt impregnated wood fiberboard or molded polyethylene board type, minimum 1/2 inch thick and 1/2 inch less than slab thickness in width.

C. Reinforcing Steel: ASTM A615, 60 ksi yield grade; deformed billet steel bars, uncoated finish.
D. Welded Steel Wire Fabric: ASTM A185, Plain type; flat sheets, uncoated finish.
E. Dowels: Plain steel, unfinished.
F. Cement: ASTM C150, Normal Portland type; white or gray color, Type I or Type II.
   a. Ground Granulated Blast-Furnace Slag: ASTM C989, Grade 100 0r 120.
G. Fine and Coarse Aggregates: ASTM C33; maximum aggregate size of 3/4 inches.
H. Water: Clean and potable; not detrimental to concrete.
I. Air Entrainment: ASTM C260.
J. Curing Compound: ASTM C309, Type 1, Class B, clear, dissipating, equal to "KURE-N-SEAL" manufactured by BASF Sonneborn.
K. Joint Sealer: Pourable, two-part, cold applied elastomeric sealant, concrete grey color, equal to "POURTHANE" manufactured by W.R. Meadows, Inc.

2.2 Concrete Mix:
A. Mix and deliver concrete in accordance with ASTM C94.
B. Provide concrete meeting the following characteristics:
   1. Compressive Strength at 28 days: 4500 psi
   2. Maximum Water-Cementitious Materials Ratio at Point of Placement: 0.45
   3. Slump: 4 inches, plus or minus 1 inch.
   4. Air Entrainment: 6 percent, plus or minus 1.5 percent.

PART 3 - EXECUTION

3.1 Examination and Preparation:
A. Verify gradients and elevations of base.
B Verify compacted granular base is ready to support paving and imposed loads.
C. Moisten substrate to minimize absorption of water from fresh concrete.

3.2 Forming:
A. Place and secure forms to correct location, dimension, and profile. All surfaces of forms shall be cleaned of any foreign material.
B. Place joint filler in joints, vertical in position, in straight lines recessed 1/2 inch below finished surface. Secure to formwork.
C. Place expansion and contraction joints at 20 foot intervals or as indicated on Drawings. Align joints.
D. Place joint filler between paving components and other appurtenances.
E. Provide tooled scored joints at intervals equal to width of sidewalk or slab unless indicated otherwise on Drawings.

3.3 Reinforcement:
A. Place reinforcement as indicated on Drawings. Allow for a minimum 1-1/2 inches of concrete cover for slabs-on-grade.
B. Interrupt reinforcement at contraction and expansion joints. Place dowels with one end lubricated the other to bond to concrete.

3.4 Placing Concrete:

A. Place concrete in accordance with ACI 301.

B. Do not disturb reinforcement or formwork components during concrete placement.

C. Place concrete continuously between predetermined joints.

D. Screed and float surfaces to required levels or grades, maintaining surface flatness of maximum 1/8 inch in 10 feet.

3.5 Finishing:

A. Sidewalk and Paved Surfaces: Medium broom finish perpendicular to direction of traffic, radius and trowel all edges and joints.

B. Apply curing compound on exposed concrete surfaces immediately after finishing. Apply in accordance with manufacturer's instructions.

C. Apply joint sealer at edge of slabs abutting building. Tool joints concave and weathertight.

3.6 Protection:

A. Immediately after placement, protect concrete from premature drying, excessive temperatures, mechanical injury, and vandalism.

END OF SECTION

SECTION 02725 - SITE DRAINAGE

PART 1 - GENERAL

1.1 Section Includes:
- A. Storm drainage piping from gutter downspouts to municipal storm sewer.
- B. Fittings and accessories.

1.2 Regulatory Requirements:
- A. Conform to applicable governing municipalities' standards and types for drainage systems work on public property or within public right-of-way.
- B. Contractor shall obtain all permits and pay all fees for system review and inspection as required by applicable governing municipalities having project jurisdiction.

PART 2 - PRODUCTS

2.1 Sewer Pipe Materials:
- A. Plastic Pipe (PVC): ASTM D3034, Type PSM, SDR 26 Poly Vinyl Chloride material; PVC fittings with solvent weld joints.
- B. Fittings: Same material as pipe, molded or formed to suit pipe size and end design.

PART 3 - EXECUTION

3.1 Examination and Preparation:
- A. Verify that excavations are ready to receive work.
- B. Hand trim excavations. Do not over-excavate.

3.2 Installation:
- A. Install pipe, fittings and accessories in accordance with ASTM for pipe materials. Seal joints watertight.
- B. Place pipe on bed of minimum 4 inches compacted sand.
- C. Lay pipe to slope gradients indicated on Drawings.
- D. Install sand at sides and over top of pipe. Provide top cover to minimum compacted thickness of 12 inches.
- E. Do not displace or damage pipe when compacting.
- F. Connect to existing sewer system piping with watertight connections.

END OF SECTION

SECTION 02837 - VINYL FENCING

PART 1 - GENERAL

1.1 Section Includes:
- A. Fence posts, rails, pickets and trims.
- B. Gates and gate hardware.
- C. Excavation and concrete for post bases.

1.2 Structural Requirements:
- A. Fencing, gate assembly and attachments shall resist lateral force of 200 lbs at any point without damage or permanent set, both downward and horizontally.

1.3 Submittals:
- A. Submit in accordance with General Requirements, Division 1.
- B. Shop Drawings: Indicate fence style and design, material and finishes, component details, connections and joining methods; include all measurements, tolerances, fixed field dimensions, and installation instructions.

1.4 Warranty:
- A. Submit manufacturer's twenty (20) year limited warranty in accordance with General Requirements, Division 1.

PART 2 - PRODUCTS

2.1 Fence Materials:
- A. Acceptable Products:
  1. "POST AND RAIL", manufactured by Boundary Fence & Railing Systems, Inc.
  2. Design Professional approved equal.
- B. Fencing System: Rigid PVC homopolymer compound, modified for cold weather impact retention and with high level of titanium dioxide pigment for long term ultraviolet resistance; height and profile as indicated on Drawings; conforming to the following:
  1. Posts: Minimum 5 inches square, 0.120 inch wall thickness.
  2. Rails: Minimum 2 x 6 inches square, 0.120 inch wall thickness.
  3. Post Caps: Standard style.
  4. Color: White.
- C. Railing Fittings, Attachment Brackets and Gate Hardware: Hot dipped galvanized steel, size and shapes as required.
- D. Fasteners: Stainless steel, type and size to suit application.

2.2 Fabrication:
- A. Pre-cut pickets, rails and posts to specified lengths.
- B. Posts shall be pre-punched to accept rails and fasteners.
- C. Rails shall be routed to accept pickets and fasteners.
- D. Fit and assemble fence sections in largest practical sections for delivery to site.

E. Fabricate gates of same materials as fencing.
F. Supply each gate complete with latches for locking, stops, keepers, and hinges.

2.3 Concrete Mix:
A. Mix and deliver concrete in accordance with ASTM C94.
B. Provide concrete meeting the following characteristics:
1. Compressive strength at 28 days: 3000 psi
2. Slump: 4 inches maximum
3. Air Entrainment: 4 to 6 percent

PART 3 - EXECUTION

3.1 Installation:
A. Install fencing components in accordance with manufacturer's installation instructions.
B. Accurately locate and stake out fence line.
C. Space line post at intervals not exceeding 6 feet on center.
D. Set terminal, line and gate posts in 12 inch diameter concrete footings, minimum 42 inches below finish grade. Slope top of footings for water runoff and flush with finish grade.
E. Set posts centered in footing, vertical in position, plumb and in line.
F. Install fence sections and securely fasten to posts.
G. Install gates true to opening and plumb in closed position.

END OF SECTION

SECTION 03001 - CONCRETE

PART 1 - GENERAL

1.1 Section Includes:
- A. Formwork, reinforcement and accessories.
- B. Cast-in-place concrete.
- C. Stripping, finishing and curing.
- D. Coordination and installation of items furnished under other Sections, including but not limited to the following:
  1. Perimeter insulation at foundations and slabs on grade.
  2. Anchoring devices and sleeves for mechanical items.
  3. Anchoring devices, sleeves, and boxes for electrical items.

1.2 Submittals:
- A. Submit in accordance with General Requirements, Division 1.
- B. Shop Drawings: Indicate pertinent dimensions, reinforcement sizes, spacings, locations and quantities; bending and cutting schedules; splicing, supporting and spacing devices.
- C. Product Data: Provide characteristics on physical and performance properties of form release agents, curing compounds, sealers and concrete admixtures.
- D. Testing Data: Submit all laboratory testing results and reports.
- E. Concrete mix designs.

1.3 Quality Assurance:
- A. Construct and erect concrete formwork in accordance with ACI 301 and 347, unless specified otherwise in this Section.
- B. Perform concrete reinforcing work in accordance with ACI 30l and CRSI 63, 65 and Manual of Standard Practice, unless specified otherwise in this Section.
- C. Perform cast-in-place concrete work in accordance with ACI 301, unless specified otherwise in this Section.
- D. Obtain materials from same source throughout the Work.

1.4 Environmental Requirements:
- A. Concrete shall be poured only when the temperature is 40 degrees F and rising, and the temperature at night does not fall below 32 degrees F for a minimum 48 hours after placement.
- B. Or Contractor shall provide temporary shelter and heat to maintain minimum 40 degrees F during, and 48 hours after placement.

1.5 Testing Requirements:
- A. Testing and analysis shall be performed by firm appointed in accordance with General Requirements, Division 1.
- B. Frequency of Tests:
  1. Concrete: Three (3) test cylinders for every 50 cubic yards, or part thereof, of each class of concrete placed.
  2. Slump, Air Content and Temperature: One test for each set of concrete test cylinders taken.

C. One additional test cylinder will be taken during cold weather concreting, and be cured on job site under same conditions as concrete it represents.

PART 2 - PRODUCTS

2.1 Form Work Materials and Accessories:

A. Sheet Materials: Sound, undamaged sheets with clean true, factory sealed edges:
   1. Metal forms to be smooth metal plate free of surface irregularities.
   2. Plywood or OSB material manufactured for use as form work.

B. Lumber: No. 2 grade.

C. Tubular Column Type: Round, spirally wound laminated materials, inside surface treated with release agent, of size indicated on drawings. Equal to "SONOTUBE PLUS" manufactured by Sonoco Products Company.

D. Form Release Agent: Colorless material which will not stain concrete or impair natural bonding characteristics of coating or finish intended for use on concrete.

E. Waterstops: Single component, self-sealing mastic, one (1) inch wide by 3/4 inch thick profile; equal to "LOCKSTOP" manufactured by Greenstreak Plastic Products Company.

F. Chamfer Strips: Purpose made polyvinyl chloride, maximum possible lengths, profile and size as indicated on Drawings; equal to product manufactured by Greenstreak Plastic Product Company.

G. Joint Filler: ASTM D1751, premolded asphaltic board, thickness as indicated on Drawings.

H. Slab Edge Bond Breaker: No. 30, asphalt impregnated felt.

I. Vapor Barrier: 3-ply laminate, combining two layers of high-density polyethylene and one layer of high strength non-woven cord grid, 37 lb/100 sq ft weight; “GRIFFOLYN TYPE-65” manufactured by Reef Industries, Inc. (www.reefindustries.com); complete with required installation accessories for complete system or equal.

J. Void Forms: Moisture resistant treated paper faces; biodegradable; structurally sufficient to support weight of wet concrete mix until initial set; profile and thickness as required.

2.2 Reinforcement Materials:

A. Reinforcing Steel: ASTM A615, 60 ksi yield grade; deformed billet steel bars, plain finish.
   1. No. 3 bars and column ties may be 40 ksi yield grade steel.

B. Welded Steel Wire Fabric: ASTM A185, plain type in flat sheets plain finish, sized as indicated on Drawings.

C. Chairs, Bolsters, Bar Supports, and Spacers: Sized and shaped for support of reinforcing.

D. Fabricate concrete reinforcing in accordance with ACI 315.

2.3 Concrete Materials:

A. Cementitious Materials:
   1. Portland Cement: ASTM C150, Normal-Type I Portland. All exposed concrete shall be of one brand of cement.
   2. Fly Ash: ASTM C618, Class F or C.

3. Slag Cement: ASTM C989, Grade 100 or 120.

B. Fine and Coarse Aggregates: ASTM C33; maximum aggregate size shall conform to the following:
   1. Footings and Buried Foundations: 1-1/2 inch maximum.
   2. Slabs and Other Concrete Work: 3/4 inch maximum.

C. Water: Clean, potable and free of matter detrimental to concrete.

D. Air Entrainment Admixture: ASTM C260.

E. Bonding Agent: Two component modified epoxy resin or acrylic latex emulsion equal to product manufactured by Chem Masters Corp.

F. Non-shrink Grout: Premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticising agents; equal to product manufactured by U. S. Grout Division, Five Star Products, Inc.

2.4 Compounds, Hardeners and Sealers:

A. Acceptable Products:
   1. "ASHFORD FORMULA", manufactured by Curecrete Chemical Company, Inc.
   2. "LIQUI-HARD", manufactured by W.R. Meadows.
   3. Design Professional approved equal.

B. Curing/Sealing Compound: Clear liquid type, odorless, non-toxic, non-flammable and non-combustible, formulated to cure, seal, harden and dustproof concrete.

2.5 Concrete Mix:

A. Mix and deliver concrete in accordance with ASTM C94.

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.

D. Proportion normal weight concrete mixture as follows:
   1. Minimum Compressive Strength at 28 Days:
      a. Footing, Foundation Walls and Piers: 3000 psi
      b. Interior Slab on Grade: 3500 psi
      c. Entry Stoop/Slab: 4500 psi
   2. Maximum Water – Cementitious Materials Ratio:
      a. For 3000 psi = 0.5 air entrained and 0.68 non air entrained
      b. For 3500 psi = 0.5 air entrained and 0.62 elsewhere
      c. For 4500 psi = 0.4 air entrained
   3. Slump: 4 inches plus or minus 1 inch.

E. 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 C494, Type A.
2. Retarding Admixture: ASTM C494, Type B.
3. Water-Reducing and Retarding Admixture: C494, Type D.
4. Plasticizing and Retarding Admixture: ASTM C1017, Type II.

F. Ready-mix concrete supplier shall furnish two sets of delivery tickets for every load of concrete delivered to site. Tickets shall contain the following information:
1. Date.
2. Name of ready-mix concrete plant.
3. Contractor and job location.
4. Type and brand of cement.
5. Class and specified cement content in sacks per cubic yard of concrete.
6. Truck number and time dispatched.
7. Cubic yards of concrete in load.
8. Admixture in concrete, if any.
9. Maximum size of aggregate.
10. Water added at job site, if any.
11. Mix number.

PART 3 - EXECUTION

3.1 Formwork Erection:
A. Erect formwork, shoring and bracing to achieve design requirements.
B. Provide bracing to ensure stability of formwork.
C. Apply form release agent to formwork in accordance with manufacturer's instructions, prior to placing for accessories and reinforcement.
D. Do not apply form release agent where concrete surfaces will receive special finishes or applied coverings which are effected by agent.
E. Clean forms as erection proceeds, to remove foreign matter.

3.2 Inserts, Embedded Components, and Openings:
A. Provide formed openings where required for work to be embedded in and passing through concrete work.
B. Coordinate work of other Sections in forming and setting openings, slots, recesses, chases, sleeves, bolts, anchors, and other inserts.
C. Install concrete accessories in accordance with manufacturer's instructions, straight, level, and plumb.
D. Place joint filler at perimeter of items penetrating floor slabs.
E. Install void forms in accordance with manufacturer's instructions. Protect forms from moisture before concrete placement and from crushing during concreting operations.

3.3 Reinforcement Placement:
A. Place reinforcement, supported and secured against displacement.
B. Ensure reinforcing is clean, free of loose scale, dirt, or other foreign coatings.

3.4 Placing Concrete:
A. Place concrete in accordance with ACI 301 and ACI 302.
B. Prepare previously placed concrete by cleaning with steel brush and applying bonding agent. Apply bonding agent in accordance with manufacturer's

instructions.

C. Install vapor barrier under interior slabs-on-grade. Lap joints minimum 6 inches and seal watertight. Repair damaged vapor barrier with vapor barrier material; lap over damaged areas minimum 6 inches and seal watertight.

D. Separate slabs-on-grade from vertical surfaces penetrating slab with bond breaker material, extended from bottom of slab to top of finished slab surface.

E. Place concrete continuously. Do not break or interrupt successive pours such that cold joints occur.

F. Where new concrete is dowelled to existing work, drill holes in existing concrete, insert steel dowels and pack with non-shrink grout, unless noted otherwise on Drawings..

G. Screed all concrete flat surfaces level, maintaining surface flatness of maximum 1/8 inch in 10 feet.

3.5 Form Removal:

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

B. Do not damage concrete surfaces during form removal.

3.6 Floor Finishing:

A. Finish concrete floor surfaces in accordance with ACI 302.

B. Uniformly spread, screed, and float concrete.

C. Steel trowel surfaces scheduled to receive carpeting, resilient flooring, seamless flooring, thin set quarry tile or ceramic tile or to be left exposed.

D. Maintain surface flatness, with maximum variation of 1/8 inch in 10 feet.

E. Apply concrete hardener on floor surfaces as scheduled. Apply in accordance with manufacturer's instructions.

3.7 Curing:

A. Apply sealer on exposed concrete floor surfaces in accordance with manufacturer's instructions.

B. Immediately after placement, protect concrete from premature drying and mechanical injury.

C. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete. Cure concrete by one of the following approved methods:

1. Membrane Curing Compound: Use product intended for scheduled finish; apply in accordance with manufacturer's instruction.
2. Spraying: Spray water over areas; maintain wet for 3 days.
3. Absorptive Mat: Spread mats over areas and saturate; maintain saturated for 3 days.

3.8 Defective Concrete:

A. Modify or replace concrete not conforming to required lines, details and elevations, as directed by Design Professional.

END OF SECTION

SECTION 04100 - MORTAR AND MASONRY GROUT

PART 1 - GENERAL

1.1 Section Includes:
- A. Mortar and grout for masonry.

1.2 Environmental Requirements:
- A. Cold Weather Requirements: IMIAC - Recommended Practices and Guide Specifications for Cold Weather Masonry Construction.
- B. Specific Cold Weather Requirements:
  1. When ambient air temperature is below 40 degrees F, heat mixing water to maintain mortar temperature between 40 degrees F and 110 degrees F until placed.
  2. When ambient air temperature is below 32 degrees F, heat sand and mixing water to maintain mortar temperature between 40 degrees F and 110 degrees F until placed.

PART 2 - PRODUCTS

2.1 Materials:
- A. Portland Cement: ASTM C150, Type I; gray color.
- B. Mortar Aggregate: ASTM C144, standard masonry type.
- C. Hydrated Lime: ASTM C207, Type S.
- D. Premix Mortar: ASTM C387, using gray cement; Normal strength.
- E. Grout Aggregate: ASTM C404.
- F. Water: Clean and potable.
- G. Cold-Weather Admixture: ASTM C494, Type C; non-chloride, non-corrosive, accelerating admixture recommended by manufacturer for use in masonry mortar mixes specified.

2.2 Mortar Mixes:
- A. Type N Mortar: ASTM C270, using the Property Method; to be used at the following locations:
  1. Exterior masonry veneers.
  2. Existing masonry.
- B. Type S Mortar: ASTM C270, using the Property Method; to be used at the following locations:
  1. Interior cmu masonry.

2.3 Mortar Mixing:
- A. Thoroughly mix mortar ingredients in quantities needed for immediate use in accordance with ASTM C270.
- B. Do not use anti-freeze compounds to lower the freezing point of mortar. No calcium chloride shall be used.
- C. If, cold-weather admixture is used, add at same rate for all mortar, regardless of weather conditions, to ensure that mortar color is consistent.

D. If water is lost by evaporation, re-temper only with 2 hours of mixing. Do **NOT** re-temper mortar more than 2 hours after mixing.

2.4 Grout Mixes:

A. Provide grout meeting the following characteristics:

1. Compressive Strength at 28 days: 2000 psi
2. Slump: 8 to 10 inches.

2.5 Grout Mixing:

A. Mix and deliver grout in accordance with ASTM C94.

B. Do not use anti-freeze compounds to lower the freezing point of grout.

PART 3 - EXECUTION

3.1 Installation:

A. Install mortar in accordance with ASTM C190.

B. Install grout in accordance with ASTM C476.

C. Work grout into masonry cores and cavities to eliminate voids. Do not displace reinforcement.

END OF SECTION

SECTION 04300 - UNIT MASONRY

PART 1 - GENERAL

1.1 Section Includes:
- A. Concrete masonry units for interior partitions.
- B. New brick veneer units. Salvaged brick units for infill and repair of existing masonry construction.
- C. Stone sills units.
- D. Reinforcement, anchorage and accessories.
- E. Coordination and installation of items furnished under other Sections, including but not limited to the following:
  1. Steel lintels.
  2. Cavity wall insulation.

1.2 Submittals:
- A. Submit in accordance with General Requirements, Division 1.
- B. Samples: Submit minimum 6 full brick units, illustrating color and color ranges available.

1.3 Quality Assurance:
- A. Store materials under cover in dry place and in a manner to prevent damage or intrusion of foreign matter. Protect from freezing.
- B. Protect reinforcement from weather prior to placing. Reinforcement shall be free of loose rust, dirt or foreign coatings that may destroy or reduce bonding.

1.4 Environmental Requirements:
- A. Cold Weather Requirements: IMIAC - Recommended Practices and Specifications for Cold Weather Masonry Construction.
- B. Hot Weather Construction Requirements: Protect masonry construction from direct exposure to wind and sun when erected in an ambient air temperature of 99 degrees F in shade, with relative humidity less than 50 percent.
- C. Cover work at end of each day with non-staining waterproof material so as to prevent entrance of excess water at top of wall.

1.5 Performance Requirements:
- A. Provide unit masonry that develops the following installed compressive strengths (f'm) at 28 days:
  1. Concrete Unit Masonry: 2000 psi (13.8 MPa), based on net area.
  2. Design is based on UNIT STRENGTH METHOD per ACI 530.1/ASCE-6.

PART 2 - PRODUCTS

2.1 Concrete Masonry Units:
- A. Hollow Load Bearing Units: ASTM C90, Grade N, Type II – Non-Moisture Controlled; nominal weight; to be used for load bearing piers, non-reinforced and reinforced, above grade.

B. Hollow Non-Load Bearing Units: ASTM C129, Grade N, Type II - Non-Moisture Controlled; light weight; to be used for interior partitions, non-reinforced and reinforced, above grade.

C. Masonry Units: Nominal modular size of 8 x 16 inches by widths indicated on Drawings. Provide other size units and special units as indicated or profiled on Drawings.

2.2 Brick Units:

A. Face Brick: ASTM C216, Type FBS, Grade SW; color and texture as approved by Design Professional.

B. Solid or cored brick are acceptable; however nowhere will cores be exposed.

C. Brick Masonry Units: Modular size units.

2.3 Stone Sill Units:

A. Stone: Indiana Oolitic Limestone, standard grade free of defeats, smooth surface finish; color as selected by Design Professional.

2.4 Reinforcement and Anchorage:

A. Acceptable Manufacturers:

1. Dur-O-Wall, Inc.
2. Heckmann Building Products Inc.
3. Hohmann & Barnard, Inc.
4. Design Professional approved equal.

B. Masonry Veneer Anchors: Hot dipped galvanized; sized to extend minimum 2-1/2 inches into veneer mortar joint; equal to “No. 75 HECKMANN POS-I-TIE” with Triangle Wire Tie; provide lengths as required for insulation thicknesses and with screws for metal stud backup wall construction.

2.5 Flashings - Thru Wall:

A. Flashing: Rubberized asphalt compound bonded to high density, cross laminated polyethylene film; 40 mils total thickness; self-sealing, self-healing, fully adhering; "PERM-A-BARRIER WALL FLASHING" manufactured by W. R. Grace & Co.

B. Surface Conditioner: Latex based, water dispersed liquid, as furnished by flashing manufacturer.

C. Termination Mastic: Rubberized asphalt based mastic, as furnished by flashing manufacturer.

D. Stainless Steel Drip Edge: Type 302, 26 gauge.

2.6 Accessories:

A. Weep / Cell Vents: Preformed rectangular cellular plastic 3/8 inch wide by 2-1/2 inches high by 3-3/8 inches long; equal to product manufactured by Hohmann & Barnard, Inc.

B. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials, recommended by masonry unit manufacturer.

C. Reinforcing Bar Positioners: Galvanized; standard 9 gauge; shapes and sizes as required; equal to product manufactured by Dur-O-Wall, Inc.

D. Grout and Insulation Stop: Coated fiber glass mesh; equal to "FIL-STOP

MESH" manufactured by Dur-O-Wall, Inc.

E. Cavity Drainage System: Non-woven, three-dimensional geometric patterned core material.

2.7 Lintels:

A. Steel Lintels: Coordinate with Metal Fabrications, Section 05500.

PART 3 - EXECUTION

3.1 Examination and Preparation:

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

B. Coordinate placement of anchors supplied by other Sections for installation.

3.2 Laying Masonry Walls - General:

A. Lay single wythe walls to actual thickness of masonry units indicated.

B. Cut masonry units with power masonry saws to provide clean, straight, unchipped edges. Cut units as required to provide continuous pattern and to fit construction. Allow units cut with water cooled saws to dry before placing.

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

D. Concrete Masonry Units: Lay in running bond unless indicated otherwise on Drawings. Course one unit and one mortar joint to equal 8 inches. Form flush mortar joints for foundation walls.

E. Lay masonry in full bed of mortar. Butter vertical head joints well for thickness of face shell or unit.

F. When stopping and resuming work, stop back courses to match bond pattern. Do not tooth. Clean exposed surfaces of set masonry, wet clay masonry units, and remove loose masonry units and mortar prior to laying fresh masonry.

3.3 Placing and Bonding:

A. Lay masonry in full bed of mortar. Butter vertical head joints well for thickness of face shell or unit.

B. When stopping and resuming work, stop back courses to match bond pattern. Do not tooth. Clean exposed surfaces of set masonry, wet clay masonry units, and remove loose masonry units and mortar prior to laying fresh masonry.

C. Isolate top joint of masonry veneer and partitions from horizontal structural framing members with compressible joint filler.

3.4 Cavity Wall, Weeps and Vents:

A. Install weep holes in veneer at 24 inches on center horizontally, above through-wall flashing, above shelf angles and at bottom of walls.

B. Install drainage / mortar control system continuously at bottom of cavity.

C. Do not permit mortar to drop or accumulate into cavity air space or to plug weep holes.

3.5 Reinforcement and Anchorages:

A. Stud Framed Back-Up: Secure wall ties and embed into masonry veneer at

maximum 16 inches on center vertically and 24 inches on center horizontally. Place at maximum 8 inches on center each way around perimeter of openings and within 12 inches of edge of openings.

3.6 Masonry Flashings:

A. Extend flashings through veneer; turn up minimum 8 inches and seal to sheathing back-up wall.
B. Lap end joints and seal watertight.
C. Use flashing manufacturer's recommended adhesive and sealer.
D. Where indicated on Drawings, fabricate stainless steel drip edge to extend minimum 2 inches into masonry veneer. Fabricate drip edge with bottom edge formed outward 1/2 inch and hemmed to form drip.
E. Install drip edge under and seal watertight to thru-wall flashing membrane.

3.7 Lintels:

A. Install loose steel lintels over window openings, door openings and other openings where required and indicated on Drawings.
B. Maintain minimum 6 inch bearing for steel on each side of opening, unless noted otherwise on Drawings.
C. Install steel lintels of differing leg lengths with long leg vertical (L.L.V.), unless noted or profiled otherwise on Drawings.

3.8 Grouted Components:

A. Reinforce masonry unit cores with reinforcement bars and grout as indicated on Drawings.
B. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch of dimensioned position. Lap splices minimum 24 bar diameter.
C. Wet masonry unit surfaces in contact with grout just prior to grout placement.
D. Place and consolidate grout fill without displacing reinforcing.

3.9 Tolerances:

A. Maximum Variation from Plumb: 1/4 inch per story, non-cumulative; 1/2 inch in two stories or more.
B. Maximum Variation from Level Coursing: 1/16 inch in 3 feet and 1/8 inch in 10 feet 1/2 inch maximum.
C. Maximum Variation from Cross Sectional Thickness of Walls: 1/4 inch.

3.10 Cleaning:

A. Remove excess mortar and mortar smears.
B. Clean soiled surfaces with cleaning solution, non-acidic which will not harm masonry or adjacent materials.
C. Use non-metallic tools in cleaning process.
D. Clean each face of masonry unit equally, do not spot clean.

END OF SECTION

SECTION 05120 - STRUCTURAL STEEL

PART 1 - GENERAL

1.1 Section Includes:
- A. Structural steel framing members, connections, fasteners and welds.
- B. Baseplates, plates and anchor bolts.
- C. Coordination with other Sections for the installation of bearing and anchorage devices for structural members.

1.2 Submittals:
- A. Submit in accordance with General Requirements, Division 1.
- B. Shop Drawings: Indicate sizes, spacing, and locations of structural members; connections, cambers, loads, and welded connections. Indicate welds and net weld lengths using standard AWS symbols.

1.3 Quality Assurance:
- A. Perform Work in accordance with AISC - Specification for the Design, Fabrication and Erection of Structural Steel for Buildings.
- B. Design steel connections not detailed on Drawings, under direct supervision of a Professional Structural Engineer registered in the State of Michigan. Design connections to support one-half of total uniform capacity indicated in Allowable Uniform Load Tables.
- C. Welders: Certified to AWS qualifications within previous 12 months.
- D. Bolted Connections: High strength bolts shall be tightened to minimum tension as specified by AISC.

PART 2 - PRODUCTS

2.1 Materials:
- A. Structural Steel Members: ASTM A36.
- B. Structural Steel Tubing: ASTM A500, Grade B.
- C. Steel Pipe: ASTM A53, Grade B or ASTM A501.
- D. Bolts, Nuts, and Washers: ASTM A325 or A490.
- E. Anchor Bolts: ASTM A307.
- F. Welding Materials: AWS D1.1; type required for materials being welded.
- G. Grout: Non-shrink type, pre-mixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing additives, capable of developing a minimum compressive strength of 8,000 psi at 28 days; equal to "EMBECO 885" manufactured by Master Builders Technologies.
- H. Shop and Touch-Up Primer: SSPC 15, Type 1, red oxide. Dry film thickness of 2.5 mils.

2.2 Fabrication:
- A. Where possible, site verify dimensions prior to shop fabrication.
- B. Provide web connections for steel beams at columns unless detailed otherwise.
- C. Splicing structural steel members is prohibited without approval by Design

Professional. Any member having a splice not shown and detailed on shop drawings will be rejected.

D. All welding shall conform to the American Welding Society Code.

E. Furnish components required for bearing and anchorage of structural members.

D. Provide drilled holes in flanges for attachment of wood nailers were indicated on Drawings. Space at 32 inches on center, unless noted otherwise and Drawings, and stagger holes either side of web.

2.3 Finish:

A. Prepare structural component surfaces in accordance with SSPC SP 2.

B. Shop prime structural steel members. Do not prime surfaces that will be field welded, in contact with concrete, or slip critical bolted connections.

PART 3 - EXECUTION

3.1 Examination and Preparation:

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

B. Supply items required to be cast into concrete or embedded in masonry, with setting templates, to appropriate Sections.

3.2 Erection:

A. Allow for erection loads. Provide temporary bracing to maintain framing in alignment until completion of erection and installation of permanent bridging and bracing.

B. Field weld components as indicated. Perform field welding in accordance with AWS D1.1.

C. Do not field cut or alter structural members without approval of Design Professional.

D. After erection, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete.

E. Grout voids under baseplates solid.

END OF SECTION

SECTION 05300 - STEEL DECKING

PART 1 - GENERAL

1.1 Section Includes:
- A. Steel deck and accessories.
- B. Framing for openings up to and including 18 inches.
- C. Bearing plates and angles.

1.2 Submittals:
- A. Submit in accordance with General Requirements, Division 1.
- B. Shop Drawings: Indicate decking plan, deck profile dimensions, support locations, projections, openings and reinforcement, pertinent details, and accessories.

1.3 Quality Assurance:
- A. Perform Work in accordance with SDI - Design Manual for Composite Decks, Form Decks, Roof Decks.
- B. Welders: Certified to AWS qualifications within previous 12 months.

PART 2 - PRODUCTS

2.1 Metal Deck and Accessories:
- A. Acceptable Manufacturers:
  1. Cyclops-Bowman Metal Deck
  2. Epic Metals Corporation
  3. Vulcraft
  4. Design Professional approved equal.
- B. Sheet Steel: ASTM A611, Grade C, cold rolled structural quality with primer paint coating.
- C. Bearing Plates and Angles: ASTM A36 steel.
- D. Welding Materials: AWS D1.1.
- E. Touch-Up Primer: SSPC 20, Type 1, inorganic.
- F. Metal Closure Strips, Wet Concrete Stops, Cover Plates and Related Accessories: 16 gauge galvanized sheet steel; of required profiles and size.
- G. Roof Sump Pan: 14 gauge sheet metal.
- H. Fasteners: Hardened gauge steel, galvanized, self-tapping.
- I. Weld Washers: Mild steel, uncoated, minimum 16 gauge.

2.2 Fabrication:
- A. Non-cellular Roof Decking: Sheet steel, configured as follows:

Span Design:	Double
Minimum Metal Thickness:	22 gauge (excluding finish)
Nominal Height:	1-1/2 inch, fluted profile
Nominal Rib Width:	2-1/2 inches, 6 inches on center
Side Joints:	Lapped
Flute Sides:	Plain vertical face

B. Non-Cellular Form (Floor) Deck: Sheet steel, configured as follows:

Span Design:	Single
Minimum Metal Thickness:	20 gauge (excluding finish)
Nominal Height:	1-3/8 inch
Side Joints:	Lapped
Flute Sides:	Plain, corrugated profile

PART 3 - EXECUTION

3.1 Installation:

A. Erect metal decking in accordance with SDI.

B. Bear decking on masonry or concrete support surfaces with 4 inch minimum bearing. Align and level.

C. Bear decking on steel supports with 1-1/2 inch minimum bearing. Align and level.

D. Fasten deck to steel support members at ends and intermediate supports with fusion welds 12 inches on center maximum, parallel and transverse with the deck flute. Welding washers shall be used when welding steel deck of less than 0.028 inch thickness (22 gauge).

E. Perform field welding in accordance with AWS D1.1.

F. Mechanically fasten male/female side laps at 24 inches on center maximum, for steel deck of less than 0.028 inch thickness (22 gauge).

G. Weld male/female side laps at 18 inches on center maximum, for steel deck of 0.028 inch (22 gauge) or greater thickness.

H. Reinforce steel deck openings from 6 to 18 inches in size with 2 x 2 x 1/4 inch steel angles. Place angles perpendicular to flutes; extend minimum two flutes beyond each side of opening and fusion weld to deck at each flute.

I. Install wet concrete stops at deck edge, upturned to top surface of slab, on decks scheduled to receive concrete or insulating fill.

J. Install sheet steel closures and angle flashings to close openings between deck and walls, columns, and openings.

K. Position roof sump pans with flange bearing on top surface of deck. Weld at each deck flute. Seal flange and deck junction watertight.

L. Immediately after welding deck and other metal components in position, coat welds, weld blooms, burned areas, and damaged surface coating, with touch-up prime paint.

END OF SECTION

SECTION 05400 - COLD FORMED METAL FRAMING

PART 1 - GENERAL

1.1 Section Includes:
- A. Load and non-load bearing formed steel stud exterior and interior wall framing.
- B. Formed steel framing accessories.
- C. Coordination with Rough Carpentry, Section 06100, for wood nailers and blocking.

1.2 Submittals:
- A. Submit in accordance with General Requirements, Division 1.
- B. Product Data: Provide manufacturer's literature describing framing members, materials, finishes, product criteria and limitations; including load tables.

PART 2 - PRODUCTS

2.1 Materials:
- A. Acceptable Manufacturers:
  1. Dale // Incor Industries
  2. Marino Industries Inc.
  3. Unimast Incorporated
  4. Design Professional approved equal.
- B. Studs: ASTM A446; sheet steel, formed to C shape, punched web; conforming to the following:
  1. Exterior Wall Studs (Stairway Construction): SQ Grade 33, 18 gauge, 4 inch stud with 1-5/8 inch wide flange.
  2. Interior Partition Studs: SQ Grade 33, 25 gauge, 3-5/8 inch stud with 1-3/8 inch wide flange.
  3. Soffit/Fascia Framing: SQ Grade 33, 18 gauge, 3-5/8 inch stud with 1-5/8 inch flange.
  4. Bulkhead Framing: SQ Grade 33, 25 gauge, widths as indicated on Drawings.
- C. Track: Formed sheet steel; channel shaped; same width and gauge as studs, solid web.

2.2 Accessories:
- A. Bracing and Bridging: Formed sheet steel, 16 gauge; galvanized.
- B. Plates, Gussets, and Clips: Formed sheet steel, minimum 14 gauge; galvanized.
- C. Fasteners: Self-drilling, self-tapping screws, hot dip galvanized.
- D. Welding Materials: AWS D1.1.

2.3 Finishes:
- A. Load Bearing Exterior Studs and Accessories: ASTM A525 and C995, G60 galvanized coating.
- B. Non-Load Bearing Interior Partition Studs and Accessories: ASTM A525, G40 galvanized coating.

PART 3 - EXECUTION

3.1 Examination and Preparation:

A. Verify that building framing components are ready to receive work.

3.2 Erection - Exterior Wall Studs:

A. Install studding in accordance with manufacturer's installation instructions.
B. Align floor and ceiling tracks. Securely anchor to supporting structure.
C. Install studs plumb, aligned and securely fasten to flanges or webs of floor and ceiling tracks.
D. Erect studs one piece full length. Splicing of studs will not be permitted.
E. Install bridging and attach in manner to prevent stud rotation. Space bridging rows in accordance with the following:
   1. Walls Up to 10 feet High: One (1) row at mid-height.
   2. Walls Over 10 feet High: Bridging rows spaced not to exceed 5 feet on center.
F. Install intermediate studs above and below wall openings to match stud spacing.
G. Install wood bucks at all door and window openings. Wood bucks at door jambs shall extend full height to structure above.
H. Install wood blocking between studs for attachment of wall hung finish items.

3.3 Erection - Interior Partition Studs:

A. Install studding in accordance with ASTM C754 and manufacturer's installation instructions.
B. Align floor and ceiling tracks. Securely anchor to supporting structure.
C. Install studs plumb, aligned and securely fasten to flanges or webs of floor and ceiling tracks.
D. Partition Heights: Full height to existing floor, ceiling or roof deck construction above.
E. Where partitions are full height to roof deck above, provide top track rigidly attached to studs but free to move vertically within a 14 gauge break-formed deep leg deflection track rigidly attached to deck.
F. Install wood blocking between studs for attachment of wall hung finish items.

END OF SECTION

SECTION 05500 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 Section Includes:

A. Shop fabricated ferrous metal items, galvanized and prime painted, including but not limited to the following:

1. Lintels, loose and built-up.
2. Exterior wall ladder.
3. Exterior and interior pipe handrailings.

D. Coordination with other Sections for the installation of anchorage devices for metal fabrications.

1.2 Submittals:

A. Submit in accordance with General Requirement, Division 1.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Indicate welded connections and net weld lengths using standard AWS symbols. Include erection drawings, elevations, and details where applicable.

PART 2 - PRODUCTS

2.1 Materials:

A. Steel Sections: ASTM A36.

B. Steel Plate: ASTM A283.

C. Steel Tubing: ASTM A500, Grade B.

D. Steel Pipe: ASTM A53, Grade B, Schedule 40 or ASTM A501.

E. Bolts, Nuts, and Washers: ASTM A325.

F. Handrail Fittings: Elbows, T-shapes, wall brackets, escutcheons; formed, cast or machined steel.

G. Welding Materials: AWS D1.1; type required for materials being welded.

H. Shop and Touch-Up Primer: SSPC-15, Type 1, red oxide. Dry film thickness of 2.5 mils.

I. Touch-Up Primer for Galvanized Surfaces: SSPC 20, Type 1, inorganic.

2.2 Fabrication - General:

A. Where possible, site verify dimensions prior to shop fabrication.

B. Fit and shop assemble in largest practical sections for delivery to site.

C. Seal joined members by continuous welds.

D. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

E. Exposed Mechanical Fastenings: Flush countersunk screws or bolts, consistent with design of component.

F. Furnish components required for anchorage of metal fabrications. Fabricate anchors and related components of same material and finish as metal fabrication.

G. Accurately form components required for anchorage of metal fabrications to each other and to building structure.
H. Accurately form handrail components to suit ramps, stairs and landings, to each other and to building structure.
I. Fabricate beam bearing plates with two (2), 6 inch long by 1/2 inch diameter headed studs for embedment into masonry.

2.3 Finish:
A. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
B. Shop prime items with one coat. Do not prime surfaces in direct contact with concrete or where field welding is required.
C. Galvanize scheduled items to minimum 2.0 ounces per square foot zinc coating.
D. Remove, fill and grind smooth all mill stamps, marks and/or blemishes from all steel members to be left exposed as finished product (architecturally exposed steel), prior to prime coating.

2.4 Steel Lintels:
A. In addition to lintels noted on Drawings, provide lintels at masonry openings required for work of all trades.
B. Lintels shall be typically 12 inches longer than width of opening.
C. Where lintel abut steel or concrete, weld a 5/16 inch thick plate to end of lintel. Weld plate to steel or anchor to concrete as required.
D. Lintels not sized on Drawing shall comply with the following:
1. For each 4 inch width of masonry at openings:
a. Up to 4'-0": One 3-1/2" x 3-1/2" x 5/16" angle
b. 4'-0" to 6'-4": One 4" x 3-1/2" x 5/16" angle
c. 6'-4" to 8'-0": One 5" x 3-1/2" x 5/16" angle
d. Over 8'-0": Structural lintel required.

2.5 Steel Wall Ladders:
A. Fabricate steel ladders of the following:
1. Side Rails: 3/8 x 2 inch bars spaced at 20 inches.
2. Rungs: One inch diameter solid rod spaced at 12 inches on center.
B. Extend side rails minimum 42 inches above top of parapet wall, bend back over parapet and return to within 12 inches of upper most roof surface. Ladder rungs shall be located on both sides of parapet walls which extend more than 18 inches above upper most roof plane.
C. Space ladder rungs 7 inches from wall surface with steel mounting brackets and attachments.

2.6 Railings:
A. Fabricate railings and entry step handrails of 1-1/2 inch diameter steel pipe.
B. Height of railings shall be 34 inches above finish floor level.
C. Equally space vertical support rails, with maximum allowable spacing of 6 feet on center.
D. Galvanize after fabrication.

PART 3 - EXECUTION

3.1 Examination and Preparation:

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

B. Supply items required to be cast into concrete or embedded in masonry, with setting templates, to appropriate Sections.

3.2 Installation:

A. Install items plumb and level, accurately fitted, free from distortion or defects.

B. Allow for erection loads and provide temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

C. Field weld components as indicated. Perform field welding in accordance with AWS D1.1.

D. Do not field cut or alter metal fabrications without approval of Design Professional.

E. After erection, prime welds, abrasions, and surfaces not shop primed or galvanized, except surfaces to be in contact with concrete.

END OF SECTION

SECTION 05510 - METAL STAIRS

PART 1 - GENERAL

1.1 Section Includes:
- A. Steel stair frame of structural sections, with closed risers.
- B. Pan to receive concrete fill stair treads and landings.
- C. Balusters and handrailing.
- D. Coordination with other Sections for the installation of anchorage devices for stairs and handrails.

1.2 Structural Requirements:
- A. Design stair assembly under direct supervision of a Professional Structural Engineer registered in the State of Michigan.
- B. Fabricate stair assembly to support live load of 100 lbs. per square foot with deflection of stringer or landing framing not to exceed 1/240 of span.
- C. Railing assembly, wall rails, and attachments to resist lateral force of 200 lbs. at any point without damage or permanent set (both downward and horizontally).

1.3 Submittals:
- A. Submit in accordance with General Requirements, Division 1.
- B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, openings, size and type of fasteners, and accessories. Indicate welded connections and net weld lengths using standard AWS symbols. Include erection drawings, elevations, and details where applicable.

PART 2 - PRODUCTS

2.1 Materials:
- A. Steel Sections: ASTM A36.
- B. Steel Plate: ASTM A283
- C. Steel Tubing: ASTM A500, Grade B.
- D. Steel Pipe: ASTM A53, Grade B, Schedule 40, or ASTM A50l.
- E. Sheet Steel: ASTM A446, Grade B, structural quality with G90 galvanized coating.
- F. Bolts, Nuts, and Washers: ASTM A325.
- G. Handrail Fittings: Elbows, T-shapes, wall brackets, escutcheons; formed, cast or machined steel.
- H. Welding Materials: AWS D1.1; type required for materials being welded.
- I. Shop and Touch-Up Primer: SSPC 15, Type 1, red oxide. Dry Film thickness of 2.5 mils.
- J. Touch-up Primer for Galvanized Surfaces: Zinc rich type.
- K. Concrete and Reinforcement for Treads and Landings: Polypropylene fibrillated fibers; Portland cement as specified in Section 03001.
- L. Woven Wire Panel Inserts: Woven wire mesh clinched to frames; No. 10 gauge; 1-1/2 inch square patten; equal to "SAFE-GUARD" manufactured by the GS Company.

2.2 Fabrication - General:

A. Where possible, site verify dimensions prior to shop fabrication.
B. Fit and shop assemble sections in largest practical sizes for delivery to site.
C. Seal joined members by continuous welds.
D. Grind exposed joints flush and smooth with adjacent finished surface. Make exposed joints butt tight, flush and hairline. Ease exposed edges to small uniform radius.
E. Exposed Mechanical Fastenings: Flush countersunk screws or bolts, consistent with design of component.
F. Furnish components required for anchorage of stairs and landings. Fabricate anchors and related components of same material and finish as stairs.
G. Accurately form components required for anchorage of stairs, landings and railings to each other and to building structure.
H. Install continuous handrail.

2.3 Fabrication - Pan Stairs and Landings:

A. Fabricate stairs and landings with closed risers and treads of 2 inch deep pan construction ready to receive concrete fill.
B. Form treads, risers and landings from minimum 14 gauge sheet steel stock. Reinforce underside of landings with structural steel members to attain design load requirements.
C. Secure tread pans to stringers with clip angles; welded in place.
D. Form stair framing of rolled steel channels or rectangular hollow sections; stringers of minimum 10 inch deep members; landing frames of 12 inch deep members. Weld closure plates to exposed ends of steel tube stringers using steel sheet.
E. Prime paint components.

2.4 Fabrication – Railings and Handrails:

A. Accurately form railings and handrail components to suit stairs and landings, to each other and to building structure.
B. Form railing posts and rails of 1-1/2 inch diameter pipe sections. Infill between top and bottom rails with woven wire panel inserts.
C. Form handrails with 1-1/2 inch diameter steel pipe sections, to profile indicated on Drawings. Weld to stringers and landings.
D. Prime paint components.

2.5 Finish:

A. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
B. Shop prime items with one coat. Do not prime surfaces in direct contact with concrete or where field welding is required.
C. Galvanize scheduled items to minimum 2.0 ounces per square foot zinc coating.

PART 3 – EXECUTION

3.1 Examination and Preparation:

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

3.2 Installation:

A. Install items plumb and level, accurately fitted, free from distortion or defects.

B. Allow for erection loads and provide temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

C. Field weld components as indicated. Perform field welding in accordance with AWS D1.1.

D. Do not field cut or alter stair components without approval of Design Professional.

E. After erection, prime welds, abrasions, and surfaces not shop primed or galvanized, except surfaces to be in contact with concrete.

END OF SECTION

SECTION 06100 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 Section Includes:
- A. Structural floor, wall, and roof framing; built-up structural members.
- B. Sheathing materials of the following types:
  1. Insulated structural wall sheathing.
  2. Fire retardant wall sheathing.
  3. Wall sheathing.
  4. Roof sheathing.
  5. Subfloor sheathing.
- C. Engineered lumber materials.
- D. Blocking at wall and roof openings; concealed wood blocking.
- E. Preservative treatment of wood.
- F. Wood construction connectors and anchors.

1.2 Quality Assurance:
- A. Perform Work in accordance with the following agencies:
  1. Lumber Grading Agency: Certified by ALSC.
  2. Plywood Grading Agency: Certified by APA.

PART 2 - PRODUCTS

2.1 Lumber Materials:
- A. Lumber Grading Rules: NLGA, WWPA and SPIB.
- B. Extreme fiber stress in bending (Fb) is for repetitive member uses, nominal 12 inches wide, unless specifically noted otherwise.
- C. Header, Joist and Rafter Framing (Structural Joist): Contractor may use the following:
  1. Hem-Fir species, No. 1 and Better grade, stress rating 1210 Fb/1.5E, S4S, DRY.
  2. Southern Pine species, No. 2 grade, stress rating 1120 Fb/1.6E, S4S, KD 19.
- D. Interior Wall Studding (2 x 4 and 2 x 6): Contractor may use the following:
  1. Spruce-Pine-Fir species, Construction grade, stress rating 978 Fb/1.0E, S4S, DRY.
  2. Southern Pine species, Stud grade, stress rating 1010 Fb/1.4E, S4S, KD 19.
- E. Exterior Wall Studding (2 x 4 and 2 x 6): Contractor may use the following:
  1. Hem-Fir (North), Select Structural grade, stress rating 1300 Fb/1.7E, S4S, DRY.
  2. Southern Pine species, No. 2 grade, stress rating 1440 Fb/1.6E, S4S, KD 19.
- F. Sill Plate: Pressure treated with structural characteristics of Header, Joist and Rafter Framing.

2.2 Engineered Lumber Materials:

A. Acceptable Manufacturers:
   1. TrusJoist MacMillian
   2. Design Professional approved equal.

B. Laminated Veneer Lumber (LVL): Veneer core, heat and pressure bonded with waterproof adhesive; stress rating 2800 Fb/2.0E, 1850 Ft, 500 Fo, 285 Fv; 1-3/4 inches thick.

C. Parallel Strand Lumber (PSL): Long, thin strands of wood structurally bonded together with waterproof adhesive; stress rating 2900 Fb/2.0E, 120,000 psi G, 650 Fc, 290 Fv; sizes as indicated on Drawings.

2.3 Sheathing Materials - Wood:

A. Plywood Roof Sheathing: APA Rated Sheathing, Span Rating 24/16; Exposure Durability Exterior; unsanded; 5/8 inch thick, 48 x 96 inch sized sheets, square edges.

B. Oriented Strand Board Wall Sheathing: APA Rated Sheathing, Span Rating 24/16; Exposure Durability 1, unsanded faces; 7/16 inch thick, 48 x 96 inch sized sheets, square edges.

C. Insulated Structural Sheathing: Polyiso insulation core bonded to 7/16 inch OSB, Exposure I PS2-10 span rated sheathing; “THERMACAL WALL” manufactured by GAF; polyiso core shall comply with ASTM C1289, Type II, Class I, Grade 2; ASTM E84 Flame Spread of equal to or less than 7 and Smoke Developed of equal to or less than 450; 48 inch wide sheets by lengths required; thicknesses as indicated on Drawings; tongue and groove foam sides.

D. Plywood Floor Sheathing: APA Rated Sturd-I-Floor, Span Rating 24 oc; Exposure Durability 1; sanded; 3/4 inch thick, 48 x 96 inch sized sheets, tongue and groove edges.

2.4 Fire Retardant Wall Sheathing:

A. Acceptable Products:
   1. “LP FLAMEBLOCK” manufactured by LP Building Products.

B. Performance Requirements:
   1. Flame Spread and Smoke Developed Performance:
      a. Flame Spread: Less than 25 when tested in accordance with ASTM E84, UL 723 or NPFA 255.
      b. Smoke Developed: Less than 100 when tested in accordance with ASTM E84, UL 723 or NFPA 255.
      c. Advance of Flame: Not to exceed 10.5 feet after 30 minute test duration.
   2. Thermal Barrier Index: Minimum 20 minutes when tested in accordance with ASTM E119, USC 26.2 and UL 1715.
   3. Structural Performance:
      a. Meet or exceed structural and Exposure 1 requirements for Category indicated.
      b. Meet or exceed bond durability and weather resistance requirements of ICC Acceptance Criteria AC264.
   4. Exterior Wall Sheathing: Coated 2 sides.

2.5 Accessories:

A. Fasteners - General: Galvanized steel for exterior, high humidity, and treated wood locations, plain finish elsewhere. Size and type to suit condition.

B. Hangers and Connectors: Galvanized steel, sized and profiled to suit framing conditions and as indicated on Drawings; equal to products manufactured by Simpson Strong-Tie Company, Inc.

C. Anchors: Toggle bolt type for anchorage to hollow masonry. Expansion shield and lag bolt type for anchorage to solid masonry or concrete. Bolt or ballistic fastener for anchorages to steel.

D. Subfloor Glue: APA AFG-01, water or solvent base, waterproof.

E. PH Ramp Threshold: Extruded aluminum, adjustable, rabbeted and interlocking ramp; equal to Models 233A and 236A manufactured by Zero International; 6 inch width.

2.6 Wood Treatment:

A. Wood Preservative: AWPA Standard C2, C9 and C15, using waterborne ACQ (alkaline copper quat) preservative, pressure impregnated in accordance with the following:

1. Ground Contact Usage: 0.40 pcf retention.
2. Above Ground Usage: 0.15 pcf retention.

B. Wood Preservative (Surface Application): Clear, water repellent, mildew and UV resistant type; equal to "CABOT CLEAR SOLUTION" manufactured by Cabot Stains.

C. Provide treated wood materials were indicated on Drawings and in schedule at end of Section.

PART 3 - EXECUTION

3.1 Framing:

A. Erect wood framing members in accordance with Drawings and applicable code. Place members level and plumb. Place horizontal members crown side up.

B. All wood framing members shall be cut square on bearings, closely fitted, accurately set to required lines, and rigidly secured in place.

C. Frame double joist and rafter headers at floor and ceiling openings. Frame rigidly into joists and rafters. Frame double joists under wall studding.

D. Bridge joist and wall framing in excess of 8 feet at mid-span or at locations indicated on Drawings.

3.2 Sheathing:

A. Install floor sheathing perpendicular to floor framing with end joints staggered. Secure sheet edges over firm bearing. Attach sheathing with construction adhesive and nails.

B. Install floor underlayment perpendicular to floor framing with end joints staggered. Secure sheet edges over firm bearing. Attach underlayment with construction adhesive and nails.

D. Install roof sheathing perpendicular to roof framing with end joints staggered. Secure sheet edges over firm bearing. Use sheathing clips at mid-span of sheets between roof framing members.

D. Installed insulated structural sheathing in strict accordance with manufacturer's installation instructions using required nails and nail gun. Tape all joints with manufacturer recommended tape.

3.3 Site Applied Wood Treatment:

A. Apply preservative treatment in accordance with manufacturer's application instructions.

B. Treat site-sawn cuts of preservative treated lumber in accordance with AWPA Standard M4-Section 1.5

C. Allow preservative to cure prior to erecting members.

3.4 Schedule of Treated Wood Materials:

A. Preservative treated lumber shall be used at the following locations:

1. Framing members in contact with concrete or masonry.
2. Plywood sheathing back-up for roofing membrane were carried up vertical walls.

END OF SECTION

SECTION 06200 - FINISH CARPENTRY

PART 1 - GENERAL

1.1 Section Includes:
- A. Exterior cementitious siding, standing and running trims.
- B. Finish carpentry items, interior standing and running trims.
- C. Handrails and mounting hardware.
- D. Chairrails - hardwood.
- E. Solid surfacing window stools.
- F. FRP wall panels and trims.

1.2 Related Work Specified in Other Sections:
- A. Section 07210 – Building Insulation: Installation of wall insulation.
- B. Section 08210 - Wood Doors: Installation of passage doors.
- C. Section 08712 - Door Hardware: Installation of finish hardware.

PART 2 - PRODUCTS

2.1 Exterior Cementitious Siding and Trims:
- A. Acceptable Products:
  1. James Hardie Building Products
     - a. Lap Siding: “SELECT CEDARMILL”
     - b. Panel Siding: “SMOOTH”
     - c. Trims: "4/4 and 5/4 SMOOTH"
  2. Design Professional approved equal.
- B. Lap Siding: ASTM C1186, Grade II, Type A; non-asbestos fiber cement, 5/16 inch thick, 7.25 inch wide panels (6 inch exposure) by 12 foot lengths; woodgrain embossed texture; factory finished, color to match existing building siding.
- C. Panel Siding: Same material as lap siding, 4x8 and 4x10 foot sheets.
- D. Trims: ASTM C1186, Grade II, Type A; non-asbestos fiber cement, 3/4 inch and 1 inch thick; factory finished, color as selected by Owner.
- E. Fasteners: Corrosion resistant, size and type as recommended by trim manufacturer.
- F. Edge Coater: As furnished by siding manufacturer; color to match siding color selected.

2.2 Lumber Materials:
- A. Softwood Lumber: Graded in accordance with AWI Custom, plain sawn; maximum moisture content of 6 percent for interior work; with mixed grain of quality suitable for paint finish.
- B. Hardwood Lumber: White oak species, graded in accordance with AWI Custom plain sawn, maximum moisture content of 6 percent; with mixed grain of quality suitable for transparent (stain) finish.
- C. Ramp Handrails: Fir species, 1-1/2 inch diameter; quality suitable for stain finish.

2.3 Finish Materials - Solid Surfacing:

A. Acceptable Products:
   1. "CORIAN", manufactured by DuPont Company
   2. "SURELL", manufactured by Formica Company
   3. "FOUNTAINHEAD", manufactured by Nevamar Decorative Surfaces
   4. Design Professional approved equal.

B. Solid Surfacing: Non-porous, homogenous, densified polyester resin based composition; color and pattern as selected by Design Professional.

C. Seaming Compound: As supplied by material manufacturer.

D. Adhesive: Type recommended by material manufacturer to suit application.

2.4 Fiberglass Reinforced Panels (FRP):

A. Acceptable Manufacturers:
   1. Kemilte Company
   2. Nudo Products, Inc.
   3. Sequentia, Inc.
   4. Design Professional approved equal.

B. Laminated Panels: Textured 0.090 inch thick fiberglass reinforced plastic sheet; 48 x 96 inch sized sheets; color as selected by Design Professional.

C. Trim Mouldings: As supplied by panel manufacturer; color to match panels.

D. Wall Adhesive: As supplied or recommended by panel manufacturer.

E. Sealant: Silicone based, single component, mildrew resistant type recommended by panel manufacturer.

2.5 Fabrication - Solid Surfacing Window Stools:

A. Fabricate solid surfacing window stools in accordance with manufacturer's fabrication instructions. Fabricate units without joints where possible.

B. Color of joint adhesive used must produce a totally invisible seamless surface.

C. Surface and edge gloss must be consistent throughout.

PART 3 - EXECUTION

3.1 Installation of Cementitious Siding and Trims:

A. Install siding and trims in accordance with manufacturer’s installation instructions.

B. Install trims and fasten through trim into structural framing. Place fasteners no closer than 3/4 inch and no further than 2 inches from side edge of trim board and no closer than one (1) inch from end. Fasten maximum 16 inches on center.

3.2 Installation - Millwork and Trim:

A. Install work in accordance with AWI Quality Standard.

B. Set and secure materials and components in place, plumb and level.

C Install mouldings and trim in maximum lengths possible. Miter exterior corners and cope interior corners.

D. Install trim with finishing type nails, set to receive wood filler.

E. All field joints are to be tightly fitted and flush. Stagger joints with adjacent members on multi-member built-up mouldings and trims.

F. All concealed areas of hardwood millwork shall be finished with one coat sealer.

3.3 Preparation For Finish:

A. Sand woodwork smooth and set exposed fasteners.

B. Site Finishing: Refer to Section 09900 – Painting.

END OF SECTION

SECTION 06410 - CUSTOM CASEWORK

PART 1 - GENERAL

1.1 Section Includes:
- A. Shop fabricated casework, cabinets, counters, shelving units and countertops.
- B. Finish hardware and attachment accessories.

1.2 Submittals:
- A. Submit in accordance with General Requirements, Division 1.
- B. Shop Drawings: Indicate materials, component profiles, elevation views, fastening and assembly methods, joint details, and finish hardware.
- C. Samples: Submit the following:
  1. Solid Surfacing: Minimum 2 x 2 inch size samples illustrating full range of colors and patterns available.
  2. Plastic Laminate: Minimum 2 x 3 inch size samples illustrating full range of colors, patterns and textures available.

1.3 Quality Assurance:
- A. Perform Work in accordance with AWI Custom.

PART 2 - PRODUCTS

2.1 Lumber and Sheet Materials:
- A. Softwood Lumber: Graded in accordance with AWI Custom; maximum moisture content of 6 percent.
- B. Softwood Plywood: PS 1, APA A-D, Exposure 1; Graded in accordance with AWI, veneer core.
- C. Wood Particleboard: ANSI A208.1, Type 1-M-2; AWI standard, mat-formed, composed of wood chips made with water resistant resin binders, sanded faces; minimum density of 45 lbs per cubic foot.
- D. Hardboard: ANSI A135.4; pressed wood fiber with resin binder, temper grade, smooth one side.
- E. Melamine Panels: Thermoset melamine resin impregnated paper, pressure bonded to industrial grade particleboard; color as selected by Design Professional; panels manufactured by Panolam Industries, (800)-6PANOLAM.

2.2 Finish Materials - Plastic Laminate:
- A. Acceptable Manufacturers:
  1. Formica
  2. Micarta
  3. Nevamar
  4. WilsonArt
  5. Design Professional approved equal.
- B. Plastic Laminate: NEMA LD 3; General Purpose grade, minimum 0.050 inch thick for horizontal; color, pattern and surface texture as selected by Design Professional.

C. Laminate Backing Sheet: 0.020 inch Backing Sheet grade; undecorated plastic laminate with smooth finish; manufacturer's standard.

2.3 Finish Materials - Solid Surfacing:

A. Acceptable Products:
   1. "CORIAN", manufactured by DuPont Company
   2. "SURELL", manufactured by Formica Company
   3. "FOUNTAINHEAD", manufactured by Nevamar Decorative Surfaces
   4. Design Professional approved equal.

B. Solid Surfacing: Non-porous, homogenous, densified polyester resin based composition; color and pattern as selected by Design Professional.

C. Seaming Compound: As supplied by material manufacturer.

D. Adhesive: Type recommended by material manufacturer to suit application.

2.4 Accessories:

A. Fasteners: Size and type to suit application; hot dipped galvanized steel for exterior, high humidity and treated wood locations, plain finish elsewhere.

B. Contact Adhesive: Water based or solvent release type to suit application and as recommended by laminate manufacturer.

C. Wall Adhesive: Cartridge type, compatible with wall substrate, capable of achieving durable bond.

D. Panel Edging: Plastic PVC molding, adhesive applied; 3mm thick; color as selected by Design Professional; equal to product manufactured by Doellken-Woodtape.

E. Counter Support Brackets: Formed aluminum, 1061-H24, 2 gauge (0.25 inch thickness); ADA compliant; 18” x 18” size, 1-1/2 inch forms with 1/4 inch mounting holes; all edges smooth; brushed aluminum finish with clear powder coat finish; equal to manufactured by A&M Hardware, Inc.

F. Coat Hanging Rod: Knape and Vogts KV750 Series Commercial Heavy-duty Round Closet Rod, steel rod with invisible welded seam, 0.075 wall thickness; 1-1/16 inch O.D.; brilliant chrome finish; supply with commercial closet rod flanges of same finish.

2.5 Cabinet Hardware:

A. Hinges: Steel five knuckle type with removable pin; finish and color as selected by Design Professional.

B. Drawer Slides: Knape and Vogts No. 8400, full extension.

C. File Drawer Slides: Knape and Vogts No. 8500, full extension.

D. Pulls: EPCO No. MC-402-3.5, finish and color as selected by Design Professional.

E. Cabinet Locks: Knape and Vogts No. 987, nickel plated steel, six tumbler; keyed to Owner's requirements.

F. Stops: Apply felt or rubber bumper/stops to door and drawers.

G Catches: EPCO No. 903 BR DIP, 3/8 inch diameter, adjustable brass catch with strike.

2.6 Fabrication - Plastic Laminate Cabinets and Shelves:

A. Fabricate in accordance with AWI - Section 400 B, Custom Grade, and as profiled on Drawings.

B. Where practical, cabinets shall be mill assembled and completed. Where design, delivery or site conditions require, cabinets may be assembled in component units with provisions made for field connecting.

C. Cabinets and shelves shall be constructed of the following materials:
   1. Cabinet Construction: Frameless, flush overlay.
   2. Cabinet Body: Particleboard, 3/4 inch thick.
   3. Cabinet Doors: Particleboard, 3/4 inch thick.
   4. Shelves: Softwood plywood, 3/4 inch thick for shelves up to 36 inches in length, one (1) inch thick for shelves over 36 inches in length.
   5. Backs: Particleboard, 3/8 inch thick.
   6. Drawer Fronts: Particleboard, 3/4 inch thick.
   7. Drawer Sides, Backs and Subfronts: Solid lumber, 1/2 inch thick.
   8. Drawer Bottoms: Hardboard, 1/4 inch thick.

   NOTE: Melamine panels will be acceptable for use at cabinet interiors only. All other surfaces shall receive plastic laminate finishes.

D. Apply plastic laminate finishes in accordance with manufacturer's instructions, to all exposed and semi-exposed surfaces.

E. Wherever possible, plastic laminate finishes shall be applied in full continuous sheets. Make corners and joints hairline.

F. Cap drawers, doors, shelves and exposed edges with PVC edging.

G. No nails, screws or other fastenings shall be visible on exposed of semi-exposed surfaces.

H. Provide cutouts for plumbing fixtures, inserts, appliances, outlet boxes, and other fixtures and fittings.

I. Cabinet woodworker shall furnish and install hardware.

2.7 Fabrication - Countertops:

A. Fabricate solid surfacing countertops and backsplashes in accordance with manufacturer's fabrication instructions. Fabricate units without joints where possible.

B. Color of joint adhesive used must produce a totally invisible seamless surface.

C. Surface and edge gloss must be consistent throughout.

D. All plastic laminate countertops shall be built on site, scribed and fitted to wall lines.

E. Apply plastic laminate finishes in accordance with manufacturer's instructions, to exposed surfaces or as indicated on Drawings.

F. Where possible, plastic laminate finishes shall be applied in one continuous sheet.

PART 3 - EXECUTION

3.1 Examination and Preparation:

A. Verify required blocking, mechanical, electrical, and other items affecting this Section are placed and ready receive millwork.

B. Prime paint surfaces of items or assemblies in contact with cementitious materials before installation.

3.2 Installation:

A. Install work in accordance with AWI Quality Standards.
B. Set and secure casework in place rigid, plumb, and level.
C. Install casework by concealed hanging methods. Loose filler members between wall and casework shall be scribed.
D. Shim cabinets as required with concealed shims.
E. All field joints are to be tightly fitted and flush.
F. Anchor casework to solid blocking built into wall. Secure with countersunk, concealed fasteners and blind nail.
G. Install countertops and backsplashes with concealed fasteners.
H. Install miscellaneous hardware in accordance with manufacturer's instructions.
I. Adjust doors, drawers, hardware, fixtures and other moving or operating parts for smooth and balanced operation.
J. At countertops with sinks, apply sealant at intersection of countertop and splashes, and splashes with wall surfaces. Coordinate with Joint Sealants, Section 07900.

END OF SECTION

SECTION 07100 - WATERPROOFING

PART 1 - GENERAL

1.1 Section Includes:
- A. Self-Adhering rubberized asphalt sheet membrane waterproofing system.

1.2 Environmental Requirements:
- A. Do not apply waterproofing during inclement weather. Maintain temperature above 40 degrees F for 24 hours before application and continuously until waterproofing has cured.

1.3 Warranties:
- A. Provide manufacturer's material warranty in accordance with General Requirements, Division 1.
- B. Provide one (1) year warranty on installation, include resultant damage from failure of installation to resist penetration of moisture.

PART 2 - PRODUCTS

2.1 Materials:
- A. Acceptable Products:
  1. "BITUTHENE 3000", manufactured by Grace Construction Products
  2. "ELASTO-PLY 1000", manufactured by Karnak Corporation
  3. "MIRADRI 860", manufactured by Mirafi Inc.
  4. Design Professional approved equal.
- B. Waterproofing Membrane: Rubberized asphalt laminated to a polyethylene film; minimum 60 mils thick.
- C. Primer: Type recommended by membrane manufacturer for use on substrate present.
- D. Sealing Mastic: Rubberized asphalt sealant type recommended by membrane manufacturer.

PART 3 - EXECUTION

3.1 Examination and Preparation:
- A. Verify that surfaces are solid, free of projections and matter detrimental to adhesion of waterproofing.
- B. Do not apply waterproofing to damp, frozen, dirty, dusty, greasy or oily surfaces. Clean and prepare surfaces in accordance with manufacturer's instructions.
- C. Protect adjacent surfaces not designated to receive waterproofing.
- D. Seal cracks and joints with recommended material and sealant.

3.2 Installation:
- A. Install waterproofing membrane in accordance with manufacturer's installation instructions.
- B. Prime surfaces and permit to dry.

C. Apply membrane, beginning at the low point and working towards the high point.
D. At inside and outside corners provide double coverage with minimum 9 inch wide strip of membrane.
E. Provide double coverage at joints, drains, penetrations and projections.
F. Apply minimum 3/4 inch fillet at juncture of horizontal and vertical surfaces.
G. Side lap membrane minimum 2-1/2 inches. End lap membrane minimum 5 inches.
H. Roll membrane immediately after placement to ensure full adhesion.
I. Seal terminations of membrane with mastic. Seal watertight.
J. Seal protrusions through membrane with mastic. Seal watertight.

3.3 Protection:

A. Protect finished waterproofing membrane from damage by installing drainage board or protection board in accordance with manufacturer's installation instructions.
B. Scribe and cut boards to fit neatly and tight around penetrations and projections.

END OF SECTION

SECTION 07190 - VAPOR AND AIR BARRIERS

PART 1 - GENERAL

1.1 Section Includes:
- A. Sheet and sealant materials to form continuous exterior air barrier from sill plate to roof construction.
- B. Sheet and sealant materials to form continuous interior vapor barrier at exterior walls.

PART 2 - PRODUCTS

2.1 Air Barrier:
- A. Acceptable Products:
  - 1. "COMMERCIAL WRAP", manufactured by DuPont Tyvex
- B. Air Barrier: Air infiltration retarder sheet; Class A fire hazard classification.
- C. Tape: Self-adhering type recommended by barrier manufacturer.
- D. Attachments: Nails or staples as recommended by barrier manufacturer.

2.2 Vapor Barrier:
- A. Sheet Vapor Barrier: Translucent polyethylene film for above grade application; 6 mil thick.
- B. Tape: Self-adhering type recommended by barrier manufacturer.
- C. Attachments: Nails or staples as recommended by barrier manufacturers.

PART 3 - EXECUTION

3.1 Examination and Preparation:
- A. Verify substrate materials are dry and clean. Remove loose or foreign matter which might impair adhesion.
- B. Coordinate with Work of other affected Sections.
- C. Clean and prime substrate surfaces to receive adhesive and/or sealants in accordance with manufacturer's instructions.

3.2 Installation:
- A. Install and secure sheet air barrier to exterior walls in accordance with manufacturer's installation instructions.
- B. Install sheet vapor barrier to interior surface of perimeter walls, ceiling/roof framing and where indicated on Drawings.
- C. Overlap vapor barrier at ceiling/wall line and all joints minimum two inches and seal with tape.
- D. Tape seal vapor barrier in place around window and door frames.
- E. Caulk with sealant to ensure complete seal.

END OF SECTION

SECTION 07210 - BUILDING INSULATION

PART 1 - GENERAL

1.1 Section Includes:

A. Rigid Board insulation for use at the following locations:
   1. Perimeter foundation wall.
   2. Under slabs on grade.

B. Thermal batt insulation in exterior wall and ceiling/roof construction.

C. Thermal mineral wool insulation in fire rated wall construction.

D. Sound control batt insulation in interior partition construction.

PART 2 - PRODUCTS

2.1 Rigid Board Insulation:

A. Acceptable Poducts:
   1. "AMOFOAM-CM", manufactured by Amoco Foam Products Company
   2. "STYROFOAM" manufactured by Dow Chemical Company
   3. "FOAMULAR 250", manufactured by UC Industries, Inc.
   4. Design Professional approved equal.

B. Polystyrene Insulation: ASTM C578, extruded cellular type, aged R-Value of 5.0 per inch (75 degrees F); minimum 25 psi compressive strength; maximum water absorption 0.3 percent; thickness as indicated on Drawings.

C. Adhesive: Water or solvent base as recommended by manufacturer.

D. Fasteners: Galvanized nails with one inch heads or wafer head screws; type and size to suit application.

E. Joint Sealant: Tape or foam-in-place sealant as recommended by board manufacturer to form air tight installation.

2.2 Fiber Glass Batt Insulation:

A. Acceptable Manufacturers:
   1. CertainTeed
   2. Manville
   3. Owens-Corning Fiberglas Corporation
   4. Design Professional approved equal.

B. Fiber Glass Thermal Insulation (Concealed Behind Gypsum Board): ASTM C665, Type ll - Kraft Faced; preformed glass fiber insulation; R-Value (thickness) as indicated on Drawings.

C. Fiber Glass Thermal Insulation (Exposed): ASTM C665, Type III, Class A; performed glass fiber insulation, with factory applied foil facing; flame/smoke rated for 25/50 or less; R-Value (thickness) as indicated on Drawings.

D. Fiber Glass Sound Insulation: ASTM C665, Type l-Unfaced; preformed glass fiber insulation; 2-1/2 inches thick.

2.3 Mineral Wool Batt Insulation:

A. Acceptable Manufacturers:
   1. Manville
   2. Design Professional approved equal.

B. Mineral Wool Thermal Insulation: ASTM C665, Type 1; inorganic fibers derived from basalt, noncombustible, moisture resistant, non-deteriorating; will not support mildew or support corrosion; Flame Spread/Smoke Developed 0/0.

PART 3 – EXECUTION

3.1 Examination:

A. Verify that substrate, adjacent materials, and insulation materials are dry and ready to receive insulation.

B. Verify mechanical and electrical services within wall have been installed and tested.

3.2 Installation - Rigid Board Insulation:

A. Install boards in accordance with manufacturer instruction for application.

B. Under slabs on grade install boards over vapor barrier with edges and ends tightly butted and joints staggered. Prevent displacement or damage while placing concrete.

C. On vertical surfaces install boards with long edges horizontal, edges and ends tightly butted and vertical joints staggered.

D. Scribe and cut boards to fit neatly and tight around penetrations and projections.

E. Seal all butt joints between boards and around all penetrations with tape or foam-in-place insulation.

3.3 Installation - Batt Insulation:

A. Install batts in accordance with manufacturer's instructions for application.

B. Place batts in framing cavities, completely filling intended spaces. Leaving no gaps or voids.

C. Fit insulation to, around and behind mechanical and electrical services within the plane of insulation.

D. Fill shim spaces around doors and windows with insulation.

E. Install friction fit batts tight to framing members completely filling intended spaces.

F. Install faced batts with factory applied membrane facing the warm side of building spaces.

G. Install faced batts between wood framing members with attachment flanges stapled taut and without gaps.

H. Repair any puncture or tears in facing by taping.

END OF SECTION

SECTION 07251 - FIRESTOPPING

PART 1 - GENERAL

1.1 Section Includes:
- A. Firestopping materials and accessories.

1.2 Submittals:
- A. Submit in accordance with General Requirements, Division 1.
- B. Product Data: Provide data on materials, product characteristics, performance, limitation criteria and installation instructions. Contractor shall provide UL design number or manufacturer's data sheet for all through wall penetration fire stopping materials / conditions required of these projects.
- C. Certifications: Manufacturer shall certify that products meet or exceed specified fire resistance ratings.

1.3 Quality Assurance:
- A. Applicator: Contractor specializing in firestopping installation and approved by material manufacturer.
- B. Materials shall be classified by Underwriters Laboratories (UL), or other approved laboratory, and shall be rated **NOT** less than fire resistance rating of adjacent construction.

1.4 Environmental Requirements:
- A. Maintain manufacturer's specified minimum ambient and substrate temperatures for 24 hours before, during, and for 24 hours after installation of firestopping.
- B. Provide adequate ventilation in areas receiving firestopping in strict accordance with manufacturer's recommendations.

PART 2 - PRODUCTS

2.1 Silicone Firestopping Materials:
- A. Acceptable Products:
  1. "FIRE STOP" Systems, manufactured by Dow Corning Corporation
  2. "PENSIL" Systems, manufactured by GE Silicones
  3. "FIRESTOP" Systems, manufactured by Hilti, Corporation
  4. Design Professional approved equal.
- B. Firestopping Sealant: Single component, silicone elastomeric sealant; non-shrinking, non-sagging formulation.
- C. Firestopping Foam: Two component, liquid silicone elastomer foam.
- D. Firestopping Wrap: Intumescent wrap strip, designed for firestopping plastic and insulated pipe penetrations; minimum expansion of ten times original volume.
- E. Primer: Type recommended by firestopping system manufacturer for substrate surfaces present.

2.2 Ceramic Fiber Firestopping Materials:
- A. Acceptable Products:
  1. "FYREPUTTY", manufactured by The Carborundum Company

2. "FIREMASTER", manufactured by Thermal Ceramics Inc.
3. Design Professional approved equal.

B. Firestopping Material: Single component, inorganic compound made from ceramic fiber; 0/0/0 (Flame/Smoke/Fuel) rating; 3200 degrees F melting point.

2.3 Accessories:

A. Dam Material: As required by firestopping system manufacturer.

B. Retainers: As required by firestopping system manufacturer.

PART 3 - EXECUTION

3.1 Examination and Preparation:

A. Verify openings are ready to receive the work of this section. Coordinate with all applicable trades.

B. Clean substrate surfaces of matter or films which may affect bond of firestopping material.

C. Remove incompatible materials which affect bond by scraping, brushing, scrubbing or sand blasting.

D. Where required, install backing materials to arrest material leakage.

3.2 Installation:

A. Install materials in accordance with manufacturer's installation instructions and to design requirements of test assemblies.

B. Apply firestopping material in sufficient thickness to achieve required fire resistance rating.

C. Install material at floors, ceilings, walls or partition openings which contain penetrating sleeves, piping, duct work, conduit and other items, requiring firestopping.

D. Level and smooth firestopping materials where exposed to view as a finish material.

E. Immediately after placements, protect firestopping from mechanical injury.

3.3 Cleaning:

A. Remove excess material, droppings and debris.

B. Remove firestopping from materials and surfaces not required to be sealed.

3.4 Schedules:

A. Firestopping material locations and ratings include, but are not limited to the following:

	Location:	Fire Rating:
1.	Stair 1 and Stair 2 walls	1 hour
2.	Stair 2 ceilings	1 hour
3.	Exit Passageway 115 walls/ceilings	1 hour

END OF SECTION

SECTION 07311 - ASPHALT SHINGLES

PART 1 - GENERAL

1.1 Section Includes:
- A. Granular surfaced asphalt shingle roofing.
- B. Ice dam protection membrane and associated flashings.

1.2 Environmental Requirements:
- A. Do not install ice dam protection sheet or shingles when ambient temperatures are below 40 degrees F.

1.3 Warranty:
- A. Provide manufacturer's thirty (30) year material warranty in accordance with General Requirements, Division 1.

PART 2 - PRODUCTS

2.1 Asphalt Shingles:
- A. Asphalt Shingles: Mineral granule surfaced type; with the following characteristics:
  1. Material Composite: Fiberglass base.
  2. Fire Rating Classification: UL Class A.
  3. Configuration: Three-tab.
  4. Color: Black.

2.2 Ice Dam Protection Membrane:
- A. Acceptable Products:
  1. "WINTERGUARD", manufactured by CertainTeed
  2. "WEATHERLOCK", manufactured by Owens Corning
  3. "ICE & WATER SHIELD", manufactured by W.R. Grace Construction Products
- B. Ice Dam Protection Membrane: Self-adhering membrane of rubberized asphalt bonded to sheet polyethylene, minimum 40 mils total thickness, with strippable treated release paper.

2.3 Accessories:
- A. Nails: Hot dipped galvanized steel or aluminum, 11 or 12 gauge barbed shank type, 3/8 inch head, of sufficient length to penetrate roof sheathing.
- B. Plastic Cement: ASTM D2822; Type 1, Class A and B, asphalt type recommended by shingle manufacturer.
- C. Lap Cement: Fibrated cutback asphalt type recommended by shingle manufacturer.
- D. Drip Edge: Preformed, 0.024 inch thick aluminum eave and rake edge; two-coat acrylic finish, color as selected by Design Professional; equal to "F9S1 DRIP EDGE" manufactured by Alcoa Building Products.

PART 3 - EXECUTION

3.1 Examination and Preparation:

A. Verify deck surfaces are dry, free of ridges, warps, or voids. Broom clean surfaces.

B. Fill knot holes and surface cracks in roof deck with latex filler at areas of bonded ice dam protection.

3.2 Installation - Ice Dam Protection:

A. Place eave and gable edge metal flashings tight with fascia boards. Weather lap joints and seal with plastic cement. Secure flange with nails.

B. Apply ice dam protection membrane in accordance with manufacturer's application instructions over entire roof deck surface.

3.3 Installation - Asphalt Shingles:

A. Apply shingles in accordance with manufacturer's application instructions.

B. Provide double course of shingles at eaves.

C. Place shingles in straight coursing pattern with required weather exposure to produce double thickness over full roof area.

D. Project first course of shingles 1/2 inch beyond eave boards.

E. Extend shingles 1/2 inch beyond face of gable edge fascia boards.

F. Cap ridge with individual shingles, maintaining weather exposure. Start on end of ridge opposite prevailing wind. Place to avoid exposed nails.

G. Complete installation to provide weather tight service.

****END OF SECTION****

SECTION 07532 - ELASTOMERIC SHEET ROOFING - ADHERED

PART 1 - GENERAL

1.1 Section Includes:
- A. Elastomeric sheet membrane conventional roofing system with insulation, roofing membrane, fully adhered.
- B. Complete tear-off of existing roofing at designated roof area.
- C. Patch and flashing work at existing roofing designated to remain.

1.2 Submittals:
- A. Submit in accordance with General Requirements, Division 1.
- B. Shop Drawings: Indicate termination conditions, conditions of interface with other materials, special joint details; tapered insulation layout, thicknesses, and anchorage details.
- C. Product Data: Provide characteristics on membrane materials, flashing materials, insulation, vapor retarders, adhesives, joint and crack sealants, with temperature range for application of membrane.

1.3 Quality Assurance:
- A. Perform Work in accordance with Underwriters Laboratories (UL) Class 90 wind uplift classification.
- B. Applicator: Company specializing in sheet membrane roofing installation and certified by membrane manufacturer.
- C. Tapered Insulation Applicator: Shall have a minimum of five (5) years experience and at least three (3) documented installations of minimum 20,000 square feet each.
- D. Installation shall contain only materials supplied or approved by membrane manufacturer for use in the roofing system.
- E. Upon completion of the roofing system, an authorized representative shall inspect and verify that installation is in full compliance with membrane manufacturer's specifications and details.

1.4 Environmental Requirements:
- A. Do not install membrane during inclement weather or when air temperature may fall below minimum recommended by manufacturer.

1.5 Warranty:
- A. Provide manufacturer's fifteen (15) year warranty in accordance with General Requirements, Division 1; including coverage of materials, installation and resulting damage to building from failure to resist penetration of moisture.

PART 2 - PRODUCTS

2.1 Membrane Materials:
- A. Acceptable Products:
  - 1. "SURE-SEAL", manufactured by Carlisle Corporation

2. "GENFLEX EPDM", manufactured by GenFlex Roofing Systems
3. "VERSIGARD", manufactured by Versico Inc.
4. "JM EPDM NR", manufactured by Johns Manville
5. Design Professional approved equal.

B. Membrane: EPDM compounded elastomer; 0.060 inch thick; black color; conforming to the following minimum criteria:
1. Tensile Strength: 1305 psi
2. Elongation, Ultimate: 300 percent
3. Tear Resistance: 150 lbs. per inch
4. Water Absorption: +8,-2 maximum
5. Brittleness Point: -49 degrees F

C. Seaming Materials: As furnished by membrane manufacturer.

D. Flexible Flashings: EPDM, Neoprene or other material as furnished by membrane manufacturer.

E. Pipe Boots and Pre-Formed Corners: Molded EPDM as furnished by membrane manufacturer.

2.2 Insulation Materials - Mechanically Fastened:

A. Roof insulation manufacturer shall be **approved** by membrane manufacturer as acceptable for use in conjunction with roofing system.

B. Polyisocyanurate Insulation: FS HH -I- 1972/GEN, Class I, faced closed cell foam core type; square edges, factory tapered.

C. Insulation Plates and Fasteners: Corrosion resistant of size and type furnished or accepted by membrane manufacturer for the following deck types:
1. Concrete deck.
2. Wood deck.

D. Insulation Adhesive: As furnished or recommended by membrane manufacturer for deck substrate.

2.3 Accessories:

A. Adhesives, Primers, Sealants and Pourable Sealers: As furnished by membrane manufacturer.

B. Termination Bars: Extruded aluminum or hard rubber as furnished by membrane manufacturer.

C. Fiber Cant and Tapered Edge Strips: Non-asphaltic cellulose fiberboard types accepted by membrane manufacturer.

D. Fasteners: Corrosion resistant of size and type accepted by membrane manufacturer.

E. Roof Drains: As specified in Mechanical Divisions.

F. Walkway Pads: As furnished or accepted by membrane manufacturer.

G. Vapor Retarder: Vinyl sheet or asphalt impregnated reinforced kraft paper, with compatible adhesive; classified by Underwriters Laboratories (UL).

H. Pipe and Conduit Supports: Closed cell, polyethylene foam block with integral strut channel, UV rated, flexible; strut channel designed to receive standard strut clamps and accessories; size and lengths as required; equal to "PIPE PIER PIPE SUPPORT SYSTEMS" manufactured by Erico.

PART 3 - EXECUTION

3.1 Examination:

A. Verify that surfaces and site conditions are ready to receive work; deck is clean and smooth, dry and free of snow or ice; properly sloped to drains, valleys or eaves.

B. Verify roof openings, curbs, and protrusions through roof are solidly set; wood nailing strips, cants and reglets are in place.

C. Verify adjacent precast concrete roof members do not vary more than 1/4 inch in height. Verify grout keys are filled flush.

3.2 Preparation:

A. Fill concrete surface honeycomb and variations with latex filler.

A. Install sheathing on metal deck. Lay with long side at right angle to flutes. Stagger end joints and provide support at ends.

B. Mechanically fasten sheathing in accordance with UL requirements. Cut sheathing cleanly and accurately at roof breaks and protrusions to provide smooth surface. Tape joints.

3.3 Vapor Retarder Application:

A. Apply vapor retarder to deck surface with adhesive in accordance with manufacturer's application instructions.

B. Extend vapor retarder under cant strips and blocking to deck edge.

C. Lap flexible flashing over vapor and air barrier of wall construction to provide continuity of vapor and air barrier seal. Coordinate with Vapor and Air Barriers Section 07190.

3.4 Insulation Application:

A. Place and mechanically attach insulation in accordance with manufacturer's application instructions for roof deck type. Minimum attachment shall be one fastener per every 2 square feet of insulation surface unless otherwise specified by manufacturer.

B. Lay multiple layer installations with all joints staggered from previous layer.

C. On tapered board installation, minimum total insulation thickness at any point shall be 1-1/2 inches plus taper.

D. Lay boards with edges in moderate contact without forcing. Joints shall be maximum 1/4 inch in width. Cut insulation to fit neatly to perimeter blocking and around penetrations through roof.

E. On steel decks, place insulation so that no edges are left unsupported along flutes.

F. Lay tapered boards to establish pitch to drains or eaves.

G. Lay tapered boards for a distance of 48 inches back from roof drains for positive drainage.

3.5 Membrane Installation:

A. Verify that surface of insulation is smooth and clean, free of contaminants or delaminated insulation facers, and all fasteners are properly seated.

B. Install membrane in accordance with manufacturer's installation instructions.

C. Unroll membrane and position over insulation without stretching.
D. Allow membrane to relax minimum 30 minutes before splicing or bonding.
E. Fold first sheet back into itself and uniformly coat bottom side of membrane and top side of insulation with adhesive. Avoid getting adhesive onto the lap joint area.
F. Allow adhesive to set in accordance with manufacturer's application instructions. Roll coated membrane onto coated substrate in a manner to eliminate wrinkles and trapped air.
G. Roll bonded surface to ensure full contact and adhesion.
H. Repeat procedure for other half of sheet and for each successive sheet. Exercise care to adhere middle of sheets.
I. Overlap edges and ends minimum 3 inches and solvent or tape seal. Apply uniform bead of sealant to joint edge.
J. Shingle joints on sloped substrate in direction of drainage.
K. Seal membrane to adjoining surfaces.
L. Continue membrane up vertical surfaces minimum 8 inches unless otherwise noted. Secure and seal watertight.
M. Reinforce membrane with multiple thickness of membrane material over joints.
N. Seal items penetrating membrane with counterflashing membrane material. Install membrane flashings. Seal watertight to membrane.
O. Coordinate installation of roof sumps and related flashings.
P. Apply roof control and expansion joint materials to isolate roof into areas as indicated on Drawings.
Q. Place walkway pads around all rooftop mounted equipment.
R. Support all piping and conduits above roof membrane with manufactured pipe supports. Size and space supports to allow for expansion and contraction in accordance with industry standards.

END OF SECTION

SECTION 07600 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 Section Includes:
- A. Fascia and flashings.
- B. Miscellaneous cover trims.
- C. Counterflashings over base flashings.
- D. Soffits and trims.
- E. Gutters and downspouts.

1.2 Section Does Not Include:
- A. Related items specified in other Sections, including but not limited to the following:
  1. Masonry through wall flashings.
  2. Flashings, sills and trims furnished as part of a total manufactured assembly.

1.3 System Description:
- A. System performance to physically protect roofing membrane, base flashings and roof edges, from damage that would permit water leakage to building interior.

1.4 Submittals:
- A. Submit in accordance with General Requirements, Division 1.
- B. Shop Drawings: Indicate flashing and trim profiles, material and material thicknesses; joint, corner and anchorage details.

1.5 Quality Assurance:
- A. Perform Work in accordance with the following:
  1. AA - Aluminum Construction Manufacturer: Aluminum Sheet Metal Work and Building Construction.
  2. SMACNA - Architectural Sheet Metal Manual.
  3. NRCA - Roofing Manual.

1.6 Storage and Handling
- A. Stack preformed and prefinished material to prevent twisting, bending, or abrasion, and to provide ventilation.

PART 2 - PRODUCTS

2.1 Sheet Materials:
- A. Aluminum Sheet – Fascias and Caps: ASTM B209, 3003-H14 alloy; shop finished after forming with fluoropolymer coating; color as selected by Design Professional; of the following minimum thickness:
  1. Up to 6 inch face: 0.040 inch thick.
  2. 6 to 8 inch face: 0.050 inch thick.
  3. 8 to 10 inch face: 0.064 inch thick.

B. Aluminum Sheet - Counterflashings: ASTM B209, 3003-H14 alloy; 0.032 inch thick; mill finish.

2.2 Soffit Material:

A. Acceptable Products:
   1. "WIND-LOC SOFFIT PANEL", by Atlas International, Inc.
   2. "SERIES E-375 SOFFIT", by Englert
   3. "PAC-750 SOFFIT", by PAC-CLAD Peterson Aluminum
   4. Design Professional approved equivalent.

B. Aluminum Sheet: ASTM B209, 3005-H19 alloy; minimum 0.032 inch thickness; smooth surface finish.

C. Soffit: Complete with starter strips and trims; conforming to the following:
   1. Profile: Non-ventilated, v-groove, 12 inch wide panels by nominal 7/16 inch deep. NOTE: 16 inch wide panels are **NOT** acceptable.

D. Finish shall be 70 percent PVDF Fluorocarbon coating, applied on a continuous coil coating line, with top side dry film thickness of 1.1 +/-0.01 mil dry film thickness and on reverse side a wash coat and primer of 0.04 +/-0.01 mil dry film thickness; color as selected by Design Professional form manufacturer's standard color selections.

2.3 Accessories:

A. Fasteners: Same material as flashing metal, with soft neoprene washers at exposed fasteners; finished same as flashing metal where exposed.

B. Protective Backing Paint: Bituminous.

C. Sealant: As specified in Joint Sealants, Section 07900.

D. Bedding Compound: Rubber-asphalt type.

E. Plastic Cement: FS SS-C-153, Type I - asphaltic base cement.

2.4 Gutters and Downspouts:

A. Gutters: Complete with end caps, downspout outlets, and expansion joints; conforming to the following:
   1. Profile: K-type, 5 inch, Heavy-duty type.
   2. Material: Extruded aluminum.
   3. Gutter Supports: Brackets.

B. Downspouts: Complete with elbows, boots or shoes, conforming to the following:
   1. Profile: Rectangular, 4 inch by 5 inch size.
   2. Material: Aluminum.
   3. Downspout Supports: Straps.

2.5 Fabrication - Flashings and Trims:

A. Form components true to shape, accurate in size, square, and free from distortion or defects. Form pieces in longest practical lengths.

B. Fabricate cleats and starter strips of same material as sheet, continuous in length, interlockable with sheet.

C. Hem exposed edges on underside 1/2 inch; miter and seam corners. Fabricate vertical faces with bottom edge formed outward 3/4 inch and hemmed to form drip.

D. Fabricate flashings to allow toe to extend 2 inches over surface of roofing membrane. Return and brake edges.
E. Form fascia with 1/4 inch expansion space at all joints. Provide back-up plate behind joints, minimum 6 inches wide, of same material, profile and finish to match fascia.

2.6 Fabrication - Gutters and Downspouts:
A. Site verify dimensions and conditions prior to shop fabrication.
B. Form gutters and downspouts to profiles and sizes indicated and in accordance with SMACNA requirements.
C. Fabricate with required connections, allowing for expansion at joints.
D. Furnish gutter and downspout accessories.

PART 3 - EXECUTION

3.1 Examination and Preparation:
A. Verify roof openings, curbs, pipes, sleeves, ducts, or vents through roof are solidly set, cant strips and reglets in place, and nailing strips located.
B. Verify membrane termination and base flashings are in place, sealed, and secure.

3.2 Installation - Flashings and Trims:
A. Conform to drawing details included in AA, SMACNA, NRCA and roof membrane manufacturer's manual.
B. Install starter and edge strips, and cleats. Parapet cap cleats shall be continuous in length.
C. Install surface mounted reglets. Seal top of reglets with sealant. Insert flashings to form tight fit. Seal flashings into reglets with sealant.
D. Apply bituminous paint to concealed surfaces in contact with cementitious materials or dissimilar metals.
E. Secure flashings in place using concealed fasteners.
F. Fit components tight in place. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.
G. Seal metal joints watertight.

3.3 Installation - Gutters and Downspouts:
A. Install gutters, downspouts and accessories in accordance with manufacturer's installation instructions.
B. Secure hangers to solid support framing at recommended spacing.
C. Join gutter lengths with seams sealed watertight. Flash and seal gutters to downspouts.
D. Provide expansion joints at maximum 40 feet on center and elsewhere as required.
E. Apply bituminous paint to concealed surfaces in contact with cementitious materials or dissimilar metals.
F. Connect downspouts to storm sewer system. Seal connection watertight.

END OF SECTION

SECTION 07900 - JOINT SEALANTS

PART 1 - GENERAL

1.1 Section Includes:
- A. Joint surface preparation.
- B. Sealant and joint backing materials.
- C. Coordination with other Sections for sealant/material compatibility.

1.2 Section Does Not Include:
- A. Related items specified in other Sections, including but not limited to the following:
  1. Exterior paving sealants.
  2. Structural sealants required by a manufactured assembly or system.
  3. Firestopping sealants.
  4. Glazing sealants.

1.3 Submittals:
- A. Submit in accordance with General Requirements, Division 1.
- B. Product Data: Provide characteristics on physical and performance properties of sealants, substrate preparation, use limitations, and colors available.

1.4 Quality Assurance:
- A. Perform Work in accordance with the following:
  1. SWRI - Sealant, Waterproofing and Restoration Institutes requirements.
  2. ASTM C790 - Use of Latex Sealing Compounds.
  3. ASTM C804 - Use of Solvent Release Type Sealants.
- B. System performance to achieve moisture and airtight joint seals.
- C. Applicator: Contractor specializing in sealant installation, employing qualified personnel. No allowance will be made for lack of skill on the part of installers.

1.5 Environmental Requirements:
- A. Maintain temperature and humidity within ranges specified by manufacturer before, during, and after installation of sealants.
- B. Provide adequate ventilation in building areas receiving solvent curing sealants in strict accordance with manufacturer's recommendations.

1.6 Warranty:
- A. Provide applicators' three (3) year warranty in accordance with General Requirements, Division 1.

PART 2 - PRODUCTS

2.1 Silicone Sealants:
- A. Acceptable Manufacturers:
  1. Dow Corning Corporation
  2. GE Silicones
  3. Pencora Corporation

4. Sonneborn Building Products
5. Design Professional approved equal.

B. Silicone Sealant (Type A): ASTM C920 Type S, Grade NS, Class 25; single component, neutral curing, non-staining, non-bleeding; ±50 percent joint movement capability; -40 to 300 degree F service temperature range.

C. Silicone Sealant (Type B): ASTM C920 Type S, Grade NS, Class 25; single component, neutral curing, mildew resistant, non-staining, non-bleeding; ±25 percent joint movement capability; -40 to 400 degrees F service temperature range.

2.2 Polyurethane Sealants:

A. Acceptable Manufacturers:
1. Pecora Corporation
2. Sonneborn Building Products
3. Tremco Sealant Systems
4. Design Professional approved equal.

B. Polyurethane Sealant (Type C): ASTM C920 Type M, Grade NS, Class 25; two component, non-staining, non-bleeding; ±50 percent joint movement capability; -20 to 180 degrees F service temperature range.

2.3 Acrylic Sealants:

A. Acceptable Manufacturers:
1. Pecora Corporation
2. Sonneborn Building Products
3. Design Professional approved equal.

B. Acrylic Sealants (Type D): ASTM C834; single component, non-sagging, non-staining, non-bleeding; ±7.5 percent joint movement capability.

2.4 Accessories:

A. Primer: Non-staining type recommended by sealant manufacturer to suit application.

B. Joint Cleaner: Non-corrosive and non-staining type recommended by sealant manufacturer; compatible with joint forming materials.

C. Joint Backing: ASTM D1056; round, closed cell expanded neoprene rod; oversized to 50 percent larger than joint width; equal to products manufactured by Williams Products, Inc.

D. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

PART 3 - EXECUTION

3.1 Examination and Preparation:

A. Verify that substrate surfaces and joint openings are ready to receive work.

B. Remove loose materials and foreign matter which might impair adhesion of sealant.

C. Clean joints in accordance with manufacturer's instructions.

D. Prime joint surfaces were required by manufacturer.

E. Verify that joint backing and release tapes are compatible with sealant.

3.2 Installation:

A. Install joint backing and sealant in accordance with manufacturer's installation instructions.

B. Measure joint dimensions and size materials to achieve required width/depth ratios.

C. Install joint backing to achieve a neck dimension no greater than 1/3 the joint width. Where joint backing is not used, install bond breaker tape.

D. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

E. Install sealant free of air pockets, foreign matter, ridges and sags.

F. Tool joints concave and weathertight.

G. Clean excess sealant from adjacent surfaces in accordance with manufacturer's instructions.

H. Protect sealants until cured.

3.3 Schedule:

A. It is intended that color of sealants shall match adjacent materials.

B. The following schedule of sealants is intended as a guide and shall not be considered entirely inclusive.

1. Type A Sealant: General use, exterior and interior.
2. Type B Sealant: Toilet rooms, kitchens, janitors closets, and other "wet" areas.
3. Type C Sealant: Masonry control joints and other required masonry caulking.
4. Type D Sealant: Exterior and interior use for areas that will receive paint finish.

END OF SECTION

SECTION 08112 - STEEL DOORS

PART 1 - GENERAL

1.1 Section Includes:
- A. Steel doors; fire rated and non-fire rated.
- B. Coordination with other Sections for the installation of door frames and hardware.

1.2 Submittals:
- A. Submit in accordance with General Requirements, Division 1.
- B. Shop Drawings: Indicate door elevations, dimensions; size, thickness, swing, type of construction; internal reinforcement and fire rating where applicable.

1.3 Quality Assurance:
- A. Perform Work in accordance with the following:
  1. SDI-100 - Standard Steel Doors and Frames.
  2. DHI - Door Hardware Institute - The Installation of Commercial Steel Doors and Steel Frames.
  3. Fire Rated Door Construction: Conform to ASTM E152 and UL 10B.
  4. Installed Door Assembly: Conform to NFPA 80 for fire rated class as scheduled.
- B. Fire rated steel doors shall be classified by Underwriters Laboratories (UL), or other approved laboratory, and shall bear metal classification labels, mechanically fastened to hinge side of door.

PART 2 - PRODUCTS

2.1 Door Types:
- A. Acceptable Manufacturers:
  1. Ceco Door Products
  2. Curries Company
  3. Republic Builders Products
  4. Steelcraft
  5. Design Professional approved equal.
- B. Interior Doors: SDI-100 Grade II, Heavy-duty, 18 gauge; 1-3/4 inch thick, full flush faces, seamless edges; honeycomb kraft paper core; primed.

2.2 Fabrication:
- A. Prepare doors for hardware, holes drilled, with minimum 14 gauge internal reinforcement for hardware.
- B. Fabricate doors with 1/8 inch bevel in 2 inches on lock edges.
- C. Doors scheduled for continuous hinges shall be factory drilled per template furnished by hardware supplier. Coordinate with Hardware, Section 08712.
- D. Close top and bottom edge of doors with inverted steel channel closures. Seal joints watertight.
- E. Attach fire rating classification label to edge of rated doors.
- F. Fabricate doors, scheduled for continuous hinges with installation in existing

frames, as follows:

1. Single Door: 15/32 inch narrower than existing frame opening, to accommodate hinge and required lock clearances.
2. Double (Pair) Doors: 7/8 inch narrower than existing frame opening, to accommodate hinges and required lock clearances.

2.3 Finish:

A. Interior Doors: Degreased, cleaned and treated with coat of rust inhibiting primer.
B. Site finish doors in accordance with Painting, Section 09900.

PART 3 - EXECUTION

3.1 Installation:

A. Install doors in accordance with ANSI/SDI-100 and manufacturer's installation instructions.
B. Coordinate installation of doors with installation of specified frames and hardware.
C. Install doors louvers, plumb and level.
D. Adjust door for smooth and balanced door operation.
E. Maintain fitting tolerances of 1/8 inch clearance at jambs and head; maximum 3/4 inch at floor.

3.2 Tolerances:

A. Maximum Diagonal Distortion: 1/8 inch measured with straight edge, corner to corner.

END OF SECTION

SECTION 08113 - STEEL FRAMES

PART 1 - GENERAL

1.1 Section Includes:
- A. Steel frames; fire rated and non-fire rated.
- B. Interior window/vision frames.
- C. Coordination with other Sections for the installation of doors, hardware and glazing.

1.2 Submittals:
- A. Submit in accordance with General Requirements, Division 1.
- B. Shop Drawings: Indicate frame elevations, dimensions; framed opening requirements and tolerances; anchorage and fasteners; fire rating where applicable.

1.3 Quality Assurance:
- A. Perform Work in accordance with the following:
  1. SDI-100 - Standard Steel Doors and Frames.
  2. DHI - Door Hardware Institute - The Installation of Commercial Steel Doors and Frames.
  3. Fire Rated Frame Construction: Conform to ASTM E152, NFPA 252, UL 10B and 10C.
  4. Installed Door Assembly: Conform to NFPA 80 for fire rated class as scheduled.
- B. Fire rated steel frames shall be classified by Underwriters Laboratories (UL), or other approved laboratory, and shall bear metal classification labels, mechanically fastened to hinge side of frame.

PART 2 - PRODUCTS

2.1 Frame Types – Welded:
- A. Acceptable Manufacturers:
  1. Ceco Door Products
  2. Curries Company
  3. Republic Builders Products
  4. Steelcraft
  5. Design Professional approved equal.
- B. Frames: Welded, double rabbet, 16 gauge; 2 inch face, 5-3/4 and 8 inch jamb depth; primed.
- C. Silencers: Resilient rubber.

2.2 Frame Types – Knocked Down, Pre-finished:
- A. Acceptable Manufacturers:
  1. Timely Industries
  2. Design Professional approved equal.
- B. Interior Drywall Frames: Knock down, unequal rabbet, 20 gauge; mitered

corners, jamb throat opening shall be 1/8 inch wider than finished wall width; factory finished.

C. Frame Profile: "S" Series for non-rated doors; "CK" Series for fire rated doors.

D. Casings: Formed steel, TA-30 profile; applied to heat treated clips on frame.

E. Frame Reinforcement and Accessories:

1. Provide reinforcement shipped loose to project site for hardware installation:
   a. TA-10: Regular arm closers, casing mounted coordinators.
   b. TA-12: Parallel arm closers, rim exit device strikes, other stop mounted surface hardware.
   c. TA-47: For CK frame, parallel arm closers, rim exit device strikes, other stop mounted surface hardware.
   d. Provide hinge reinforcement (TA-11) of 14 gauge steel pierced to create depth of thread for hinge screws equal to or exceeding 7 gauge steel.
2. Weatherstrip/Gasket: TA-46 (QDS500) 90 minute rated gasket for kerfed frames. All pieces factory mitered to assure perfect corner alignment. Black color.
3. Silencers: TA-5 vinyl, 2 per frame, clear stick-on type.
4. Glass Stops: TA-14 removable rolled steel, shape, butted ends. Pre-punched and countersunk for flat head tek screws.
5. Adjustable Strikes: Emboss frames for TA-1 strike for cylindrical lock. Provide TA-1 strike in finish compatible with hardware finish.
6. Installation Fasteners (Provided by Others): #6 drywall type of length sufficient to penetrate studs or structure at least 1/2 inch.

F. Finishing: Pre-finish with factory applied impact resistant, polyurethane baked enamel finish or optional electrostatic applied water based paint system. Color selected from manufacturer's standard pre-matched custom colors (Designer Colors).

2.3 Fabrication - Welded Frames:

A. Accurately form and cut mitered corners. Cope butt joints of mullions.

B. Securely weld joints and grind to smooth uniform surface.

C. Reinforce frames wider than 48 inches with roll formed steel channels fitted tightly in frame head, flush with top.

D. Prepare frames for hardware, holes drilled, with internal reinforcement plates welded in place.

E. Frames scheduled for continuous hinges shall be factory drilled per template furnished by hardware supplier. Coordinate with Hardware, Section 08712.

F. Prepare frame for silencers and install.

G. Ship frames with temporary removable spreader bar fastened to bottom of each frame.

2.4 Fabrication – Pre-finished Knock Down Frames:

A. Openings for single swing, pair, borrowed light and sidelight frames to be pre-cut, notched and fabricated at factory facility. For fire rated openings, provide kerf at stop for installation of smoke gasket.

B. Provide minimum 14 gauge hinge reinforcement plate tapped for machine screws

supplied with hinges. Hinge plate to be mechanically attached to hinge emboss on frame.

C. Casing Clips: Fabricate frames with factory applied, heat treated clips to ensure no deflection in clip upon application or removal of casing. Attachment clips may not be of same material as frame.

D. Provide notches, tabs and/or stops for positive alignment of frame parts at all corners.

E. Mullions to be notched as required to provide tight joints.

F. Provide manufacturer's standard mullion brackets for positive connection of frame and mullion parts.

G. Provide manufacturer's standard steel glass stop pre-cut to exact length. Fire rated glazed openings to have hole for installation screw within 2 inches of each end of stop piece.

H. Provide insert channel full width of borrowed lights installed on finish floor. Provide full width head channel for ceiling height units.

I. Provide adequate structural support (by others) for ceiling insert channel for ceiling height frames.

J. Transom bars to be fixed type with compatible profiles to jamb and head.

K. Attach approved mylar label to each fire rated frame indicating fire rated details.

L. Factory install TA-46 smoke gasket on all prefinished, CK series frames. Install with factory mitered corners to ensure adequate seal and pleasing appearance.

2.5 Finish – Welded Frames:

A. Interior Frames: Degreased, cleaned and treated with coat of rust inhibiting primer.

B. Site finish frames in accordance with Painting, Section 09900.

PART 3 - EXECUTION

3.1 Installation:

A. Install frames in accordance with SDI-105 and manufacturer's installation instructions.

B. Coordinate installation of frames with installation of specified doors and hardware.

C. Coordinate with wall construction for frame anchor placement.

D. Install frames plumb, level and square.

E. Coordinate installation of glass and glazing.

END OF SECTION

SECTION 08210 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 Section Includes:
- A. Wood doors; non-fire rated.
- B. Coordination with other Sections for the installation of door frames, hardware and glazing.

1.2 Submittals:
- A. Submit in accordance with General Requirements, Division 1.
- B. Shop Drawings: Indicate door elevations, cutouts and trim details for glazing and louvers, size, thickness, swing, type of construction, blocking for hardware attachment.
- C. Samples: Submit two panels of door veneer, 8 x 10 inch in size illustrating wood grain, color, and finish.

1.3 Quality Assurance:
- A. Perform Work in accordance with the following:
  - 1. NWWDA Industry Standard I.S.1. - 80 Series and AWI Quality Standards for Architectural Flush Doors.

1.4 Warranty:
- A. Provide manufacturer's life of installation warranty in accordance with General Requirements, Division 1

PART 2 - PRODUCTS

2.1 Door Types:
- A. Acceptable Manufacturers:
  - 1. Algoma Hardwoods, Inc.
  - 2. Eggers Industries
  - 3. Graham Doors
  - 4. Marshfield Door Systems, Inc.
  - 5. VT Industries
  - 6. Design Professional approved equal.
- B. Interior Doors: Solid core construction; 1-3/4 inches thick; non-fire rated.

2.2 Door Construction:
- A. Solid Core: Non-rated, conforming to the following minimum criteria:
  - 1. Stiles: Two-ply laminated, 1-1/8 inch wide.
  - 2. Rails: Solid or laminated, 1-1/8 inch wide.
  - 3. Core: Grade 1-L-1, solid mat formed particleboard.

2.3 Door Facing:
- A. Wood Veneer: Graded in accordance with AWI Premium; 3-ply panels minimum 1/8 inch thick; face veneer as follows:

1. Species: White oak.
2. Veneer Cut: Quarter sawn.
3. Veneer Matching: Book.

B. Adhesive: NWWDA, Type I or II.

2.4 Accessories:

A. Glass Stops: Wood of same species as door veneer; square profile.

2.5 Fabrication:

A. Fabricate non-rated doors in accordance with NWWDA I.S.1 requirements.
B. Laminate stiles with minimum 1/2 inch thick edge strip of wood species to match face veneer.
C. Glue stiles, rails and lock blocks to core under pressure.
D. Glue face panels to stiles, rails and lock blocks under pressure.
E. Factory machine doors for finish hardware.
F. Factory pre-fit doors for frame opening dimensions identified on shop drawings.

2.6 Finish:

A. Factory finish doors in accordance with manufacturer's standard finish system to approved sample.
B. Finish grade shall be AWI Premium.
C. Finish system shall consist of filler/stain and minimum three clear topcoats.

PART 3 - EXECUTION

3.1 Installation:

A. Install doors in accordance with manufacturer's instructions and NWWDA I.S.1 requirements.
B. Coordinate installation of glass and glazing.
C. Trim non-rated door width by cutting equally on both jambs. Trim door height by cutting equally on top and bottom edges, total maximum 3/4 inch.
D. Install door, plumb and level.
E. Coordinate installation of doors with installation of specified frames and hardware.
F. Adjust door for smooth and balanced door operation.
G. Maintain fitting tolerances of 1/8 inch clearance at jambs and top; 3/4 inch at floor.

3.2 Tolerances:

A. Maximum Diagonal Distortion: 1/4 inch measured with straight edge, corner to corner.

END OF SECTION

SECTION 08305 - ACCESS DOORS

PART 1 - GENERAL

1.1 Section Includes:
- A. Access doors and frames, fire rated and non-fire rated.
- B. Coordination with all trades for number, locations, sizes, and ratings for all access doors required for this project.

1.2 Submittals:
- A. Submit in accordance with General Requirements, Division 1.
- B. Product Data: Include sizes, types, finishes, scheduled locations, details of adjoining work and fire rating where applicable.

1.3 Quality Assurance:
- A. Fire rated access doors shall be classified by Underwriters Laboratories (UL), or other approved laboratory, and shall bear labels indicating rating.

PART 2 - PRODUCTS

2.1 Access Doors:
- A. Acceptable Products:
  1. J. L. Industries
     - a. "MODEL FD", Fire Rated
     - b. "MODEL TM", Non-Fire Rated
  2. Karp
     - a. "KRP-150FR", Fire Rated
     - b. "DSC-214M", Non-Fire Rated
  3. Larsen's Manufacturing Company
     - a. "L-FRAP", Fire Rated
     - b. "L-MP", Non-Fire Rated
  4. Design Professional approved equal.
- B. Stud Wall Construction: Flush door design with drywall joint compound flange and bead; fire rated or non-fire rated as required.

2.2 Fabrication - Non-Fire Rated Doors:
- A. Fabricate frames of 16 gauge steel and door of 14 gauge steel.
- B. Flange of frame shall be one-piece construction, minimum 3/4 inch wide, without miters or welds on face.
- C. Door hinge shall be continuous piano hinge.
- D. Door lock shall be flush, screwdriver operated with stainless steel cam and studs.
- E. Provide units set in masonry walls with masonry anchor straps.

2.3 Fabrication Fire Rated Doors:
- A. Fabricate frames of 16 gauge steel. Flange of frame shall be one piece construction, minimum 3/4 inch wide, without miters or welds on face.
- B. Fabricate doors of 20 gauge steel, welded pan type with 2 inch thick fire-rated

insulation.

C. Door hinge shall be concealed continuous piano hinge.
D. Door lock shall be latch type, operated by ring turn.
E. Equip door with automatic spring door closer and interior latch release.
F. Provide units set in masonry walls with masonry anchor straps.

2.4 Finish:
A. Steel Surfaces: Prime coat of rust inhibitive electrostatic powder, baked enamel.

PART 3 - EXECUTION

3.1 Examination and Preparation:
A. Verify rough openings for door and frame are correctly sized and located.

3.2 Installation:
A. Install in accordance with manufacturer's installation instructions.
B. Install frame plumb and level within opening.
C. Position to provide convenient access to concealed work requiring access.
D. Rigidly secure in place.

END OF SECTION

SECTION 08410 - ALUMINUM ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 Section Includes:
- A. Aluminum doors, frames and glazed lights.
- B. Aluminum storefront assemblies.
- C. Manufacturer provided hardware and weatherstripping.
- D. Coordination with other Sections for installation of hardware, glass and glazing.

1.2 Performance Requirements:
- A. Storefront System:
  1. System performance to provide for expansion and contraction within system components caused by temperature cycling without detrimental effects to system or components.
  2. Limit air infiltration through assembly to 0.06 cfm per square foot of fixed area, measured at a reference differential pressure across assembly of 6.24 psf as measured in accordance with ASTM E283.
  3. Water Infiltration: None, when measured in accordance with ASTM E331 with a test pressure difference of 15 psf.
  4. Design and size members to withstand dead loads caused by pressure and suction under windload of 30 psf. Maximum mullion deflection of 1/175 of the span.
  5. There shall be no buckling, stress on glass, edge seal failure, excess stress on curtainwall structure, anchors and fasteners or reduction in performance when tested in accordance with AAMA 501.5-98 at a temperature range of 0 to 180 degrees F.
  6. There shall be no “Life/Safety” type failures (glass breakage, anchor failures, or structural damage) when tested in accordance with AAMA 501.4, seismic test (lateral cycling).
  7. Thermal transmittance due to conduction shall be 0.40 – poured & debridged BTU/Hr/Ft^2/F degrees. Condensation Resistance Factor (CFR) shall not be less than 54 – poured & debridged only when tested in accordance with AAMA 1503-98.

1.3 Submittals:
- A. Submit in accordance with General Requirements, Division 1.
- B. Shop Drawings: Indicate system and component dimensions; elevation views; components within assembly; framed openings requirements and tolerances; anchorage and fasteners; glass and infill panels; and affected related work.
- C. Product Data: Provide hardware schedule listing description and finish of each item; include manufacturer's catalog cuts.

1.4 Warranty:
- A. Provide manufacturer's five (5) year warranty in accordance with General Requirements, Division 1; including coverage for insulated glass units.

PART 2 - PRODUCTS

2.1 Materials:

A. Acceptable Products:

1. Kawneer Company, Inc.
   a. Storefront Framing: "451T"
   b. Entrances: “500”
2. Tubelite
   a. Storefront Framing: "T14000"
   b. Entrances: “STANDARD WIDE STILE”
3. YKK AP
   a. Storefront Framing: “YES 45 TU”
   b. Entrances: “50D”
5. Design Professional approved equal.

B. Extruded Aluminum – Storefront Framing: ASTM B221; 6063-T5 alloy.

C. Sheet Aluminum: ASTM B209; 5005 alloy.

D. Primer: Zinc chromate for shop application and field touch-up.

E. Fasteners: Aluminum or stainless.

F. Sealant and Backing Materials: As specified in Joint Sealants, Section 07900.

2.2 Fabricated Components:

A. Entrance Frames - Exterior: 2 x 4-1/2 inch profile thermally broken, applied glazing stops. Door frames shall have screw applied stops, snap-on stops are **NOT** acceptable.

B. Swing Doors - Wide Stile: 1-3/4 inch thick, 5 inch wide top rail, 5 inch wide vertical stiles, 10 inch wide bottom rail; square glazing stops.

C. Flashings: Aluminum, finish to match mullion sections where exposed.

2.3 Glass and Glazing Materials:

A. Glass and Glazing Materials: As specified in Glazing, Section 08800, conforming to the following:

1. Glass in Doors: Safety glass, 1/4 inch thick.
2. Glass in Exterior Lights: Safety glass; insulated glass units, one (1) inch thick.
3. Glass in Interior Lights: Safety glass, 1/4 inch thick.

2.4 Insulated Composite Metal Glazing Panels:

A. Acceptable Products:

1. "OMEGA FOAM-PLY HBD", manufactured by Laminators, Inc.
2. "INSULATED PANEL", manufactured by Mapes Industries
3. "GLAZEGUARD 1000", manufactured by Citadel Architectural Products
4. Design Professional approved equal.

B. Aluminum Sheet: ASTM B209; minimum 0.010 inch thick; baked on acrylic finish; aluminum sheet surface texture and color as approved by Design Professional to match existing glazing panels.

C. Stabilizer Sheet: Exterior grade tempered hardboard; 1/8 inch thick.

D. Polystyrene Core: ASTM C578, Type IX, expanded closed cell foam board; nominal 3/4 inch thick.

2.5 Fabrication:

A. Fabricate doors and frames allowing for minimum clearances and shim spacing around perimeter of assembly.

B. Accurately fit and rigidly secure joints and corners, flush, hairline, and weatherproof.

C. Drain water entering joints, caused by condensation or migrating moisture occurring within unit, to exterior.

D. Arrange fasteners, attachments, and jointing to ensure concealment from view.

E. Prepare components with internal reinforcement for door hardware.

2.6 Finishes:

A. Exposed Aluminum Surfaces:

1. Front Storefronts: Anodized, Architectural Class 1; Bronze color to match existing storefront assemblies.

2. Rear Storefronts: Anodized, Architectural Class 1; Clear color.

B. Concealed Steel Items: Galvanize to 2.0 ounce per square foot.

C. Apply bituminous paint to concealed aluminum and steel surfaces in contact with cementitious or dissimilar materials.

PART 3 - EXECUTION

3.1 Examination and Preparation:

A. Verify that wall openings and adjoining air and vapor seal materials are ready to receive work of this section.

3.2 Installation:

A. Install doors, frames, glazing, hardware and flashings in accordance with manufacturer's installation instructions.

B. Use anchorage devices to securely attach frame assembly to structure.

C. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.

D. Coordinate attachment and seal of air and vapor barrier materials. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

E. Install hardware using templates provided.

F. Install glass in accordance with Glazing, Section 08800, using exterior combination or dry method of glazing.

G. Install perimeter exterior type sealant, backing materials, and installation requirements in accordance with Joint Sealants, Section 07900.

H. Adjust and lubricate moving parts of windows to operate smooth and fit accurately.

I. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths. Take care to remove dirt from corners and wipe surfaces clean.

J. Remove excess sealant from glass and aluminum by method acceptable to sealant and finish manufacturer.

END OF SECTION

SECTION 08420 - INSULATED COMPOSITE DOORS

PART 1 - GENERAL

1.1 Section Includes:
- A. Fiberglass reinforced polyester faced flush doors.
- B. Aluminum tubular frames.
- C. Manufacturer provided hardware and weatherstripping.
- D. Coordination with other Sections for installation of hardware, glass and glazing.

1.2 Submittals:
- A. Submit in accordance with General Requirements, Division 1.
- B. Shop Drawings: Indicate door and frame elevations, dimensions, cutouts and trim details for glazing; framed opening requirements and tolerances; anchorage and fasteners; glass and infill panels; door hardware requirements.
- C. Product Data: Provide hardware schedule listing manufacturer, quantity, description and finish of each item; include manufacturer's catalog cuts. Note: On hardware items with more than one acceptable manufacturer, submit catalog cut on scheduled item and submitted item.

1.3 Warranty:
- A. Provide manufacturer's materials and workmanship warranties in accordance with General Requirements, Division 1, as follows:
  1. Entry System: Minimum five (5) years.
  2. Factory Installed Hardware: Minimum five (5) years.

PART 2 - PRODUCTS

2.1 Materials:
- A. Acceptable Manufacturers:
  1. Special-Lite, Inc.
  2. PPG Industries, Inc.
  3. Tubelite Architectural Products
  4. Vistawall Architectural Products
- B. Extruded Aluminum: ASTM B221; 6063-T5 alloy.
- C. Face Sheet - FRP: Fiberglass reinforced polyester, 0.120 inch thick, embossed surface texture; integral color through full thickness of fiberglass sheet.
- D. Foam Core: Closed cell polyurethane type, foamed in place, minimum 4 lbs. per cubic foot density.
- E. Steel Sections: Structural shapes to suit mullion sections; galvanized.
- F. Fasteners: Stainless or galvanized steel, size and type to suit application.

2.2 Fabricated Components:
- A. FRP Flush Doors: Fiberglass reinforced polyester face sheets interlocked to aluminum tubular stiles and rails of minimum 0.125 inch wall thickness, continuous 3/8 inch tie rods top and bottom rails; solid foam core construction; 1-3/4 inches thick.

C. Frames: Extruded aluminum, minimum 0.125 inch wall thickness, 1-3/4 x 4-1/2 inch profile, internally reinforced at joints and hardware attachment points, applied glazing stops.

2.3 Glazing Materials:
A. Glass Materials: As specified in Glazing, Section 08800, conforming to the following:
1. Glass in Doors: Safety glass; 1/4 inch thick.
2. Glass in Exterior Lights: Safety glass; one (1) inch thick insulating units.
B. Rectangular Vision Lites: Aluminum glazing stops, screw applied.

2.4 Hardware by Door Manufacturer:
A. Pull: Aluminum, recessed; as furnished by door manufacturer.
B. Weatherstrip: Wool pile, integral with door frame and insert frame.
C. Door Sweep: Nylon brush type, replaceable.
D. Meeting Stile Sweep: Nylon brush type, replaceable.

2.6 Fabrication:
A. Fabricate doors and frames allowing for minimum clearance and shim spacing around perimeter of assembly.
B. Accurately and rigidly fit and secure joints and corners, flush, hairline, and weatherproof.
C. Fabricate frames with door jambs extended full height of opening.
D. Internally reinforce all frame joints with full width joint anchors.
E. Fabricate door joinery with steel tie rods, top and bottom, bolted through continuous extruded splines and reinforcing angles.
F. Prepare components with internal reinforcement for door hardware.

2.7 Finishes:
A. Aluminum Surfaces: Anodized, Architectural Class I; Clear color.
B. FRP Surfaces: As selected by Design Professional from manufacturer’s standard colors.
C. Concealed Steel Items: Galvanized to 2.0 ounces per square foot.

PART 3 - EXECUTION

3.1 Examination and Preparation:
A. Verify that wall openings are ready to receive work of this section.

3.2 Installation:
A. Install frames, doors and glazing in accordance with manufacturer's installation instructions.
B. Use anchorage devices to securely attach frame assembly to structure.
C. Align assembly plumb and square, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.
D. Install thresholds, surface applied door closers and holders in accordance with

manufacturer's installation instructions using templates provided.

E. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

F. Install perimeter exterior type sealant and backing materials in accordance with Joint Sealants, Section 07900.

G. Adjust hardware for smooth and balanced door operation.

END OF SECTION

SECTION 08572 – FIBERGLASS FRAME WINDOWS

PART 1 - GENERAL

1.1 Section Includes:
- A. Fiberglass frame windows; fixed and single hung units.
- B. Glass and glazing.
- C. Installation accessories.

1.2 Performance Requirements:
- A. Windows shall meet Rating FW-CW-PG specifications in accordance with ANSI/AAMA/NWWDA 101/I.S.2/A440-08.
- B. Window Air Leakage, ASTM E 283: Window air leakage when tested at 1.57 psf (25 mph) shall be 0.25 cfm/ft^2 of frame or less.
- C. Window Water Penetration, ASTM E 547: No water penetration through window when tested under static pressure of 7.5 psf (54 mph) after 4 cycles of 5 minutes each, with water being applied at a rate of 5 gallons per hour per square foot.

1.3 Submittals:
- A. Submit in accordance with Division 1 requirements.
- B. Product Data: Submit manufacturer's product data, including installation instructions.
- C. Shop Drawings: Submit manufacturer's shop drawings, indicating dimensions, construction, component connections and locations, anchorage methods and locations, hardware locations, and installation details.
- D. Samples: Submit full-size or partial full-size sample of window illustrating glazing system, quality of construction, and color of finish.

1.4 Quality Assurance:
- A. American Architectural Manufacturers Association (AAMA):
  1. AAMA 502 - Voluntary Specification for Field Testing of Windows and Sliding Doors.
  2. AAMA 623 - Voluntary Performance Requirements and Test Procedures for Organic Coatings on Fiber Reinforced Thermoset Profiles.
- B. American Society for Testing and Materials (ASTM):
  1. ASTM C 1036 - Flat Glass.
  2. ASTM C 1048 - Heat-Treated Flat Glass-Kind HS, Kind FT Coated and Uncoated Glass.
  3. ASTM E 283 - Rate of Air Leakage Through Exterior Windows, Curtain Walls and Doors Under Specified Pressure Difference Across the Specimen.
  4. ASTM E 547 - Water Penetration of Exterior Windows, Curtain Walls and Doors by Cyclic Static Air Pressure Differential.
  5. ASTM E 1105 - Standard Test Method for Field Determination of Water Penetration of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.

C. Window and Door Manufacturers Association (WDMA):
1. ANSI/AAMA/NWWDA 101/I.S.2 - Voluntary Specifications for Aluminum, Vinyl (PVC) and Wood Windows and Glass Doors.

1.5 Delivery, Storage and Handling:
A. Delivery: Deliver materials to site undamaged in manufacturer's or sales branch's original, unopened containers and packaging, with labels clearly identifying manufacturer and product name. Include installation instructions.
B. Storage:
1. Store materials in accordance with manufacturer's instructions.
2. Store materials off ground and under cover.
3. Protect materials from weather, direct sunlight, and construction activities.
C. Handling: Protect materials and finish during handling and installation to prevent damage.

1.6 Warranty:
A. Provide manufacturer's five (5) year warranty in accordance with General Requirement, Division 1; including coverage for insulated glass units.

PART 2 - PRODUCTS

2.1 Window Units:
A. Acceptable Manufacturers:
1. “IMPERVIA”, manufactured by Pella Corporation
2. Design Professional approved equal.
B. Window Types: Factory-assembled:
1. Fixed frame window.
2. Single hung with interior titling interior sash.
C. Frame Material: Duracast. 5-layer, pultruded-fiberglass material, reinforced with interlocking mat.
D. Frame:
1. Type: Block frame.
2. Interior and Exterior Frame: Pultruded, fiberglass composite with foam inserts.
3. Overall Frame Depth: 3-1/4 inches.
4. Nominal Wall Thickness of Fiberglass Members: 0.050 inch to 0.080 inch.
5. Frame Corners:
a. Mitered.
b. Joined and bonded with thermoset polyurethane adhesive, nylon corner lock, and mechanically fastened.
6. Frame can be installed with glazing stop on interior or exterior (unit can be flipped to install in either direction).
7. Jambs: Contain optional factory-drilled, counter-bored, installation screw holes.
8. Head and Sill: Contain optional factory-drilled, counter-bored, installation screw holes.

E. Glazing:
   1. Float Glass: ASTM C 1036, Quality 1.
   2. Type: Polyurethane reactive (PUR) hot-melt glazed, 1-inch thick, insulating glass, multi-layer Low-E coated with argon.

F. Insect Screens:
   1. Compliance: ASTM D3656 and SMA 1201
   2. Screen Cloth: Black vinyl-coated fiberglass, 18/16 mesh.
   3. Set in aluminum frame. Complete with necessary hardware.
   4. Screen Frame Color: Baked enamel, white color.

2.2 Hardware:

A. Single Hung Units:
   1. Balances: Galvanized steel block and tackle balances.
   2. Lock:
      a. Type: Self-aligning, cam-action lock.
      b. Windows 37 Inches Wide or Greater: Two (2) locks.
      c. Finish: Satin nickel.
   3. Tilt Latches:
      a. Glass reinforced Nylon 6
      b. Integrated into sash corner
      c. Finish is matte gray
   4. Lower Sash Lift: Integrated into checkrail.

2.3 Tolerances:

A. Windows shall accommodate the following opening tolerances:
   1. Vertical Dimensions Between High and Low Points: Plus 1/4-inch, minus 0 inch.
   2. Width Dimensions: Plus 1/4-inch, minus 0 inch.
   3. Building Columns or Masonry Openings: Plus or minus 1/4-inch from plumb.

2.4 Finish:

A. Exterior and Interior Duracast Finish: Factory-applied powder-coat paint, comply with AAMA 623.
   1. Color: White.

2.5 Installation Accessories:

A. Flashing/Sealant Tape: Pella SmartFlash.
   1. Aluminum-foil-backed butyl window and door flashing tape.
   2. Maximum Total Thickness: 0.013 inch.
   3. UV resistant.
   4. Verify sealant compatibility with sealant manufacturer.

B. Interior Insulating-Foam Sealant: Low-expansion, low-pressure polyurethane insulating window and door foam sealant.

C. Exterior Perimeter Sealant: “Pella Window and Door Installation Sealant” or equivalent high quality, multi-purpose sealant as specified in the joints sealant section.

D. Block Frame Installation Accessories: Vinyl installation fin with head drip flashing.

PART 3 - EXECUTION

3.1 Examination and Preparation:

A. Verify that rough openings are correctly sized and located.

B. Prepare opening to permit correct installation of frame and achieve continuity of air and vapor barrier seal.

3.2 Installation:

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

B. Install windows to be weather-tight.

C. Maintain alignment with adjacent work.

D. Secure assembly to framed openings, plumb and square, without distortion.

E. Integrate window system installation with exterior water-resistant barrier using flashing/sealant tape. Apply and integrate flashing/sealant tape with water-resistant barrier using watershed principles in accordance with window manufacturer's instructions.

F. Place interior seal around window perimeter to maintain continuity of building thermal and air barrier using insulating foam sealant.

G. Seal window to exterior wall cladding with sealant and related backing materials at perimeter of assembly.

3.3 Cleaning:

A. Clean window frames and glass in accordance with Division 1 requirements.

B. Do not use harsh cleaning materials or methods that would damage finish or glass.

C. Remove labels and visible markings.

D. Protect installed windows to ensure that, except for normal weathering, windows will be without damage or deterioration at time of substantial completion.

END OF SECTION

SECTION 08712 - DOOR HARDWARE

PART 1 - GENERAL

1.1 Section Includes:
- A. Hardware for aluminum, hollow metal and wood doors.
- B. Coordination of work with other Sections, including but not limited to the following:
  1. Furnish templates for door and frame hardware preparation.
  2. Furnish hardware for factory installation.

1.2 Submittals:
- A. Submit in accordance with General Requirements, Division 1.
- B. 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:

Category	**Specified**	**Scheduled**
Hinges	**Manufacturer A**	**Manufacturer B**
Locksets	**Manufacturer X**	**Manufacturer X**
Kick Plates	**Open**	**Manufacturer Z**

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

C. Product Data:
   1. Submit, in booklet form Manufacturers Catalog cut sheets of scheduled hardware.
   2. Submit product data with hardware schedule.

D. 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.

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

F. 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.

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

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 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.

1.5 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.

1.6 Warranty:

A. Provide manufacturer's warranties in accordance with General Requirements, Division 1, as follows:
   1. Continuous Hinges: Life time of building.
   2. Closers: Thirty (30) years.
   3. Exit Devices: Three (3) years.
   4. Locksets: Ten (10) years.

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

1.5 Maintenance Materials:

A. Deliver in accordance with General Requirements, Division 1.

B. Provide special wrenches, maintenance tools and accessories applicable to each different or special hardware component.

PART 2 - PRODUCTS

2.1 Hardware:

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

B. 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.

C. Hinges:
   1. Furnish hinges of class and size as listed in sets.
   2. Number used are Ives (IVE).
   3. Products of a BHMA member are acceptable.

D. Continuous Hinges:
   1. Aluminum, 6063-T6 alloy, anodized finish (cap on entire hinge painted if specified); manufacturer to template, uncut hinges non-handed, pinless assembly, three inter-locking extrusions, full height of door and frame, lubricated polyacetal thrust bearing; fasteners shall be 410 stainless steel plated and hardened. All hinge profiles to be manufactured to template bearing locations, with standard duty bearing configurations at 5-1/2 inch spacing with a minimum 16 bearings; and heavy duty at 2-9/16 inch spacing with a minimum of 32 bearings. Anodizing of material shall be done after fabrication of components so that all bearing slots are anodized.
   2. Length: One (1) inch less than door opening height. Fastener 12-24 x 1/2 inch #3 Phillips keen form stainless steel self tapping at aluminum and hollow metal doors, 12- 1/2 inch #3 Phillips, flathead full thread at wood doors.
   3. Furnish fire rated hinges “FR” at labeled openings.
   4. Numbers used are Ives.

a. For Wood and Hollow Metal Frames:
1) Ives 224HD
2) Equal products by Hager and Select will also be accepted.
b. For Aluminum Frames:
1) Ives 112HD
2) Equal products by Hager and Select will also be accepted.

E. Locksets and Latchsets – Heavy Duty Cylindrical Type:
1. Function numbers listed are Falcon.
2. Provide 2-3/4 inch backset.
3. 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 inch beyond door frame trim at single doors and have 7/8 inch lip to center at pairs of doors.
4. Locksets and Latchsets:
a. Schlage ND
5. Lockset Trim:
a. Schlage Sparta

F. Exit Devices: Shall comply with the following:
1. Exit devices shall be touchpad style, fabricated of brass, bronze, stainless steel, or aluminum, plated to standard architectural finishes to match balance of door hardware.
2. All exit devices shall incorporate a fluid damper, which decelerates touchpad on its return stroke and eliminates noise associated with exit device operation. Touchpad shall extend a minimum of one half of door width. All latchbolts to be deadlatching type, with a self-lubricating coating to reduce wear.
3. End caps will be sloped to deflect any impact from carts and they shall be flush with external mechanism case. End caps that overlap and project above the mechanism case are unacceptable. End caps shall utilize a two point attachment to 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 were 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 reset.

12. VonDuprin 98 Series: Series and function numbers as listed in sets.
13. Trim:
    a. As specified in sets.
    b. Levers to match lockset design where specified.

G. Electric Strike:
1. Electric strikes shall provide remote release of latchbolts. They shall be designed for use with type locks shown at each opening where required. Strikes will be UL listed for Burglary-Resistant Electric Door Strike and where required shall be UL listed as electric strikes for Fire Doors or Frames. Faceplates shall be stainless steel with finish as specified for each opening. Locking components shall be stainless steel to resist damage and abuse.
2. Solenoids shall be of continuous duty type for voltage specified. Plug connectors will be furnished. Strikes shall have an adjustable backbox to compensate for misalignment of door and frame.
3. Numbers used in sets are Von Duprin.
    a. Von Duprin 6000 Series

G. Push and Pull Hardware:
1. Push-Pull Units: One inch round rod. Push: Straight push bar. Pull: 90 degree offset, 12 inch centers. Attach top post of pull back to back with latch stile end of push bar, bottom post of pull and hinge stile end of push bar with end caps.
2. Pull, Offset: One inch round rod, 90 degree offset, 12 inch centers.
3. Manufacturer: Provide push and pull hardware from any member of BHMA.

H. Closers: Shall comply with the following:
1. Door closures shall have fully hydraulic, full rack and pinion action with a high strength cast iron cylinder. Cylinder body shall be 1-1/2 inch diameter and double heat treated pinion shall be 11/16 inch 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 full range of closer sizes and allow for reduced opening force for physically handicapped. Hydraulic regulation shall be by tamperproof, non-critical valves. Closer shall have separate adjustment for latch speed, general speed and backckeck.
4. All closers shall have solid forged steel 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 hardware schedule.

8. Acceptable manufacturers and types:
    a. LCN Series as listed in sets.

I. Overhead Holders and Stop:
1. Plastic end caps, hold open mechanisms and shock blocks are not allowed. End caps must be finished same as balance of unit.
2. Manufacture products using base material of Brass/Bronze for US3, US4 and US10B finished products and 300 Stainless Steel for US32 and US32D finished products.
3. Type, function and fasteners must be same as Glynn-Johnson specified. Size per manufacturer's selector chart.
    a. Glynn-Johnson

J. Kick Plates:
1. Furnish 0.050 inch thick, beveled four sides, countersunk fasteners, 10 inches high by door width less two (2) inches at single doors and less one (1) inch at pairs. Where glass or louvers prevent this height, supply with height equal to height of bottom rail less two (2) inches.
2. Any BHMA manufacturer's product meeting above is is acceptable.

K. Bumpers:
1. Wrought, forged or cast, approximately 2-1/2 inch diameter, convex or concave rubber center, concealed fasteners.
    a. Ives WS406/WS407 Series
    b. BHMA L02101

L. Wall Stops:
1. Length to exceed projection of all other hardware. Provide with threaded studs and expansion shields for masonry construction.
    a. Ives WS447
    b. BHMA L12011 or L12021

M. Wall Holders:
1. Products specified by series only; furnish strike length to exceed projection of all other hardware.
    a. Ives WS40
    b. Equal products of any BHMA manufacturer.

N. Thresholds:
1. 1/2 inch high by 5 inches wide. Cope at jambs.
2. Furnish full wall opening width when frames are recessed.
3. Cope in front of mullions when thresholds project beyond door faces.
4. Furnish with non-ferrous Stainless Steel screws and lead anchors.
    a. Zero as listed in sets.
    b. Equal by NGP or Reese.

O. Door Sweeps:
1. Surface Sweeps:
    a. Zero as listed in sets.
    b. Equal by NGP or Reese.

P. Weather Seal:
1. Apply to head and jamb stops.
2. Solid Bar stock all sides.
    a. Zero as listed in sets.
    b. Equal by NGP or Reese.

Q. Miscellaneous:

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

R. 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.**

2.2 Finishes:
A. Generally, Dull Chrome, US26D / BHMA 626. Provide finish for each item as indicated in Schedule at end of this Section.

2.3 Templates and Hardware Locations:
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.

2.4 Cylinders and Keying:
A. All cylinders for this project will be supplied by one supplier regardless of door type and location.
B. Finish Hardware supplier will meet with Architect and/or Owner to finalize keying requirements and obtain keying instructions in writing.
C. Provide a cylinder for all hardware components capable of being locked.
D. Provide cylinders master and grand mastered keyed to existing Schlage 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 construction period. When so directed and in the presence of the Owner's representative convert construction cores or keying to final system.
1. Supplier shall include cost of this service in his proposal.

PART 3 - EXECUTION

3.1 Examination and Preparation:
A. Verify that doors and frames are ready to receive work and dimensions are as instructed by the manufacturer.

3.2 Installation:
A. Install hardware in accordance with manufacturer's installation instructions and template dimensions. Attach all items of finish hardware to doors, frames, walls, etc. with fasteners furnished and required by manufacturer of item.
B. Provide blocking/reinforcement for all wall mounted hardware.

C. Reinforce hollow metal doors and frames and reinforce aluminum doors and frames will be drilled and tapped for machine screws.
D. Solid wood doors and frames; full threaded wood screws. Drill pilot holes before inserting screws.
E. Continuous gear hinges attached to hollow metal doors and frames and aluminum doors and frames; 12-24 x 1/2 inch #3 Phillips Keenform self-tapping. Use #13 or 3/16 inch drill for pilot.
F. Continuous gear hinges require continuous mortar guards of foam or cardboard 1/2 inch thick by frame height applied with construction adhesive.
G. Install weatherstrip 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 hardwre. Door closers will require special templating. Exit devices will required adjustment in backset.

3.3 Hardware Mounting Heights:
A. Dimensions are from finish floor to centerline of items.

1.	Hinges:	Door manufacturer's standard
2.	Flush Bolt Levers:	72 inches and 12 inches
3.	Levers:	Door Manufacturer’s standard
4.	Exit Device Touchbar:	Per template
5.	Deadlatch Cylinder:	43 inches
6.	Deadlock MS Cylinder:	43 inches
7.	Push/Pull Units:	42 inches to pull portion
8.	Offset Pulls:	Suitable for exit devices
9.	Push/Pulls:	42 inches
10.	Wall Stops/Holders:	At head

3.4 Final Adjustment and Inspection:
A. Inspect material furnished, its installation and adjustment and instruct the Owner’s personnel in adjustment, care and maintenance of hardware.
B. Locksets, closers and exit devices shall be inspected by a factory representative and adjusted after installation and after HVAC system is in operation, to insure correct installation and proper adjustment in hardware operation.
C. Representative shall prepare a written report stating compliance, and also recording locations and types of non-compliance.

3.5 Schedule:
A. The following schedule of hardware is intended as a guide and shall not be considered entirely inclusive. Should any particular door or item be omitted, provide said door or item with same hardware as required for similar purpose and location.

H-1 EACH OPENING TO HAVE Door 01

2 ea	Hinge	5BB1HW 4.5 X 4.5	652	IVE
1 ea	Electric Hinge	5BB1HW 4.5 X 4.5 CON TW4	652	IVE
1 ea	EL Storeroom Lock	ND80PDEL SPA CON 12V/24V DC	626	SCH

1 ea	Overhead Stop	100S	652	GLY
1 ea	Surface Closer	4011 MC	689	LCN
1 ea	Kick Plate	8402 10” X 2” LDW B-CS	630	IVE
1 set	Wire Harness	CON-6		SCH
1 ea	Access Control	(By Security Contractor)		
1 ea	Power Supply	PS902 900-2RS 120/240 VAC		VON

Presenting an authorized credential will unlock the outside lever to allow access. Free egress is always allowed. Coordinate system operation and component locations with the Owner, Architect and all related trades.

H-2 EACH OPENING TO HAVE Door 06

2 ea	Hinge	5BB1 4.5 X 4.5	652	IVE
1 ea	Electric Hinge	5BB1 4.5 X 4.5 CON TW4	652	IVE
1 ea	EU Storeroom Lock	ND80PDEU SPA CON 12V/24V DC	626	SCH
1 ea	Wall Stop	WS406/407CCV	630	IVE
1 ea	Wire Harness	CON-6		SCH
1 ea	Access Control	(By Security Contractor)		
1 ea	Power Supply	PS902 900-2RS 120/240 VAC		VON

Presenting an authorized credential will unlock the outside lever to allow access. Free egress is always allowed. Coordinate system operation and component locations with the Owner, Architect and all related trades.

H-3 EACH OPENING TO HAVE Door 101

1 ea	Continuous Hinge	112XY TWP CON	628	IVE
1 ea	Elec Panic Hardware	HD-QEL-33A-NL-OP-388 24 VDC	626	VON
1 ea	Rim Cylinder	20-022	626	SCH
1 ea	90 Deg Offset Pull	8190EZHD 12” O	630-316	IVE
1 ea	Overhead Stop	100S	630	GLY
1 ea	Surface Closer	4021 MC	689	LCN
1 ea	Mounting Plate	4020-18G	689	LCN
1 set	Weather Seal	(By Frame Manufacturer)		
1 ea	Door Sweep	39A	A	ZER
1 ea	Threshold	65A-223	A	ZER
1 ea	Access Control	(By Security Contractor)		
1 ea	Power Supply	PS902 900-2RS 120/240 VAC		VON

Presenting an authorized credential will retract the panic hardware latch to allow access. Free egress is always allowed. Coordinate system operation and component locations with the Owner, Architect and all related trades.

H-4 EACH OPENING TO HAVE Door 103

1 ea	Continuous Hinge	112XY TWP CON	628	IVE
1 ea	Elec Panic Hardware	HD-QEL-99-NL-OP-110MD 24 VDC	626	VON
1 ea	Rim Cylinder	20-022	626	SCH
1 ea	Recessed Pull	(By Door Manufacturer)		
1 ea	Overhead Stop	100S	630	GLY
1 ea	Surface Closer	4111 EDA MC	689	LCN
1 set	Weather Seal	(By Frame Manufacturer)		
1 ea	Door Sweep	39A	A	ZER
1 ea	Threshold	65A-223	A	ZER
1 ea	Access Control	(By Security Contractor)		
1 ea	Power Supply	PS902 900-2RS 120/240 VAC		VON

Presenting an authorized credential will retract the panic hardware latch to allow access. Free egress is always allowed. Coordinate system operation and component locations with the Owner, Architect and all related trades.

H-5 EACH OPENING TO HAVE Doors 104, 201 and 211

2 ea	Hinge	5BB1HW 4.5 X 4.5	652	IVE
1 ea	Electric Hinge	5BB1HW 4.5 X 4.5 CON TW4	652	IVE
1 ea	EL Storeroom Lock	ND80PDEL SPA CON 12V/24V DC	626	SCH
1 ea	Surface Closer	4011 MC	689	LCN
1 ea	Kick Plate	8402 10” X 2” LDW B-CS	630	IVE
1 ea	Wall Stop	WS406/407CCV	630	IVE
1 set	Wire Harness	CON-6		SCH
1 ea	Access Control	(By Security Contractor)		
1 ea	Power Supply	PS902 900-2RS 120/240 VAC		VON

Presenting an authorized credential will unlock the outside lever to allow access. Free egress is always allowed. Coordinate system operation and component locations with the Owner, Architect and all related trades.

H-6 EACH OPENING TO HAVE Door 105

3 ea	Hinge	5BB1HW 4.5 x 4.5	652	IVE
1 ea	Storeroom Lock	ND80P6D SPA	626	SCH
1 ea	Electric Strike	6400 FSE 12/24 VAC/VDC	630	VON
1 ea	Overhead Stop	90S	652	GLY
1 ea	Surface Closer	4011 MC	689	LCN
1 ea	Kick Plate	8400 10” X 2” LDW B-CS	630	IVE
1 ea	Access Control	(By Security Contractor)		
1 ea	Power Supply	PS902 900-2RS 120/240 VAC		VON

Presenting an authorized credential will energize the electric strike and allow access. Free egress is always allowed. Coordinate system operation ND component locations with the Owner, Architect and related trades.

H-7 EACH OPENING TO HAVE Door 111

2 ea	Hinge	5BB1 4.5 X 4.5	652	IVE
1 ea	Electric Hinge	5BB1 4.5 X 4.5 CON TW4	652	IVE
1 ea	EU Storeroom Lock	ND80PDEU SPA CON 12V/24V DC	626	SCH
1 ea	Surface Closer	4111 CUSH MC	689	LCN
1 ea	Kick Plate	8400 10” X 2” LDW B-CS	630	IVE
1 ea	Wire Harness	CON-6		SCH
1 ea	Access Control	(By Security Contractor)		
1 ea	Power Supply	PS902 900-2RS 120/240 VAC		VON

Presenting an authorized credential will unlock the outside lever to allow access. Free egress is always allowed. Coordinate system operation and component locations with the Owner, Architect and all related trades.

H-8 EACH OPENING TO HAVE Door 118

2 ea	Hinge	5BB1HW 4.5 X 4.5	652	IVE
1 ea	Electric Hinge	5BB1HW 4.5 X 4.5 CON TW4	652	IVE
1 ea	EU Storeroom Lock	ND80PDEU SPA CON 12V/24V DC	626	SCH
1 ea	Surface Closer	4011 MC	689	LCN
1 ea	Kick Plate	8402 10” X 2” LDW B-CS	630	IVE
1 ea	Wall Stop	WS406/407CCV	630	IVE
1 ea	Wire Harness	CON-6		SCH
1 ea	Access Control	(By Security Contractor)		
1 ea	Power Supply	PS902 900-2RS 120/240 VAC		VON

Presenting an authorized credential will unlock the outside lever to allow access. Free egress is always allowed. Coordinate system operation and component locations with the Owner, Architect and all related trades.

H-9 EACH OPENING TO HAVE Door 121

5 ea	Hinge	5BB1HW 4.5 X 4.5	652	IVE
1 ea	Electric Hinge	5BB1HW 4.5 X 4.5 CON TW4	652	IVE
1 ea	Panic Hardware	9927-DT-LBR	626	VON
1 ea	Elec Panic Hardware	HD-QEL-9927-NL-LBR 24 VDC	626	VON
1 ea	Rim Cylinder	20-022	626	SCH
2 ea	OH Stop & Holder	90H	652	GLY
2 ea	Surface Closer	4021 MC	689	LCN
2 set	Mounting Plate	4020-18G	689	LCN
2 ea	Kick Plate	8400 10” X 2” LDW B-CS	630	IVE
1 ea	Access Control	(By Security Contractor)		
1 ea	Power Supply	PS902 900-2RS 120/240 VAC		VON

Presenting an authorized credential will retract one panic hardware latch to allow access. Free egress is always allowed. Coordinate system operation and component locations with the Owner, Architect and all related trades.

H-10 EACH OPENING TO HAVE Door 122

1 ea	Electric Strike	6300 FSE 12/24 VAC/VDC	630	VON
1 ea	Access Control	(By Security Contractor)		
1 ea	Power Supply	PS902 900-2RS 120/240 VAC		VON
		Balance of existing hardware to remain		

Presenting an authorized credential will energize the electric strike and allow access. Free egress is always allowed. Coordinate system operation ND component locations with the Owner, Architect and related trades. Verify existing hardware and provide electric strike type as required.

H-11 EACH OPENING TO HAVE Door 05

3 ea	Hinge	5BB1 4.5 X 4.5	652	IVE
1 ea	Storeroom Lock	ND80P6D SPA	626	SCH
1 ea	Surface Closer	4011 MC	689	LCN
1 ea	Kick Plate	8402 10” X 2” LDW B-CS	630	IVE
1 ea	Wall Stop	WS406/407CCV	630	IVE

H-12 EACH OPENING TO HAVE Doors 09, 112, 114

3 ea	Hinge	5BB1HW 4.5 X 4.5	652	IVE
1 ea	Storeroom Lock	ND80P6D SPA	626	IVE
1 ea	Surface Closer	4111 EDA MC	689	LCN
1 ea	Kick Plate	8402 10” X 2” LDW B-CS	630	IVE
1 ea	Wall Stop	WS406/407CCV	630	IVE

H-13 EACH OPENING TO HAVE Door 119

3 ea	Hinge	5BB1 4.5 X 4.5	652	IVE
1 ea	Panic Hardware	CDSI-99-NL	626	VON
1 ea	Mortise Cylinder	20-001	626	SCH
1 ea	Rim Cylinder	20-022	626	SCH
1 ea	Surface Closer	4111 CUSH MC	689	LCN
1 ea	Kick Plate	8402 10” X 2” LDW B-CS	630	IVE

H-14 EACH OPENING TO HAVE Door 102

3 ea	Continuous Hinge	112XY	628	IVE
1 ea	Push/Pull Bar	9190EZHD-12”-NO	630-316	IVE
1 ea	Overhead Stop	100S	630	GLY
1 ea	Surface Closer	4021 MC	689	LCN
1 ea	Mounting Plate	4020-18G	689	LCN

H-15 EACH OPENING TO HAVE Doors 02, 202, 203

3 ea	Hinge	5BB1 4.5 X 4.5	652	IVE
1 ea	Storeroom Lock	ND80P6D SPA	626	SCH
1 ea	Wall Stop	WS406/407CCV	630	IVE

H-16 EACH OPENING TO HAVE Door 03

3 ea	Hinge	5BB1 4.5 X 4.5	652	IVE
1 ea	Privacy w/Coin Turn	L9044 17B 09-544 L283-722	626	SCH
1 ea	Surface Closer	4111 CUSH MC	689	LCN
1 ea	Kick Plate	8400 10” X 2” LDW B-CS	630	IVE

H-17 EACH OPENING TO HAVE Door 04

3 ea	Hinge	5BB1 4.5 X 4.5	652	IVE
1 ea	Privacy w/Coin Turn	L9044 17B 09-544 L283-722	626	SCH
1 ea	Overhead Stop	90S	652	GLY
1 ea	Surface Closer	4011 MC	689	LCN
1 ea	Kick Plate	8400 10” X 2” LDW B-CS	630	IVE

H-18 EACH OPENING TO HAVE Doors 07, 08, 107

3 ea	Hinge	5BB1 4.5 X 4.5	652	IVE
1 ea	Storeroom Lock	ND80P6D SPA	626	SCH
1 ea	Surface Closer	4011 MC	689	LCN
1 ea	Kick Plate	8400 10” X 2” LDW B-CS	630	IVE
1 ea	Wall Stop	WS406/407CCV	630	IVE

H-19 EACH OPENING TO HAVE Door 208

1 ea	Continuous Hinge	112XY	628	IVE
1 ea	DBL CYL Store w/DB	L9466P 17B	626	SCH
1 ea	OH Stop & Holder	100H	630	GLY
1 ea	Surface Closer	4111 EDA MC	689	LCN
1 set	Weather Seal	(By Frame Manufacturer)		
1 ea	Door Sweep	39A	A	ZER
1 ea	Threshold	65A-223	A	ZER

H-20 EACH OPENING TO HAVE Door 120

6 ea	Hinge	5BB1 4.5 X 4.5 NRP	652	IVE
2 ea	Roller Latch	RL32	626	IVE
2 ea	Single Dummy Trim	ND170 SPA	626	SCH
2 ea	Overhead Stop	90S	652	GLY

H-21 EACH OPENING TO HAVE Doors 106 and 210

3 ea	Hinge	5BB1 4.5 X 4.5	652	IVE
1 ea	Storeroom Lock	ND80P6D SPA	626	SCH
1 ea	Overhead Stop	90S	652	GLY

H-22 EACH OPENING TO HAVE Doors 108, 113, 115, 116, 117 204, 205 and 206

3 ea	Hinge	5BB1 4.5 X 4.5	652	IVE
1 ea	Entrance/Office Lock	ND50P6D SPA	626	SCH
1 ea	Wall Stop	WS406/407CCV	630	IVE

H-23 EACH OPENING TO HAVE Doors 109, 110 and 209

3 ea	Hinge	5BB1 4.5 X 4.5	652	IVE
1 ea	Privacy w/Coin Turn	L9044 17B 09-544 L283-722	626	SCH
1 ea	Surface Closer	4011 MC	689	LCN
1 ea	Kick Plate	8400 10” X 2” LDW B-CS	630	IVE
1 ea	Wall Stop	WS447	626	IVE

H-24 EACH OPENING TO HAVE Door 207

3 ea	Hinge	5BB1 4.5 X 4.5	652	IVE
1 ea	Push Plate	8200 4” X 16”	630	IVE
1 ea	Pull Plate	8302 8” 4” X 16”	630	IVE
1 ea	Surface Closer	4011 MC	689	LCN
1 ea	Kick Plate	8400 10” X 2” LDW B-CS	630	IVE
1 ea	Wall Stop	WS406/407CCV	630	IVE

END OF SECTION

SECTION 08800 - GLAZING

PART 1 - GENERAL

1.1 Section Includes:
- A. Glass and glazing for, but not limited to the following:
  1. Hollow metal and aluminum work.
  2. Glazed wall assemblies.
  3. Door lights.

1.2 Section Does Not Include:
- A. Glazing items specified in other Sections, including but not limited to the following:
  1. Factory assembled and glazed window units.

1.3 Submittals:
- A. Submit in accordance with General Requirements, Division 1.
- B. Product Data: Provide physical and environmental characteristics, size limitations, and special installation requirements.
- C. Samples: Submit two samples of each, 12 x 12 inch in size, illustrating tinted glass coloration and insulated glass unit construction.

1.4 Quality Assurance:
- A. Perform glazing installation Work in accordance with the following:
  1. FGMA - Glazing Manual and Sealant Manual.
  2. SIGMA
  3. Laminators Safety Glass Association - Standard Manual.

1.5 Warranty:
- A. Provide manufacturer's ten (10) year warranty in accordance with General Requirements, Division 1, for the following items:
  1. Insulated Glass Units: Include coverage of seal failure, interpane dusting or misting, and replacement of same.
  2. Low E Glass: Include coverage of coatings against pealing and defects due to installation conditions.

PART 2 - PRODUCTS

2.1 Flat Glass Materials:
- A. Float Glass: Clear, 1/4 inch thick.
- B. Safety Glass: Clear; fully tempered or laminated with plastic interlayer; conforming to ANSI Z97.1; 1/4 inch thick.
- C. Tinted Glass: Float and safety type, light reducing; 1/4 inch thick; equal to “GRAY”, manufactured by Vitro Architectural Glass, formerly PPG Industries.
- D. Low E Glass: Float and safety type, clear, coating on inner surface; 1/4 inch thick; equal to "SUNGATE 500" manufactured by Vitro Architectural Glass, formerly PPG Industries, Inc.

2.2 Sealed Insulating Glass Units:

A. Insulated Glass Units: Double pane with silicone sealant edge seal; colored metal spacer with fused or bent corners; interpane space purged dry hermetic air; conforming to the following:
   1. Total Unit Thickness: One (1) inch.
   2. Outer Pane: Tinted glass; safety type where required.
   3. Inner Pane: Low E glass: safety type where required.

2.3 Glazing Compounds:

A. Modified Oil: Non-hardening, knife grade consistency; grey color.
B. Butyl Sealant: Single Component; Shore A hardness of 10-20, black color; non-skinning.
C. Acrylic Sealant: Single Component, solvent curing, cured Shore A hardness of 15-25; non-bleeding.
D. Polysulphide Sealant: Two component, chemical curing, non-sagging type; cured Shore A hardness of 15-25.
E. Polyurethane Sealant: Single component, chemical curing, non-staining, non-bleeding, non-sagging type, Shore A hardness range of 20 to 35.
F. Silicone Sealant: Single component, chemical solvent curing; capable of water immersion without loss of properties; non-bleeding, non-staining; cured Shore A hardness of 15-25.

2.4 Glazing Accessories:

A. Setting Blocks: Neoprene or EPDM; 80 - 90 Shore A durometer hardness.
B. Glass Spacers: Neoprene; 50 - 60 Shore A durometer hardness, self adhesive on one face.
C. Glazing Tape: Fabricator may use either of the following:
   1. Preformed butyl compound with integral resilient tube spacing device; black color.
   2. Closed cell polyvinyl chloride foam, maximum water absorption by volume of 2 percent, designed for compression of 25 percent to effect an air and vapor seal.
D. Glazing Splines: Resilient polyvinyl chloride extruded shape to suit glazing channel retaining slot; black color.
E. Glazing Clips: Manufacturer's standard type.

PART 3 - EXECUTION

3.1 Examination and Preparation:

A. Verify that openings for glazing are correctly sized, within tolerance, and glazing channels or recesses are clean, free of obstructions, and ready to receive glazing.
B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.

3.2 Exterior - Dry Method (Preformed Glazing):

A. Cut glazing tape or spline to length; install on glazing pane. Seal corners with butyl sealant.
B. Place setting blocks at 1/4 points.

C. Rest glazing on setting blocks and push against fixed stop with sufficient pressure to attain full contact.
D. Install removable stops without displacing glazing spline. Exert pressure for full continuous contact.
E. Trim protruding tape edge.

3.3 Exterior - Wet/Dry Method (Preformed Tape and Sealant):
A. Cut glazing tape to length and set against permanent stops. Seal corners with butyl sealant.
B. Apply heel bead of butyl sealant along intersection of permanent stop with frame ensuring full perimeter seal between glass and frame to complete the continuity of the air and vapor seal.
C. Place setting blocks at 1/4 points.
D. Rest glazing on setting blocks and push against tape and heel bead of sealant to attain full contact at perimeter of pane or glass unit.
E. Install removable stops, with spacer strips inserted between glazing and applied stops, 1/4 inch below sight line. Place glazing tape on glazing pane or unit with tape flush with sight line.
F. Fill gap between glazing and stop with sealant to depth equal to bite of frame on glazing, but not more than 3/8 inch below sight line.
G. Apply cap bead of sealant along void between the stop and the glazing, to uniform line, flush with sight line. Tool or wipe sealant surface smooth.

3.4 Interior - Dry Method (Tape and Tape):
A. Cut glazing tape to length and set against permanent stops, projecting 1/16 inch above sight line.
B. Place setting blocks at 1/4 points with edge block no more than 6 inches from corners.
C. Rest glazing on setting blocks and push against tape for full contact at perimeter of pane or unit.
D. Place glazing tape on free perimeter of glazing in same manner described above.
E. Install removable stop without displacement of tape. Exert pressure on tape for full continuous contact.
F. Knife trim protruding tape.

3.5 Interior - Wet/Dry Method (Tape and Sealant):
A. Cut glazing tape to length and install against permanent stops, projecting 1/16 inch above sight line.
B. Place setting blocks at 1/4 points with edge block no more than 6 inches from corners.
C. Rest glazing on setting blocks and push against tape to ensure full contact at perimeter of pane or unit.
D. Install removable stops with spacer shims inserted between glazing and applied stops at 24 inch intervals, 1/4 inch below sight line.
E. Fill gaps between pane and applied stop with sealant to depth equal to bite on glazing, to uniform and level line.
F. Trim protruding tape edge.

3.6 Interior - Wet Method (Compound and Compound):

A. Install glazing resting on setting blocks. Install applied stop and center pane by use of spacer shims at 24 inch centers, kept 1/4 inch below sight line.

B. Locate and secure glazing pane using spring wire clips or glazers' clips.

C. Fill gaps between glazing and stops with glazing compound until flush with sight line. Tool surface to straight line.

3.7 Cleaning:

A. Remove glazing materials from finish surfaces.

B. Remove labels after Work is complete.

C. Clean glass and mirrors.

3.8 Schedule:

A. Interior Vestibule Door Lights and Sidelights: Safety glass, single pane.

B. Interior Door Lights and Sidelights - Non-rated: Safety glass, single pane.

C. Interior Vision Windows - Non-rated:

1. Lights Within 24 inches of Door or 18 inches from Floor Surface: Safety glass, single pane.
2. Lights Over 24 inches from Door or Over 18 inches of Floor Surface: Float glass, single pane.

D. Exterior Door Lights: Clear safety glass, single pane.

E. Exterior Door Sidelights and Transoms: Insulating units:

1. Outer Pane: Clear safety glass.
2. Inner Pane: Low E safety glass.

F. Front Exterior Storefronts: Insulating units:

1. Outer Pane: Tinted safety glass.
2. Inner Pane: Low E safety glass.

END OF SECTION

SECTION 09250 - GYPSUM BOARD

PART 1 - GENERAL

1.1 Section Includes:
- A. Gypsum board on steel stud and wood framing with taped and sanded joint treatment.

1.2 Quality Assurance:
- A. Perform Work in accordance with the following:
  1. ASTM C840.
  2. GA-216 - Recommended Specifications for the Application and Finishing of Gypsum Board.
  3. GA-600 - Fire Resistance Design Manual.
  4. Underwriters Laboratories (UL) - Fire Resistance Directory.
- B. Conform to applicable code, fire rated assembly design numbers and fire resistance ratings as indicated on Drawings.

1.3 Environmental Requirements:
- A. Maintain minimum ambient temperature of 55 degrees F for 48 hours before, during and after gypsum board installation is complete.
- B. Provide adequate ventilation and humidity control in areas of installation.

PART 2 - PRODUCTS

2.1 Gypsum Board:
- A. Acceptable Manufacturers:
  1. Domtar Gypsum
  2. Gold Bond - National Gypsum Company
  3. United States Gypsum Company
- B. Gypsum Board Types: Maximum permissible length; ends square cut, tapered edges; unless noted otherwise as follows:
  1. Standard Gypsum Board: ASTM C36; mold/mildew/moisture resistant type; of the following thicknesses:
     a. Walls and Bulkheads: 5/8 inch thick.
     b. Bottom of Ceiling Joist: 1/2 inch thick; sag resistance type.
  2. Fire Rated Gypsum Board: ASTM C36, Type X fire resistive, UL rated; 5/8 inch thick, mold/mildew/moisture resistant type.
  3. Moisture Resistant Gypsum Board: ASTM C630.

2.2 Accessories:
- A. Acoustical Insulation: As specified in Building Insulation, Section 07210.
- B. Acoustical Sealant: Water based, non-hardening, non-skinning, for use in conjunction with gypsum board.
- C. Corner Beads: Metal, galvanized.
- D. Edge Trim: GA 216, Type LC, J shape exposed reveal bead.
- E. Joint Materials: ASTM C475, reinforcing tape, joint compound, adhesive, and

water.

F. Fasteners: ASTM C1002, Type W screws for wood framing; bugle-shaped heads.

G. Adhesive: ASTM C557, solvent or rubber based type recommended by gypsum board manufacturer.

PART 3 - EXECUTION

3.1 Installation - Acoustical Accessories:

A. Place acoustical insulation in partitions indicated, tight within spaces, around cut openings, behind and around electrical and mechanical items within or behind partitions, and tight to items passing through partitions.

B. Install acoustical sealant within partitions in accordance with manufacturer's installation instructions.

3.2 Installation - Gypsum Board:

A. Install gypsum board in accordance with GA-216 and manufacturer's installation instructions.

B. Fasten gypsum board to furring or framing with screws.

C. Place control joints consistent with lines of building spaces as indicated on Drawings.

D. Place corner beads at external corners. Use longest practical length. Place edge trim where gypsum board abuts dissimilar materials.

E. Maintain surface flatness with maximum of 1/8 inch in 10 feet in any direction.

3.3 Control Joints:

A. Place control joints consistent with lines of building spaces and as indicated on Drawings.

B. Where not indicated, gypsum panels shall be isolated with control joints in accordance with the following:

1. Partition, furring or column abuts a structural element (except floors) or dissimilar wall or ceiling.
2. Ceiling or soffit abuts a structural element, dissimilar wall, partition or other vertical penetration.
3. Construction changes within plane of partition or ceiling.
4. Partition or furring runs exceeding 30 feet in length.
5. Ceiling dimensions exceed 50 feet in either direction with perimeter relief, or 30 feet without relief.

3.4 Joint Treatment:

A. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.

B. Feather coats onto adjoining surfaces so that camber is maximum 1/16 inch.

C. Erect in accordance with manufacturer's installation instructions.

END OF SECTION

SECTION 09300 - TILE

PART 1 - GENERAL

1.1 Section Includes:
- A. Non-glazed porcelain ceramic tile using the thinset application method for use at the following:
  1. Floor finish.
  2. Drinking fountain wall wainscot.

1.2 Submittals:
- A. Submit in accordance with General Requirements, Division 1.
- B. Product Data: Provide material specifications, characteristics, and instructions for using adhesives and grouts.
- C. Samples: Submit actual tiles illustrating pattern, full range of colors available and color variations for each type of tile.
- D. Maintenance Instructions: Include recommended cleaning methods, cleaning materials and stain removal methods.

1.3 Quality Assurance:
- A. Perform Work in accordance with the following:
  1. TCA Handbook for Ceramic Tile Installation.
  2. ANSI A108.1 - Installation of Ceramic Tile with Portland Cement.
  3. ANSI A108.4 - Installation of Ceramic Tile with Water Resistant Organic Adhesives.
  4. ANSI A108.5 - Installation of Ceramic Tile with Dry Set or Latex Portland Cement Mortar.

1.4 Environmental Requirements:
- A. Maintain minimum ambient temperature of 50 degrees F at tile installation area before, during and for 7 days after tile installation is complete.

PART 2 - PRODUCTS

2.1 Porcelain Paver/Tile Materials:
- A. Acceptable Products:
  1. "SIMPLY MODERN", manufactured by Stonepeak Ceramics
  2. Design Professional approved equal.
- B. Porcelain Paver/Tile: ANSI/TCA 137.1; conforming to the following:
  1. Size: 12 x 24 inch.
  2. Surface Finish: Unglazed; matte, with square edge.
  3. Color: As selected.
- C. Base: Porcelain tile, 3 x 12 inch bullnose; color to match floor tile.

2.2 Setting Materials:
- A. Thinset Mortar Materials: ANSI/TCA A118.4, Portland cement, sand, latex additive, and water; equal to “LATICRETE 253 GOLD”, manufactured by

Laticrete International, Inc.

B. Waterproofing Membrane: Cold applied, liquid rubber and reinforcing fabric; equal to "LATICRETE 9235 WATERPROOF MEMBRANE" manufactured by Laticrete International, Inc.

2.3 Grout Materials:

A. Colored Grout: Cementitious type; resistant to shrinking, stain causing mold and mildew; color as selected by Owner; equal to "LATICRETE PERMACOLOR GROUNT", manufactured by Laticrete International, Inc.

B. Sealant: Silicone sealant, moisture and bacteria resistant type, as recommended by tile manufacturer.

C. Mix and proportion grout materials in accordance with manufacturer's instructions and TCA Handbook for Ceramic Tile Installation.

2.5 Accessories:

A. Floor Edging: Brass; upstand leg height to match tile thickness; equal to trims manufactured by Schluter Systems Inc.; of the following types:

1. Tile to Resilient Flooring: RENO-U.
2. Outside Edge of Wall Tile: RONDEC.

B. Joint (Crack) Isolation Membrane: Composite sheet membrane of chlorinated polyethylene (CPE) laminated to non-woven fabric on both sides; nominal thickness of 0.030 inch; equal to "NOBLESEAL CIS" manufactured by The Nobel Company.

PART 3 - EXECUTION

3.1 Examination and Preparation:

A. Verify substrate surfaces are smooth and flat with maximum variation of 1/8 inch in 10 feet.

B. Seal substrate surface cracks with filler.

C. Vacuum clean substrates.

3.2 Installation:

A. Install adhesive, tile and grout in accordance with manufacturer's installation instructions and to TCA Handbook for Ceramic Tile Installation methods.

B. Lay tile and accessories to pattern indicated on Drawings

C. Accurately cut and fit tile tight to penetrations, fixtures and drains. Form corners and bases neatly. Align floor, base and wall joints.

D. Provide edge strip where exposed edge of tile meets carpet, or resilient flooring.

E. Grout tile joints. Make joints watertight, without voids, cracks, excess mortar or excess grout.

F. Apply sealant to junction of tile and dissimilar materials and at junction of dissimilar planes.

G. After completion of grouting, clean tile surfaces of foreign matter.

H. Protect finished installation for minimum 3 days.

END OF SECTION

SECTION 09511 - SUSPENDED ACOUSTICAL CEILINGS

PART 1 - GENERAL

1.1 Section Includes:
- A. Suspended metal grid ceiling system.
- B. Acoustical panels.

1.2 Submittals:
- A. Submit in accordance with General Requirements, Division 1.
- B. Product Data: Provide data on grid and acoustical unit materials, product characteristics, performance, limitation criteria, and special installation instructions when applicable.
- C. Certifications: Manufacturer shall certify that products meet or exceed specified fire resistance ratings.

1.3 Environmental Requirements:
- A. Do not install acoustical ceilings until dust generating activities have terminated and wet work is completed and dry.
- B. Maintain minimum ambient temperature of 60 degrees F, and maximum relative humidity of 70 percent before, during, and after ceiling installation is complete.

PART 2 - PRODUCTS

2.1 Suspension System Materials:
- A. Acceptable Products:
  1. "PRELUDE", manufactured by Armstrong World Industries, Inc.
  2. "500 SYSTEM", manufactured by Chicago Metallic Corporation
  3. "DX GRID", manufactured by USG Interiors, Inc. - Donn
  4. Design Professional approved equal.
- B. Grid: ASTM C635, components die cut and interlocking; conforming to the following:
  1. Non-fire rated.
  2. Duty Classification: Intermediate.
  3. Profile: Exposed Tee.
  4. Face Dimension: 15/16 inch.
  5. Material: Cold rolled galvanized steel.
  6. Finish: Polyester paint; white color.
- C. Accessories: Stabilizer bars, clips, splices, edge moldings and hold down clips required for suspended grid system.
- D. Support Channels and Hangers: Galvanized steel; size and type to suit application.

2.2 Acoustic Unit Materials:
- A. Acceptable Products:
  1. "FINE FISSURED", manufactured by Armstrong World Industries, Inc.
  2. "FINE FISSURED", manufactured by CertainTeed

3. "RADAR ClimaPlus", manufactured by USG Interiors, Inc.
4. Design Professional approved equal.

B. Acoustic Panels: Conforming to the following:
1. Size: 24 x 24 inches.
2. Thickness: 5/8 inches.
3. Composition: Mineral.
4. Sag/Humidity Resistance: High humidity and sag resistance
5. Light Reflectance: 82%
6. NRC Range: .55
7. STC Range: 30 to 39.
8. Fire Hazard Classification: Class A.
9. Edge: Angled Tegular
10. Surface Color: White.
11. Surface Finish: Factory applied vinyl latex paint.

PART 3 - EXECUTION

3.1 Inspection:
A. Verify that building conditions are ready to receive work.
B. Verify that layout of hangers will not interfere with other work.

3.2 Installation - Suspension System:
A. Install system in accordance with ASTM C636 and manufacturer's installation instructions.
B. Install system capable of supporting imposed loads to a maximum deflection of 1/360.
C. Hang system independent of walls, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.
D. Locate system on room axis according to reflected ceiling plan.
E. Support fixture loads by supplementary hangers located within 6 inches of each corner; or support components independently.
F. Do not eccentrically load system or produce rotation of runners.
G. Install edge molding at intersection of ceiling and vertical surfaces, using longest practical lengths. Miter corners.
H. Maintain grid surface plane flatness with maximum variations of 1/8 inch in 10 feet in any direction.

3.3 Installation - Acoustical Units:
A. Install acoustical units level, free from damage, twist, warp or dents.
B. Lay directional patterned units one way with pattern parallel to shortest room axis. Fit border neatly against abutting surfaces.
C. Install hold-down clips to retain panels tight to grid system within 20 feet of an exterior door.

END OF SECTION

SECTION 09520 - ACOUSTICAL PANELS

PART 1 - GENERAL

1.1 Section Includes:
- A. Acoustical ceiling panels, fabric wrapped.
- B. Mounting hardware and accessories.

1.2 System Description:
- A. Panel Size: Approximately 9'-10" by 10'-10" made up of four (4) equal panels.
- B. Core Material: Glass fiber.
- C. Panel Facing: Fabric.
- D. Edge Treatment: Chemically hardened; all edges wrapped.
- E. Corners: Square.
- F. Edge Detail: Square and Half bevel.
- G. Noise Reduction Coefficient: 0.090
- H. Mounting Method: Per manufacturer's recommendation for attachment to existing lath and plaster ceiling.

1.3 Submittals:
- A. Submit in accordance with General Requirements, Division 1.
- B. Product Data: Provide data on acoustical panel materials, product characteristics, performance, limitation criteria, and installation instructions.
- C. Samples: Submit sample charts of panel facing material illustrating texture and full range of colors available.
- D. Certifications: Manufacturer shall certify that products meet or exceed specified fire resistance rating.

1.4 Environmental Requirements:
- A. Do not install acoustical panels until building is enclosed, HVAC systems are installed and operable, dust generating activities have terminated and wet work is complete and dry.
- B. Maintain minimum ambient temperature of 60 degrees F, and maximum relative humidity of 80 percent before, during and after wall panel installation is complete.

1.5 Allowances:
- A. Cash Allowance: Include in accordance with General Requirements, Division 1.
- B. Allowance is to cover cost of fabric panel facing only. Panel fabrication and Installation is included in this Section and is part of the Base Bid.
- C. Cash Allowance: $24.00 per square yard.

PART 2 - PRODUCTS

2.1 Materials:
- A. Acceptable Products:
  1. Conwed - Respond
  2. ESSI Acoustical Products Company

3. Integrated Interiors
4. Metal Building Interior Products Company
5. Design Professional approved equal.

B. Core: Glass fiber, minimum 7 lbs per cubic foot density with 1/8 inch thick, 16-20 lbs per cubic foot glass fiber board laminated to front.

C. Panel Facing: Polyester fabric; Class A flame/smoke rating; color as selected by Design Professional from manufacturer's standards.

D. Mounting Adhesive: Type recommended by panel manufacturer for substrate present.

PART 3 - EXECUTION

3.1 Examination and Preparation:

A. Verify that surfaces and building conditions are ready to receive work.

3.2 Installation:

A. Install acoustical panels in accordance with manufacturer's installation instructions.

B. Secure panels to substrate, plumb, free from damage, warp or dents.

C. Fit panels neatly against abutting surfaces. Butt panels tight, without gaps at joints.

D. Install adjacent panels in same plane.

END OF SECTION

SECTION 09650 - RESILIENT FLOORING

PART 1 - GENERAL

1.1 Section Includes:
- A. Resilient tile flooring.
- B. Resilient wall base, standard and contours profiled types.
- C. Stair treads and tiles on landings.

1.2 Submittals:
- A. Submit in accordance with General Requirements, Division 1.
- B. Samples: Submit wall base and flooring units, minimum 3 x 3 inches in size, illustrating full range of colors and patterns available.

1.3 Environmental Requirements:
- A. Maintain minimum ambient temperature of 70 degrees F at flooring installation area for 48 hours before, during, and after flooring installation is complete.
- B. Allow flooring material to reach equal temperature as area.

1.4 Maintenance Materials:
- A. Deliver in accordance with General Requirements, Division 1.
- B. Provide 25 square feet of each color and pattern of flooring material selected.
- C. Provide minimum 8 lineal feet of each color base material selected.

1.5 Warranty:
- A. Provide the following manufacturer's warranties in accordance with General Requirements, Division 1.
  1. LVT Resilient Plank: 15 year commercial limited warranty.
  2. All Other Products: Manufacturer’s standard warranty.

PART 2 - PRODUCTS

2.1 Vinyl Composition Tile Materials:
- A. Acceptable Products:
  1. "IMPERIAL TEXTURE", manufactured by Armstrong World Industries
  2 "ALTERNATIVES", manufactured by Congoleum Commercial Flooring
  3. "CORTINA", manufactured by Tarkett Commercial Flooring
  4. Design Professional approved equal.
- B. Vinyl Composition Tile: FS SS-T-312B, Type IV, Composition 1; 12 x 12 inch size, 1/8 inch thick; color and pattern as selected by Design Professional.

2.2 LVT Resilient Plank Materials:
- A. Acceptable Products:
  1. "ANEW Style / I543V", manufactured by Patcraft
  2. Design Professional approved equal.
- B. Construction: ASTM F1700, Class III Printed film vinyl plank, Type B (embossed); 7.75 inches wide by 48 inches long with 0.020 inch wear layer

thickness and total thickness of 0.197 inches; square edge; glue down installation; meeting the following:
1. Static Load: ASTM F970, passes Modified 1,000 psi
2. Radiant Flux: ASTM E648, Class 1
3. Smoke Density: ASTM E662; less than 450

C. Adhesive: “LokWorx+Resilient/4151/S150”, as recommended by LVT plank manufacturer.

2.3 Wall Base Materials:

A. Acceptable Manufacturers:
1. Johnsonite
2. Mercer Products Company, Inc.
3. Roppe Corporation
4. VPI, Floor Product Division
5. Design Professional approved equal.

B. Vinyl Wall Base: FS SS-W-40a, Type II; vinyl, 4 inches and 6 inches high, 1/8 inch thick; top set coved toe; colors as selected by Design Professional.

2.4 Stair Covering Materials:

A. Acceptable Manufacturers:
1. Flexco Company
2. Johnsonite
3. Mercer Products Company, Inc.
4. Roppe Corporation
5. Design Professional approved equal.

B. Stair Treads: FS RR-T-650C, Composition A, Type 2; rubber, nominal 1/4 inch thick, width and depth of stair tread, square nose; raised square design; color as selected by Design Professional.

C. Rubber Tile (Stair Landings): Composition, profile and color to match stair treads.

2.5 Accessories / Adhesives / Sealers:

A. Sub-Floor Filler: White premix latex type, recommended by resilient flooring manufacturer.

B. Primers and Adhesives: Waterproof type, recommended by resilient flooring manufacturer for sub-floor present; epoxy type for use in kitchen, toilet rooms, vestibules and other "wet" areas.

C. Edge Strips: Same material as flooring; color as selected by Design Professional.

2.6 Profiled Wall Base System Materials:

A. Acceptable Products:
1. "novel #45 PV7045", manufactured by Roppe Corporation
2. Design Professional approved equal.

B. Contours Wall Base: ASTM F1861, Type TP (rubber, thermoplastic), Group 2, Style A&B; 7-3/4 inches high, 1/4 inches thick; color as selected by Design Professional.

C. Adhesives: Products provided by manufacturer as follows:
1. Excelsior WB-600 Acrylic Wall Base Adhesive

2. Excelsior C-630 Contact Adhesive

D. Accessories: Micro Corners, inside and outside corners.

E. Maintenance Materials: Excelsior NC-900, All-Purpose neutral pH cleaner furnished by manufacturer.

PART 3 - EXECUTION

3.1 Examination and Preparation:

A. Verify substrate surfaces are smooth and flat with maximum variation of 1/8 inch in 10 feet.

B. Verify concrete floors are dry to maximum 7 percent moisture content, and exhibit negative alkalinity, carbonization, and dusting.

C. Remove substrate ridges and bumps. Fill low spots, cracks, joints, holes and other defects with sub-floor filler.

D. Vacuum clean substrate.

E. Apply primer were recommended by resilient flooring manufacturer.

3.2 Installation - Flooring:

A. Open floor tile cartons and mix tile to eliminate shade variations from occurring within any one area.

B. Start flooring material layout in center of room unless required otherwise by Design Professional.

C. Spread adhesive uniformly over entire substrate and set flooring in place. Press with heavy roller to ensure full adhesion. Ensure entire perimeter edge is fully adhered to substrate.

D. Lay tile flooring with joints and seams parallel to building lines, unless indicated otherwise on Drawings. Install with minimum 1/2 inch full tile size at room or area perimeter, with pattern grain parallel with width of room for all units.

E. Terminate flooring at centerline of door openings where adjacent floor finish is dissimilar. Termination shall be located under door in closed position.

F. Install edge strips at unprotected or exposed edges where flooring terminates.

G. Scribe flooring to walls, columns, cabinets, floor outlets and other appurtenances to produce tight joints.

3.3 Installation - Wall Base:

A. Fit joints tight and vertical. Scribe and fit to door frames and other obstructions.

B. Miter internal corners. No joints shall be closer than 24 inches to corner.

C. Adhere base tight to wall and floor surfaces.

D. Install straight and level to variation of plus or minus 1/8 inch in 10 feet.

3.4 Cleaning:

A. Remove excess adhesive from surfaces without damage.

B. Clean floor and base surfaces according to manufacturer's instructions.

END OF SECTION

SECTION 09688 - CARPET-ADHERED

PART 1 - GENERAL

1.1 Section Includes:
- A. Carpet and accessories.
- B. Coordination with Resilient Flooring, Section 09650 for vinyl base installation.

1.2 Submittals:
- A. Submit in accordance with General Requirements, Division 1.
- B. Samples: Submit carpet samples minimum 3 x 4 inches in size illustrating full range of colors and patterns for each carpet material specified.

1.3 Environmental Requirements:
- A. Do not install carpet until building is enclosed, HVAC systems are installed and operable, dust generating activities have terminated and wet work is completed and dry.
- B. Maintain minimum ambient temperature of 60 degrees F, and maximum relative humidity of 60 percent for 24 hours before, during, and after carpet installation is complete.

1.4 Warranty:
- A. Provide manufacturer's lifetime commercial limited warranty in accordance with General Requirements, Division 1.

PART 2 - PRODUCTS

2.1 Carpet Materials:
- A. Acceptable Products:
  1. Mohawk Group
     - a. “RECHARGE”
     - b. “RETHINK”
     - c. “ROUTER”
  2. Patcraft
     - a. “BIG SPLASH”
     - b. “NIGHT MOVES”
  3. Design Professional approved equal.
- B. Tufted Carpet: Conforming to the following criteria:
  1. Weave: Textured loop pile, multi-level.
  2. Face Yarn: Solution dyed and yarn dyed nylon.
  3. Gauge: 1/10.
  4. Face Weight: Minimum 22 ounce per square yard.
  5. Primary Backing Material: Synthetic.
  6. Protective Treatment: Soil protection.
  7. Max. Electrostatic Charge: 3 Kv. at 20 percent R.H.
  8. Roll Width: 12 feet.
  9. Color: As selected by Design Professional.

2.2 Accessories:

A. Subfloor Filler: White premix latex; type; recommended by carpet manufacturer.
B. Adhesive: Waterproof, strippable type, recommended by carpet manufacturer.
C. Edge Strips: Vinyl type, smooth finish, color as selected by Design Professional.

PART 3 - EXECUTION

3.1 Examination and Preparation:

A. Verify that substrate surfaces are smooth and flat with maximum variation in 1/4 inch in 10 feet.
B. Verify concrete floors are dry to maximum 7 percent moisture content, and exhibit negative alkalinity, carbonization and dusting.
C. Remove substrate, ridges and bumps. Fill local low spots, cracks, holes and other defects with subfloor filler.
D. Vacuum clean floor surfaces.
E. Apply primer where recommended by carpet manufacturer.

3.2 Installation - Carpet Adhesive Applied:

A. Apply carpet and adhesive in accordance with manufacturers' application instructions.
B. Verify carpet match before cutting to ensure minimal variation between dye lots.
C. Lay carpet with run of pile in same direction of anticipated traffic flow.
D. Double cut carpet, to allow intended seam and pattern match. Make cuts straight, true, and unfrayed.
E. Locate seams in area of least traffic where possible.
F. Join seams by hot adhesive tape method. Form seams straight, not overlapped or peaked, and free of gaps.
G. Lay carpet tight and flat on subfloor, well fastened at edges, with a uniform appearance. Provide monolithic color, pattern, and texture match within any one area.
H. Do not change run of pile in any room where carpet is continuous through a wall opening into another room. Locate change of color or pattern between rooms under door centerline.
I. Cut and fit carpet around interruptions.
J. Fit carpet tight to intersection with vertical surfaces without gaps.
K. Where wall bases are scheduled, cut carpet tight to walls. Fit carpet tight to vertical interruptions, leaving no gaps.
L. Install edge strips where carpet terminates with other floorings.

3.3 Cleaning:

A. Remove excess adhesive from floor, base, and wall surfaces without damage.
B. Clean and vacuum carpet surfaces.

END OF SECTION

SECTION 09900 - PAINTING

PART 1 - GENERAL

1.1 Section Includes:
- A. Surface preparation and field application of paints, coatings, and finishes.
- B. Coordination with Joint Sealants, Section 07900, for compatibility of sealants and coatings.
- C. Coordination with Room Finish Schedule.

1.2 Quality Assurance:
- A. Applicator: Company specializing in commercial painting and finishing, employing qualified personnel. No allowance will be made for lack of skill on part of painters.
- B. Should a question arise, use of a "Tooke Dry Film Thickness Gage" shall be used to verify dry mill thickness of paint applied.

1.3 Environmental Requirements:
- A. Do not apply exterior coatings if ambient temperature is below 50 degrees F, or when relative humidity is above maximum specified by manufacturer.
- B. Do not apply coatings until building is enclosed, HVAC systems are installed and operable, dust generating activities have terminated and wet work is completed and dry.
- C. Maintain minimum interior ambient temperature of 65 degrees F, and maximum relative humidity of 85 percent prior to, during and until coatings have cured.
- D. Provide adequate ventilation and humidity control in areas of application.
- E. Provide adequate lighting on surfaces to be finished, 80 foot candles minimum.

1.4 Delivery, Storage and Handling:
- A. Deliver materials in tightly-sealed containers, clearly labeled with manufacturer's name, type of paint, color designation and instructions for mixing or reducing.
- B. Store materials in a well ventilated area, maintained at minimum ambient temperature of 50 degrees F.
- C. Take precautionary measures to prevent fire hazards and spontaneous combustion.

1.5 Maintenance Materials:
- A. Deliver in accordance with General Requirements, Division 1.
- B. Provide minimum one gallon of each color and surface texture used.
- C. Label each container with color designation, texture, room locations, in addition to manufacturer's label.

PART 2 - PRODUCTS

2.1 Materials:
- A. Acceptable Manufacturers - Paint and Coatings:
  1. Benjamin Moore
  2. Pittsburgh Paints

3. Pratt and Lambert
4. Sherwin-Williams
5. Design Professional approved equal.

B. Coatings: Top quality, ready mixed except field catalyzed coatings, of good flow and brushing properties; capable of drying or curing free of streaks or sags.

C. Accessory Materials: Linseed oil, shellac, turpentine, paint thinners and other materials required to achieve the finishes specified, of commercial quality.

PART 3 - EXECUTION

3.1 Examination and General Preparation:

A. Verify surfaces and substrate conditions are ready to receive work in accordance with coating manufacturer's instructions.

B. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture contents are below maximums specified by coating manufacturer.

C. Correct minor defects and clean surfaces which affect work of this Section.

D. Remove or mask off hardware, accessories, plates, lighting fixture trim, escutcheons, and fittings prior to preparing surface or finishing. Use only skilled installers for removal and reinstallation of these items. Do not use solvent to clean hardware that may remove permanent lacquer finish.

E. Seal marks which may bleed through surface finishes.

F. Remove mildew from impervious surface by scrubbing with solution of water and household bleach or commercial mildew wash. Rinse with clean water and allow surface to dry.

3.2 Surface Preparation - New Uncoated Surfaces:

A. Prepare surfaces in accordance with coating manufacturer's instructions.

B. Gypsum Board Surfaces:

1. Clean surfaces free of sanding dust and other foreign matter, prime to reveal defects.
2. Fill minor defects with latex compounds. Spot prime defects after repairs.

C. Concrete and Unit Masonry Surfaces:

1. Remove dirt, loose mortar, scale, salt or alkali powder, and other foreign matter.
2. Remove oil and grease with solution of tri-sodium phosphate, rinse well and allow to dry.
3. Remove form release agents with solvents recommended by manufacturer, rinse well and allow to dry.

D. Galvanized Metal Surfaces:

1. Remove surface contamination and fabricating oils. Aggressively clean surfaces with solvent.
2. Sand clean areas of rust and immediately spot prime.
3. Apply coat of galvanized metal etching primer.

E. Shop Primed Steel Surfaces:

1. Scrape and sand clean areas of rust and loose primer. Feather out edges and clean surfaces with solvent.
2. Prime paint bare steel surfaces.

F. Wood Surfaces - Interior:
   1. Sand rough surfaces smooth. Wipe off dust and grit prior to sealing or priming.
   2. Seal knots, pitch streaks, and sappy section with sealer.
   3. Fill nail holes and cracks after sealer or primer has dried. Sand between coats.

3.3 Surface Preparation - Previously Coated Surfaces:
A. Prepare surfaces in accordance with coating manufacturer's instructions.
B. Concrete Surfaces:
   1. Scrape or mechanically clean surfaces of peeling and scaling paint.
   2. Remove dirt, grease, oil and other residue with detergent solution. Rinse well and allow to dry.
   3. Dull glossy surfaces by lightly sanding.
   4. Remove stains caused by weathering of corroding metals with solution of sodium metasilicate after thoroughly wetting with water. Allow to dry.
   5. Fill structural cracks and holes with latex patching compounds. Spot prime defects after repairs.
   6. Remove and replace loose and failed sealants.
C. Gypsum Board and Plaster Surfaces:
   1. Scrape and sand clean surfaces of peeling and scaling paint. Feather edges smooth with adjacent surface.
   2. Fill cracks, holes, and blemished areas with latex compounds. Finish to match wall texture, flush with adjacent surface.
   3. Dull glossy surfaces by lightly sanding.
   4. Spot prime stains and marks which may bleed through finish.
D. Steel and Iron Surfaces:
   1. Scrape or mechanically clean surfaces of peeling and scaling paint.
   2. Remove dirt, grease, oil and other residue by solvent cleaning.
   3. Dull glossy surfaces by sanding.
   4. Prime paint bare steel surfaces.
E. Wood Surfaces - Interior:
   1. Clean surfaces of wax, grease and water-soluble residue.
   2. Scrape and sand surfaces of loose, scaling or chipped paint. Feather edges smooth with adjacent surface.
   3. Fill holes, cracks, and imperfections with paste wood filler.
   4. Dull glossy surfaces by sanding.
   5. Spot prime bare wood and defects after repairs.
   4. Remove and replace loose and failed sealants.

3.4 Protection:
A. Protect adjacent materials and elements surrounding the Work from paint and damage.
B. Furnish drop cloths, shields and protective equipment to prevent over-spray or droppings on other surfaces.

3.5 Application:
A. Apply each coat at proper consistency and rate of coverage in accordance with manufacturer's application instructions.

B. Do not apply finishes on surfaces that are not dry.
C. Tint primer coat to match color selected for finish coats.
D. Each coat of paint is to be slightly darker or lighter than preceding coat unless otherwise approved by Design Professional.
E. Allow each coat of finish to dry before following coat is applied, unless instructed otherwise by manufacturer.
F. Sand lightly between coats to achieve required finish.
G. Where clear finishes are required, verify tint fillers match wood. Work fillers well into the grain before set. Wipe excess from the surface.
H. Backprime surfaces of interior woodwork, scheduled to receive paint finish, with primer paint.
I. Backprime surfaces of interior woodwork, scheduled to receive stain or varnish finish, with gloss varnish reduced 25 percent with mineral spirits.
J. Prime top and bottom edges of metal doors. Finish coat same as face of doors.

3.6 Finishing Mechanical and Electrical Equipment:
A. Refer to mechanical and electrical Sections for color coding and identification banding of equipment, ducting, piping and conduit. Color band or identify same by applying arrows, names, or numbers.
B. Finish paint shop primed equipment.
C. Remove unfinished grilles, covers, and access panels on mechanical and electrical components and paint separately.
D. Prime and paint exposed insulated and bare pipes, duct, conduit, boxes, hangers, brackets, collars and supports, except where items are plated or prefinished. Color and texture to match adjacent surfaces, unless selected otherwise by Design Professional.
E. Replace identification markings on mechanical or electrical equipment when painted over or spattered.

3.7 Cleaning:
A. Promptly remove coatings where spilled, splashed, or spattered, as work proceeds.
B. Place all cotton waste, cloths, and material which may constitute a fire hazard in closed metal containers and remove daily from site.

3.8 Painting and Finishing Schedule - Exterior:
A. Product names and series listed below are based on Sherwin Williams, and are given to set quality standards. Equal products by other acceptable manufacturers will be allowed.
B. Cementitious Siding and Trims.
1. One coat acrylic latex primer.
Loxon Concrete & Masonry Primer Sealer, A24W8300.
2. Two coats acrylic latex, gloss.
A-100 Exterior Latex Gloss, Series A8 Series.
C. Steel - Shop Primed.
1. One coat primer.
Pro Industrial Pro-Cryl Universal Primer, B66-310 Series.
2. Two coats acrylic, semi-gloss.
Pro Industrial Acrylic Semi-Gloss, B66-650 Series.

3.9 Painting and Finishing Schedule - Interior:

A. Product names and series listed below are based on Sherwin Williams, and are given to set quality standards. Equal products by other acceptable manufacturers will be allowed.

B. Wood Trim - Painted.
   1. One coat latex primer.
      S-W Premium Wall and Wood Primer, B28W8111.
   2. Two coat acrylic, semi-gloss.
      S-W PreClassic Waterborne Acrylic Semi-Gloss, B31 Series.

C. Wood Exposed Joist and Deck – Water-Based Dry-Fall System:
   1. One coat primer.
      As recommended by paint manufacturer.
   2. Two topcoats.
      As recommended by paint manufacturer.

D. Wood Trim - Stain/Clear Finish:
   1. Minwax 250 Interior Stain, coats as required to achieve color selected.
   2. Two coats latex urethane acrylic, satin.
      Minwax Water Based Polyurethane Varnish, Satin.

E. Gypsum Board and Plaster - Walls.
   1. One coat latex primer.
      ProMar 200 Zero VOC Latex Primer, B28W2600
   2. Two coats water based catalyzed epoxy.
      Pro-Industrial Water Based Catalyzed Epoxy Eg-Shel, B73-360.

F. Gypsum Board - Ceilings and Bulkheads.
   1. One coat latex primer.
      ProMar 200 Zero VOC Latex Primer, B28W2600
   2. Two coats latex flat.
      ProMar 200 Zero VOC Interior Latex Flat, B30-2600 Series

G. Concrete.
   1. One coat latex prime; minimum 3.0 mils DFT.
      Loxon Conrete & Masonry Primer, A24W8300; minimum 3.2 DFT.
   2. Two coats latex eggshell; minimum 1.7 mils DFT per coat.
      ProMar 200 Zero VOC Latex Eg-Shel, Series B20-2600.

H. Steel - Doors, Frames and Miscellaneous Metals.
   1. One coat primer.
      Pro Industrial Pro-Cryl Universal Primer, B66-310 Series.
   2. Two coats acrylic, semi-gloss.
      Pro Industrial Acrylic Semi-Gloss, B66-650 Series.

I. Water-Based Dry-Fall System – Exposed Steel Decking.
   1. One coat primer.
      Per paint manufacturer's recommendation.
   2. Two coats acrylic, flat.
      Pro Industrial Waterbourne Acrylic DryFall Flat, B42-82; minimum 3.8 DFT.

END OF SECTION

SECTION 10100 - MARKERBOARDS AND TACKBOARDS

PART 1 - GENERAL

1.1 Section Includes:
- A. Markerboards and tackboards.
- B. Trim, chalkrail, display rails and accessories.

1.2 Submittals:
- A. Submit in accordance with General Requirements, Division 1.
- B. Shop Drawings: Indicate board dimensions and elevation views, assembly components, gauges, profiles and finishes; locations and method of jointing, details of blocking and attachment.
- C. Samples: Submit board units, minimum 5 x 8 inches in size, illustrating surface finish and panel composition; include color charts illustrating full range of colors available.

1.3 Quality Assurance:
- A. Perform porcelain surfacing Work in accordance with Porcelain Enamel Institute - Performance Specifications for Porcelain Enamel Chalkboards.

PART 2 - PRODUCTS

2.1 Components:
- A. Acceptable Products:
  1. "SERIES 185", manufactured by Claridge Products and Equipment, Inc.
  2. Marsh Industries, Inc.
  3. Platinum Visual Systems
  4. "500 SERIES", manufactured by Polyvision Corporation
  5. Design Professional approved equal.
- B. Markerboard Panel: Face sheet and backing laminated to core, conforming to the following:
  1. Panel Size: Nominal 7/16 inch thick, 48 inches wide by lengths indicated on Drawings.
  2. Face Sheet: Porcelain enameled steel, 24 gauge.
  3. Core Material: Nominal 7/16 inch thick fiberboard, Class A flame/smoke rating.
  4. Panel Backing: Aluminum sheet, 0.015 inch thick.
  5. Color: As selected by Design Professional.
- C. Tackboard Panel: Covering laminated to core, conforming to the following:
  1. Panel Size: Nominal 7/16 inch thick, 48 inches wide by lengths indicated on Drawings.
  2. Covering Material: Vinyl coated fabric.
  3. Core Material: Nominal 7/16 inch thick fiberboard; Class A flame/smoke rating.
  4. Color: As selected by Design Professional.
- D. Frame and Trim: Extruded aluminum, of wide trim profile; concealed fasteners.

E. Chalkrail: Extruded aluminum, box type with slanted front; one piece, full length of markerboard; molded end closures; concealed fasteners.

2.2 Finish:

A. Porcelain Enamel: PEI Type A, glass fibered enamel, baked to vitreous surface; colors selected from manufacturer's standards.

B. Aluminum Surfaces: Clear anodized, satin finish.

C. Tackboard Surface: Vinyl coated fabric with linen weave texture, standard weight, Class A flame/smoke rating; colors selected from manufacturer's standards.

PART 3 - EXECUTION

3.1 Examination and Preparation:

A. Verify that surfaces and building conditions are ready to receive panels.

3.2 Installation:

A. Install markerboards and tackboards in accordance with manufacturer's installation instructions.

B. Establish bottom of perimeter frame at 32 inches above finish floor unless indicated otherwise on Drawings.

C. Securely anchor units to substrate, level and plumb. Install blocking pads at 16 inches on center behind all units.

D. Install finish trims and accessories.

END OF SECTION

SECTION 10402 - EXTERIOR SIGNAGE

PART 1 - GENERAL

1.1 Section Includes:
- A. Building name sign.

1.2 System Description:
- A. Non-illuminated, flat cut metal, individual letters.
- B. Letter Style: Arial Bold
- C. Painted finish.
- D. Mounting: Stud welded.

1.3 Submittals:
- A. Submit in accordance with General Requirements, Division 1.
- B. Shop Drawings: Indicated letter style and heights, and mounting details.
- C. Product Data: Provide data on sign fabrication, materials, and finishes.
- D. Samples: Submit color charts illustrating full range of colors available for specified finish.

1.4 Allowances:
- A. Cash Allowance: Include in accordance with General Requirements, Division 1.
- B. Allowance is to cover cost of all letters and installation.
- C. Cash Allowance: Lump sum of $2500.00.

PART 2 - PRODUCTS

2.1 Materials:
- A. Acceptable Manufacturers:
  1. Gemini
  2. American Sign Letters
  3. Design Professional approved equal.
- B. Aluminum Sheet: ASTM B209; 1/8 inch thick.
- C. Finish: Acrylic polyurethane, directionally brushed and liquid sprayed; oven baked.

PART 3 - EXECUTION

3.1 Examination and Preparation:
- A. Verify that site conditions are ready to receive work.

3.2 Installation:
- A. Install signs in accordance with manufacturer's installation instructions.
- B. Locate signs where indicated on Drawings.

END OF SECTION

SECTION 10522 - FIRE EXTINGUISHERS, CABINETS AND ACCESSORIES

PART 1 - GENERAL

1.1 Section Includes:
- A. Fire extinguishers, cabinets and accessories.
- B. Coordination with other Sections for recessed cabinet wall openings.

1.2 Submittals:
- A. Submit in accordance with General Requirements, Division 1.
- B. Product Data: Indicate component locations, dimensions, color and finish, details of attachment and anchorage, with mounting heights.
- C. Maintenance Instructions: Include test, refill or recharge schedules, procedures, and re-certification requirements.

1.3 Quality Assurance:
- A. Conform to NFPA 10 requirements for portable fire extinguishers.
- B. Fire extinguishers shall be classified by Underwriters Laboratories (UL) and shall bear "Listing Mark" for type, rating and classification indicated.

PART 2 - PRODUCTS

2.1 Components:
- A. Acceptable Products:
  1. "ACADEMY", manufactured by J.L. Industries
  2. "ARCHITECTURAL", manufactured by Larsen's Manufacturing Co.
  3. "ALTA SERIES", manufactured by Potter-Roemer
  4. Design Professional approved equal.
- B. Fire Extinguisher Cabinets: Formed sheet steel, minimum 20 gauge; baked acrylic enamel finish; conforming to the following:
  1. Cabinet Type: Semi-recessed; 1 hour fire rated for cabinets located in fire rated wall assembly
  2. Trim Style: Rolled edge.
  3. Cabinet Dimensions: Nominal 1-1/2 inches wide by 24 inches high by 5-1/2 inches deep.
  4. Door Style: Narrow vertical glass.
  5. Door Material and Finish: Aluminum, clear anodized.
  6. Door Glazing: Safety glass.
- C. Dry Chemical Type (Multi-Purpose): Steel tank, with pressure gauge; pull pin-upright squeeze grip operation; polyester epoxy finish, red color; conforming to the following:
  1. Nominal Capacity: 5 lbs.
  2. Cylinder Dimensions: 4-1/4 x 14-5/8 inches.
  3. UL Rating: 2A-10BC.

2.2 Accessories:
- A. Fire Extinguisher Brackets: Steel, with baked enamel finish; as furnished by manufacturer for extinguisher specified.

2.3 Fabrication:

A. Fabricate body of cabinet with tight corners and seams.
B. Predrill holes for anchorage.
C. Form perimeter trim and door stiles with mitered corners, flush, hairline, and rigidly secured.
D. Hinge doors for 180 degree opening with continuous hinge.
E. Glaze doors with resilient channel gasket glazing.

PART 3 - EXECUTION

3.1 Examination and Preparation:

A. Verify rough openings for cabinet are correctly sized, located, and ready to receive Work of this Section.
B. Verify servicing, charging and tagging of all fire extinguishers.

3.2 Installation:

A. Install cabinets, trims and wall brackets in accordance with manufacturer's installation instructions.
B. Securely anchor cabinets in wall openings plumb and level, 32 inches from finished floor to inside bottom of cabinet.

3.3 Schedule of Units:

A. Cabinet and Extinguisher:
1. Five (5) non-fire rated cabinets.
2. One (1) fire rated cabinet.

END OF SECTION

SECTION 10800 - TOILET AND BATH ACCESSORIES

PART 1 - GENERAL

1.1 Section Includes:
- A. Toilet room accessories.
- B. Attachment hardware.
- C. Coordination with other Sections for the installation of rough-in frames.

1.2 Submittals:
- A. Submit in accordance with General Requirements, Division 1.
- B. Product Data: Provide data on accessories describing size, finish, details of function, attachment methods.
- C. Supply 2 keys for each accessory to Owner. Master key all accessories.

PART 2 - PRODUCTS

2.1 Materials:
- A. Acceptable Manufacturers:
  1. American Specialties, Inc.
  2. Bobrick Washroom Equipment, Inc.
  3. Bradley Washroom Accessories
  4. Design Professional approved equal.
- B. Sheet Steel: ASTM A366.
- C. Stainless Steel Sheet: ASTM A167, Type 304.
- D. Tubing: ASTM A269, stainless steel.
- E. Fasteners, Screws, and Bolts: Hot dip galvanized, tamper-proof security type.

2.2 Fabrication:
- A. Form surfaces flat without distortion. Weld and grind joints smooth.
- B. Shop assemble components and package with anchors and fittings.
- C. Back paint components to prevent electrolysis.
- D. Provide steel anchor plates, adapters, and anchor components for installation.
- E. Hot dip galvanize exposed and painted ferrous metal and fastening devices.

2.3 Finishes:
- A. All components shall be factory finished.
- B. Chrome/nickel Plating: ASTM B456, Type SC 2; polished finish.
- C. Stainless Steel: No. 4 stain luster finish.
- D. Enamel: Degreased, cleaned and treated with one coat primer and two coats epoxy or electrostatic baked enamel.
- E. Ferrous Metals: Degreased, cleaned and treated with one coat primer.

2.4 Lavatory Pipe Insulation Kits:
- A. Acceptable Manufacturers:
  1. Brocar Products Inc.
  2. Truebro Inc.

3. Design Professional approved equal.

B. Insulation: Molded closed cell vinyl, UV and heat resistant; minimum 1/8 inch wall thickness.

C. Fasteners: Nylon, supplied by kit manufacturer.

2.5 Accessory Types:

A. Grab Bars: Stainless steel, 1-1/2 inch diameter; concealed mounting plate with cover secured with set screws; peened non-slip gripping surface.

B. Toilet Tissue Dispenser: Surface mounted, single roll, cast aluminum; molded plastic spindle, non-controlled delivery.

C. Paper Towel Dispenser: Surface mounted, stainless steel cabinet; dispenses C-fold or multifold towels, tumbler lock and piano hinge on door.

D. Soap Dispenser: Surface wall mounted, stainless steel container body and back, corrosion resistant dispenser valve, refill window; locked, hinged refill top.

E. Mirrors: Polished float/plate glass, 1/4 inch thick, electrolytically copper plated; one piece, roll formed stainless steel angle frame, weld corners; concealed wall hanger.

F. Sanitary Napkin Disposal: Surface mounted stainless steel cabinet, self-closing door, tumbler lock.

G. Robe Hook: Stainless steel, square flange, concealed mounting.

H. Baby Changing Station: Surface mounted, durable, injection molded polypropylene, secure to metal mounting chassis with concealed steel on steel hinge; antimicrobial embedded into plastic material on changing surface with nylon safety strap and hook for bags or purses.

PART 3 - EXECUTION

3.1 Examination and Preparation:

A. Verify exact location of accessories for installation.

B. Deliver inserts and rough-in frames to site. Provide templates and rough-in measurements as required.

3.2 Installation:

A. Install fixtures, accessories and items in accordance with manufacturer's installation instructions.

B. Install plumb and level, securely and rigidly anchored to substrate.

3.3 Schedule:

A. Items listed below are identified by American Specialties Inc. catalog numbers to set quality standards. Equal by specified acceptable manufacturers will be considered.

TAS-1 EACH TOILET ROOM TO HAVE Toilet 98, 99 and 206

1	Grab Bar	3201-P x 36
1	Grab Bar	3201-P x 42
1	Grab Bar (Vertical)	3201-P x 18
1	Toilet Tissue Dispenser	0263-1A

1	Soap Dispenser	0347	
1	Paper Towel Dispenser	0210	
1	Mirror	0620	24 x 36

TAS-2 EACH TOILET ROOM TO HAVE Men 106

1	Grab Bar	3201-P x 36	
1	Grab Bar	3201-P x 42	
1	Grab Bar (Vertical)	3201-P x 18	
1	Toilet Tissue Dispenser	0263-1A	
1	Soap Dispenser	0347	
1	Paper Towel Dispenser	0210	
1	Mirror	0620	24 x 36
1	Robe Hook	7340	
1	Baby Changing Station	9014	

TAS-3 EACH TOILET ROOM TO HAVE Women 107

1	Grab Bar	3201-P x 36	
1	Grab Bar	3201-P x 42	
1	Grab Bar (Vertical)	3201-P x 18	
2	Toilet Tissue Dispenser	0263-1A	
2	Sanitary Napkin Disposals	0473-A	
1	Soap Dispenser	0347	
1	Paper Towel Dispenser	0210	
1	Mirror	0620	24 x 36
1	Robe Hook	7340	
1	Baby Changing Station	9014	

TAS-4 EACH JANITOR CLOSET TO HAVE Janitor 98, 102 and 203

1	Mop and Broom Holder	8215-5

END OF SECTION

SECTION 21 05 00

FIRE PROTECTION 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 21 – Fire Suppression 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 21 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 21 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 a complete furnishing, installation and operational fire protection systems. 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. All sprinkler system pipe routing, sprinkler head locations, etc. shall be approved by the Architect in a schematic layout prior to starting shop drawings. 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 Fire Protection 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 Fire Protection 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 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

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.

1.5 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 may show approximate location of existing services. The Fire Protection Contractor shall check with local utility companies or municipal agencies for exact location of services which they expect to encounter. The Fire Protection 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 Fire Protection 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.

1.6 QUALITY ASSURANCE

A. Sprinkler Systems: Perform work to NFPA 13.

B. Standpipe and Hose Systems: Perform to NFPA 14.

C. Welding Materials and Procedures: Perform to ASME Code.

D. Valves: Bear UL label or marking. Provide manufacturer's name and pressure rating marked on valve body.

1.7 SUBMITTALS

A. Furnish electronic sets of complete detailed Computer Aided Design (CAD) working drawings, hydraulic calculations, equipment shop drawings and product data of the system.

B. Preliminary Shop Drawings: Prior to detailed submission, submit preliminary layout of finished ceiling areas indicating only head locations coordinated with ceiling installation on a Computer Aided Design (CAD) background. In areas of exposed piping, submit a preliminary layout showing pipe routing. Preliminary layouts shall be approved by the Architect prior to detailed shop drawing submission.

C. Shop Drawings: Indicate hydraulic calculations, detailed pipe layout, hangers and supports, components and accessories. Indicate system controls. Submit actual flow test results, with name of witness from proper local authorities attending, on shop drawings. Hydraulic calculations must be based on actual flow test results.

D. Product Data: Provide data on sprinkler heads, valves and specialties, including manufacturers catalog information. Submit performance ratings rough-in details, weights, support requirements, and piping connections.

E. Samples: Submit two of each style of sprinkler head specified.

F. Provide tests and documentation as required by the Fire Marshal

G. Manufacturer's Certificate: Certify that system has been tested and meets or exceeds code requirements.

1.8 SCOPE OF WORK

A. Design and provide an automatic sprinkler and standpipe system for all portions of the building. Furnish and install all piping from city service valve to fire service area including service tee, domestic curb valve, hydrant curb valve, fire hydrant post indicator valve, detector check valve, alarm check valve with retarding chamber and pressure switch, OS & Y valves with supervisor switches, check valves, pump test connection, fire department connection, controllers, interior piping, sprinkler and accessories and appurtenances for complete systems as shown on drawings and hereinafter specified. Also furnish and install double check valve back-flow prevention assembly. See drawings. (Some items mentioned in this section may not be required for this project - coordinate required equipment with drawings and NFPA Codes and regulations).

B. The entire installation shall be strictly in accordance with NFPA Standard No. 13, Sprinkler Systems, NFPA Standard No. 14 installation of standpipe and hose systems, and NFPA Standard No. 24 installation of private fire service mains, NFPA 70 National Electric Code, and shall meet the requirements of the Owners insurance carrier, governing Fire Marshal and all other authorities having jurisdiction. Note: extended coverage sprinkler head system will not be accepted without written approval from the Engineer.

C. Systems shall be hydraulically designed, detailed, furnished and installed by a competent, experienced and licensed Fire Protection Contractor regularly engaged in furnishing and installing fire protection systems.

D. Contractor shall furnish preliminary system layout drawings and after approval, complete detailed Computer Aided Design (CAD) working drawings, hydraulic calculations and equipment shop drawings of the system and shall submit them to the Owners insurance carrier and governing Fire Marshal for their review and approval. Shop drawings shall bear designers/installers State of Michigan License number and Certification number, and have approval of Fire Marshall before being submitted to the Engineer. Eight copies of approved drawings, calculations, shop drawings and product data shall be submitted to Architect/Engineer for review. No work shall be commenced before shop drawings are reviewed by Architect/Engineer.

E. Contractor shall examine the drawings to determine building construction which would affect location of mains and heads.

F. All permits, licenses, fees, inspections and arrangements required for the work under this contract shall be obtained and paid for by the contractor. Documentation shall be provided as required by the State Fire Marshal.

G. At completion of the project, the Fire Protection Contractor shall clean, lubricate and operate all control valves, alarms and devices. Provide Owner with two copies of NFPA Standard No. 25 on inspection, testing and maintenance of water based fire protection systems and maintenance and parts lists for all equipment installed. Install hydraulic design plate on sprinkler riser as per Section 10-5 and provide spare sprinkler heads with wrenches in wall mounted box near riser as per Section 3-2.9 in the 1999 edition of NFPA 13.

H. Contractor shall be responsible for total system design and layout of sprinkler heads and piping.

I. Contractor shall be responsible for obtaining all volume, pressure and flow test data from local water supply system necessary to allow a complete bid price and approved final design and installation.

J. It shall be the responsibility of the Fire Protection Contractor to verify the fire protection water service size noted on the drawings and shall be responsible for notification of any changes in pipe size to the General Contractor (or Owner) prior to the bid date, that is required to accomplish a complete, operational and code approved system.

1.9 OPERATION AND MAINTENANCE DATA

A. Submit Maintenance Instructions: Include installation instructions, spare parts lists, procedures, and treatment programs.

1.10 QUALITY ASSURANCE

A. Sprinkler Systems: Perform work to NFPA 13.

B. Standpipe and Hose Systems: Perform to NFPA 14.

C. Welding Materials and Procedures: Perform to ASME Code.

D. Valves: Bear UL label or marking. Provide manufacturer's name and pressure rating marked on valve body.

E. Fire Protection Contractor shall be licensed and certified by the State of Michigan for the design and installation of fire protection standpipe, hose and sprinkler systems.

1.11 RECORD DRAWINGS

A. Maintain an up-to-date set of "record" drawings showing actual piping, sprinkler heads, 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.

1.12 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.

1.13 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.

1.14 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.

1.15 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.

1.16 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 Fire Protection Contractor's 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.

1.17 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.

1.18 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. The contractor shall be required to remove and replace at his/her expense any non-approved materials or equipment installed by him as directed by 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 mechanical systems as is intended by these drawings and specification.

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 this 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. Drawings are diagrammatic with no attempt made to show and precisely locate every tee, ell, fitting, valve, etc. All equipment, 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, sprinkler heads, 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 fire protection items requiring access that are concealed behind finished surfaces with the General Trades. Access panels and doors are to be furnished and installed by the Architectural Trades unless otherwise noted. 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.

B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.21 PLACEMENT OF ORDERS

A. 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.

1.22 COOPERATION WITH ARCHITECT/ENGINEER AND OTHERS

A. Coordinate all aspects of the fire protection 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.

C. 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.

1.23 WORK INVOLVING OTHER TRADES

A. Equipment or materials specified 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.

1.24 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.

1.25 CUTTING AND PATCHING

A. Unless noted otherwise, the Mechanical Trades shall be responsible for all cutting, patching and associated work required. 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. Irregardless, 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. Irregardless, all drilling of holes shall be the responsibility of the contractor requiring same.

1.26 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 fire protection equipment, 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. 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.).

1.27 ELECTRICAL CONNECTIONS

A. The Electrical Trades shall be responsible for furnishing and installing all electrical equipment, wiring, etc. required for operation of the fire protection equipment unless otherwise noted on the drawings. The Fire Protection Contractor 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 Fire Protection Contractor furnishes an "approved equal" or "alternate" that require changes in the original electrical design, the Fire Protection Contractor 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 EXCAVATION AND BACKFILLING

A. Furnish all excavation, backfilling and removal of excess dirt to accomplish installation of the fire protection system 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.

1.29 BASES AND SUPPORTS

A. This contractor shall be responsible for furnishing all equipment pads and supports for the fire protection equipment and materials, unless otherwise noted on drawings.

B. All floor mounted fire protection 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 21. 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 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.

1.30 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.

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.

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.

1.31 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 21 whether furnished by this contractor or by the Owner or other trades.

1.32 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.

1.33 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, materials, etc. from freezing.

1.34 COMMON PIPE MATERIALS AND INSTALLATION INSTRUCTIONS

A. Refer to individual 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 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.

4. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

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.

d. PVC to ABS Piping Transition: ASTM D 3138.

1.35 PIPE HANGERS AND SUPPORTS

A. Hangers and saddles shall be Modern Hanger Corp., Grinnel/Elcen, 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 Fig. 260, with maximum spacing per ASHRAE or NFPA Standards, whichever is most stringent:

Pipe Size	Steel Pipe	Copper Pipe	PVC Pipe	Rod Size
½ to ¾ inch	5 foot	5 foot	Continuous	3/8”
1 to 1¼ inch	7 foot	6 foot	Continuous	3/8”
1½ to 2 inch	9 foot	8 foot	Continuous	1/2”
2½ to 3½ inch	11 foot	9 foot	Continuous	5/8”
4 to 6 inch	12 foot	10 foot	Continuous	5/8”

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.

F. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.

G. Wall Support for Pipe Sizes up thru 3 Inches: Cast iron hook.

H. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.

I. Vertical Support: Steel riser unistrut clamps at high, mid, and low locations.

J. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

K. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.

L. 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.

1.36 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.

1.37 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. Thoroughly clean all floor drains, cleanouts, and plumbing fixtures. Clean all trays and strainers.

E. Finish paint all equipment, materials, piping, etc. as noted on drawings or listed in this specification. Match Owner's existing color scheme. Any Division 21 equipment which has been scratched or damaged shall be finished equal to the original finish.

1.38 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.

1.39 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

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SECTION 21 05 10

FIRE PROTECTION SYSTEMS TESTING, CLEANING & STARTUP

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Testing of piping systems.

B. Cleaning of piping systems.

C. Substantial completion check list and sign-off forms.

1.2 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 and testing of the fire protection 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 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.

PART 2 PRODUCTS – Not Applicable

PART 3 - EXECUTION

3.1 FIRE PROTECTION PIPING SYSTEM

A. All fire protection piping, sprinkler heads, etc. shall be flushed, tested, and started per all NFPA and NEC requirements.

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

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SYSTEMS COMPLETION CHECKLIST						
Inspection/Review Item	**Notice Required**	**Installing Contractor**		**Date**	**Owner's Representative Signature**	**Remarks**
		Name	**Signature**			
Fire Protection System, Continued						
Owner's Training	7 days	Owner Representative				Complete Owner's training or operation of the automation system.
Flushing and testing of fire protection piping	48 hours	Owner Representative				Tested per NFPA requirements

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.

SECTION 21 10 00

FIRE PROTECTION PIPING, SPRINKLER HEADS, & MISC.

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Pipe, fittings, valves, and connections for a complete fire protection system including all required sprinkler heads, piping, standpipes, etc.

B. Wet-pipe sprinkler system.

C. System design, installation, and certification.

D. Fire department connections.

1.2 REFERENCES

A. ANSI/ASME B16.1 - Cast Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 250, and 800.

B. ANSI/ASME B16.3 - Malleable Iron Threaded Fittings, Class 150 and 300.

C. ANSI/ASME B16.4 - Cast Iron Threaded Fittings, Class 125 and 250.

D. ANSI/ASME B16.5 - Pipe Flanges and Flanged Fittings.

E. ANSI/ASME B16.9 - Factory-made Wrought Steel Buttwelding Fittings.

F. ANSI/ASME B16.11 - Forged Steel Fittings, Socket-welding and Threaded.

G. ANSI/ASME B16.25 - Buttwelding Ends.

H. ANSI/ASME B36.10 - Welded and Seamless Wrought Steel Pipe.

I. ANSI/ASME Sec 9 - Welding and Brazing Qualifications.

J. ANSI/ASTM A135 - Electric-Resistance-Welded Steel Pipe.

K. ANSI/ASTM A47 - Malleable Iron Castings.

L. ANSI/ASTM B32 - Solder Metal.

M. ANSI/AWS A5.8 - Brazing Filler Metal.

N. ANSI/AWWA C104 - Cement Mortar Lining for Ductile Iron Pipe.

O. ANSI/AWWA C105 - Polyethylene Encasement for Ductile Iron Pipe.

P. ANSI/AWWA C111 - Rubber Gasket Joints for Ductile Iron Pipe.

Q. ANSI/AWWA C110 - Ductile Iron and Gray Iron Fittings.

R. ANSI/AWWA C151 - Ductile Iron Pipe, Centrifugally Cast.

S. ANSI/AWWA C500 - Gate Valves, 3” thru 48” for water and sewage systems.

T. ANSI/AWWA C502 - Dry Barrel Fire Hydrants.

U. ANSI/AWWA C509- Resilient Seated Gate Valves 3” thru 12” for water and sewage systems.

V. ANSI/AWWA C600 - Installation of Ductile Iron Water Mains and Appurtenances.

W. ASTM A53 - Pipe, Steel, Black and Hot-Dipped, Zinc-coated Welded and Seamless.

X. ASTM A234 - Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures.

Y. ASTM A795 - Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use.

Z. AWS D10.9 - Specifications for Qualification of Welding Procedures and Welders for Piping and Tubing.

AA. NFPA 13 - Installation of Sprinkler Systems.

BB. NFPA 14 - Standpipe and Hose Systems.

CC. NFPA 24 - Installation of Private Fire Service Mains and Their Appurtenances.

DD. NFPA 70 - National Electrical Code

EE. UL - Fire Protection Equipment Directory.

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 $100.00 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.

PART 2 PRODUCTS

2.1 SPRINKLER AND STANDPIPE PIPING, BURIED (Must be Approved by Governing Authorities)

A. Ductile Iron Pipe: ANSI/AAWWA C151/A21.51 rated 350 psi. with Class 350 fittings.

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)
3. Pipe Joints: Push on, ANSI/AWWA C1533/A21.53, with Tyton gaskets.
4. Fitting Joints: Mechanical, compact, ANSI/AWWA 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 manufacturer's recommendations.

B. PVC Pipe:
1. 1½" to 3" - ASTM D2241, SDR 21 - Class 200 AWWA C900.
2. 4" and Larger - ASTM D2241, DR18- Class 150 AWWA C900.
3. Fittings: ASTM D2466, PVC
4. Joints: ASTM D3139, integral bell and gasket seal installed with concrete thrust blocks, or ASTM D2855, solvent weld with ASTM D2564 solvent cement.

2.2 SPRINKLER AND STANDPIPE PIPING, ABOVE GROUND

A. Fire protection pipe shall be black steel, ASTM A135, ASA Schedule 10 for grooved systems, Schedule 40 for screwed systems, Grade A, ASTM Spec. A-53, U.L. listed and F.M. approved and in compliance with NFPA 13.

1. Fittings for steel pipe may be grooved with gasket and clamp, threaded, flanged, or welded. Welding shall be performed by ASME (Boiler Code - Section IX) qualification welders. Fittings shall be 175 psig water working pressure.

2. Grooved end fittings shall be short-pattern, with flow equal to standard pattern fittings. Basis of Design: Victaulic FireLock.

3. Grooved joint couplings shall consist of two ductile iron housing segments to ASTM A536, pressure responsive gasket to ASTM D2000, and zinc electroplated steel bolts and nuts to ASTM A449.

a. Rigid Type: Coupling housings shall be cast with offsetting, angle-pattern bolt pads to provide joint rigidity and support and hanging in accordance with NFPA-13. Couplings shall be fully installed at visual pad-to-pad offset contact. Tongue-and-recess type couplings, or any coupling that requires exact gapping of bolt pads at required torque ratings, are not permitted.

1) Victaulic Style 009-EZ and 107H, Installation-Ready, for direct stab installation without field disassembly, with grade EHP gasket, suitable for water service to +250 deg F

2) Victaulic FireLock Style 005 and Style 07 "Zero-Flex"

b. Flexible Type: For use in locations where vibration attenuation and stress relief are required, and for the elimination of flexible connectors. Victaulic Installation-Ready Style 177 or Style 77

2.3 GATE VALVES

A. Up to and including 2 Inches: Bronze body, bronze trim, rising stem, handwheel, OS&Y, single wedge or disc, threaded ends.

B. Over 2 Inches: Iron body, bronze trim, rising stem, handwheel, OS&Y, single wedge, flanged or grooved ends. Basis of Design: Victaulic Series 771H.

2.4 BUTTERFLY VALVES

A. 2 Inches and Over: Ductile iron body with grooved ends, electroless-nickel coated ductile iron disc, pressure responsive elastomer seat, and stainless steel stem. (Stem shall be offset from the disc centerline to provide complete 360-degree circumferential seating.)

B. Valves shall include a weatherproof actuator housing with two SPDT supervisory switches, and handwheel.

C. Basis of Design: Victaulic Series 705.

2.5 DRAIN VALVES

A. Gate Valve.

B. Brass ball valve with cap and chain, ¾ inch hose thread.

2.6 STANDPIPE AND HOSE SYSTEM EQUIPMENT (When required)

A. Hose Cabinet:
1. Style: Recessed, semi-recessed or surface mounted. See drawings.
2. Tub: 16 gage thick steel, prepared for pipe and accessory rough-in.
3. Door: 12 gage thick steel, with 1/4 inch thick wired glass full panel, hinged, positive latch device.
4. Finish: Enameled, color red.

B. Hose Rack: Steel; with polished chrome finish; swivel type with pins and water stop.

C. Hose: 50 feet of rubber lined synthetic hose; mildew and rot-resistant.

D. Nozzle: Brass, chrome plated; combination fog, straight stream, and adjustable shut-off.

E. Angle Valve: Hydrolator type, 1½ inch nominal size. Verify size with NFPA requirements.

F. Fire Department Outlet Valve: Angle type; brass finish; 2½ inch size, thread to match fire department hardware, 300 psig working pressure, with threaded cap and chain of same material and finish.

2.7 FIRE DEPARTMENT CONNECTION

A. Type: Flush mounted wall type with brass. Two way with thread size to suit fire department hardware; threaded dust cap and chain of matching material and finish.

B. Drain: ¾ inch automatic drip, outside.

C. Label: "Standpipe - Fire Department Connection".

D. At the low point near each fire department connection, install a 90-degree elbow with drain connection to allow for system drainage to prevent freezing. Basis of Design: Victaulic #10-DR.

2.8 SPRINKLER HEADS

A. Sprinklers shall be glass bulb type, with a hex-shaped wrench boss integrally cast into the sprinkler body to reduce the risk of damage during installation. Basis of Design: Victaulic Company.
   1. Wrenches shall be provided by the sprinkler manufacturer that directly engage the wrench boss.
   2. Sprinklers with rubber O-rings are not permitted.

B. Suspended Ceiling:
   1. Type: Standard coverage semi-recessed pendant type with matching push-on escutcheon plate. (Used in finish areas unless noted otherwise on drawings).
   2. Head Finish: Chrome plated.
   3. Escutcheon Plate Finish: Chrome plated.
   4. Fusible Link: Glass bulb type temperature rated for specific area hazard.
   5. Basis of Design: Victaulic Model V27.

C. Exposed Area Type:
   1. Type: Standard coverage upright type.
   2. Head Finish: Brass.
   3. Fusible Link: Glass bulb or fusible solder link type temperature rated for specific area hazard.
   4. Basis of Design: Victaulic Model V27.

D. Sidewall Type:
   1. Type: Standard coverage semi-recessed horizontal sidewall type with matching push on escutcheon plate and guard if required by area use.
   2. Head Finish: Chrome plated.
   3. Escutcheon Plate Finish: Chrome plated.
   4. Fusible Link: Glass bulb type temperature rated for specific area hazard.
   5. Basis of Design: Victaulic Model V27.

E. Concealed type (use only when noted on drawings):
   1. Quick response bulb spring type, 175 psi working pressure rated, 500 psi factory tested, bronze frame, brass deflection, brass screw, engineered plastic bulb seat, silicone 0-ring, glass bulb with glycerin solution, upper steel escutcheon plate, brass cover plate with color selected by Architect.

2. Glass bulb shall be temperature rated for specific hazard.
3. Basis of Design: Victaulic Model V38 or V39.

F. Escutcheons and guards shall be listed, supplied, and approved for use with the sprinkler by the sprinkler manufacturer.

G. Vic-flex multiple-use, open-gate, flexible drop system may be used to properly locate the sprinklers. The drop shall include a UL approved Series AH2 braided hose with a bend radius to 2" to allow for proper installation in confined spaces. The hose shall be listed for [(4) bends at 31" length] [(5) bends at 36" length] [(8) bends at 48" length] [(10) bends at 60" length] [(12) bends at 72" length]. Union joints shall be provided for ease of installation. The flexible drop shall attach to the ceiling grid using a one-piece open gate Series AB1 bracket. The bracket shall allow installation before the ceiling tile is in place. The drop system shall include all required supports and bracing. The braided drop system is UL listed and FM approved for sprinkler services to 175 psi (1206 kPa).

2.9 PIPING SPECIALTIES

A. Wet Pipe Sprinkler Alarm Valve: Check type valve with divided seat ring, rubber faced clapper to automatically actuate electrically operated alarms, with pressure retard chamber and variable pressure trim. Internal components shall be replaceable without removing the valve from the installed position. Basis of Design: Victaulic Series 751.

B. Electric Alarm: The sprinkler contractor shall include a weatherproof audio visual (horn/strobe) device mounted on the outside of the building above the siamese connection. Include all conduit/wire etc. back to a reserved circuit breaker as well as to the flow switch.

C. Water Flow Switch: Vane type switch for mounting horizontal or vertical, with two contacts rated 10 amp at 115 volt AC. Basis of design: System Sensor.

2.10 PIPE HANGERS AND SUPPORTS

A. Fire Protection Piping:
1. Conform to NFPA 13 and NFPA 14.
2. Hangers for Pipe Sizes 1/2 to 1 1/2 Inch: Malleable iron, adjustable swivel, split ring.
3. Hangers for Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
4. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
5. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
6. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.
7. Vertical Support: Steel riser clamp.
8. Floor Support: Cast iron adjustable pipe saddle, locknut, nipple, floor flange, and concrete pier or steel support.
9. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

2.11 DOUBLE CHECK VALVE ASSEMBLY

A. A testable double detector check valve assembly with meter bypass shall be furnished and installed as required by local authorities.

B. Provide on new fire protection systems, as well as on existing systems that are being altered, added to or changes. Coordinate exact requirements with local authorities.

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 foreign material, from 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.)

E. Coordinate work of this Section with other affected work.

3.2 INSTALLATION

A. Install piping in accordance with NFPA 13 for sprinkler systems, NFPA 14 for standpipe and hose systems, NFPA 24 for service mains and NFPA 70 National Electrical Code and all other applicable codes and regulations.

B. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.

C. Install piping to conserve building space, and not interfere with use of space and other work.

D. Group piping whenever practical at common elevations.

E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

F. Slope piping and arrange systems to drain at low points.

G. Prepare pipe, fittings, supports, and accessories for finish painting. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.

H. Grooved joint shall be installed in accordance with the manufacturer’s written recommendations. Grooved ends shall be clean and free from indentations, projections, or roll marks. The gasket shall be molded and produced by the coupling manufacturer of an elastomer suitable for the intended service. The coupling manufacturer’s factory trained representative shall provide on-site training for the contractor’s field personnel in the use of grooving tools and installation of product. The representative shall periodically visit the job site to ensure best practices in grooved

product installation are being followed. (A distributor's representative is not considered qualified to conduct the training.)

I. Do not penetrate building structural members unless indicated.

J. Provide sleeves when penetrating footings, floors and walls. Seal pipe and sleeve penetrations to achieve fire resistance equivalent to fire separation required.

K. Die cut screw joints with full cut standard taper pipe threads with red lead and linseed oil or other non-toxic joint compound applied to male threads only.

L. Install valves with stems upright or horizontal, not inverted. Remove protective coatings after installation.

M. Provide valves for shut-off or isolating service. Verify all code requirements for location and operation of all shutoff valves. Installation shall meet code.

N. Provide drain valves at main shut-off valves, low points of piping and apparatus.

O. Install equipment, sprinkler heads, miscellaneous materials, etc. in accordance with manufacturer's instructions.

P. Locate and secure hose cabinet plumb and level. Verify height of top of cabinet (inside horizontal) surface above finished floor.

Q. Locate angle valve in cabinet at required height above floor. Locate fire department connection below angle valve and not closer than 4 inches from side or bottom of cabinet.

R. Connect standpipe system to water source ahead of domestic water connection.

S. Where static pressure exceeds 100 psi at any hose station, provide pressure reducing valve to prevent pressure on hose exceeding 90 psi.

T. Provide two way fire department outlet connection on roof.

U. Flush entire new piping system of foreign matter.

V. Install buried shut-off valve in valve box. Provide post indicator.

W. Provide double check valve assembly and required valving at sprinkler system water source connection.

X. Locate fire department connection with sufficient clearance from walls, obstructions, or adjacent siamese connectors to allow full swing of fire department wrench handle. Verify and get local fire department approval for location and type of connection.

Y. Locate outside electric alarm bell on building wall. Coordinate location with Architect/Engineer.

Z. Place pipe runs to minimize obstruction to other work.

AA. Place piping in concealed spaced above finished ceilings.

BB. Center heads in two directions in ceiling tile and provide piping offsets as required. Coordinate location of piping, heads, etc. with ceiling layout, lights and all other trades. Location of all sprinkler heads shall be approved by the Architect.

CC. Apply masking tape or paper cover to ensure concealed sprinkler head cover plates do not receive field paint finish.

DD. Do not install sprinklers that have been dropped, damaged, or show a visible loss of fluid. Never install sprinklers with cracked bulbs.

EE. Sprinkler bulb protectors shall be removed by hand. Do not use any tools or devices that could damage the bulb.

FF. Install system main drain at low point of system. Extend drain piping to nearest janitor's sink with drain piping routed above ceilings if drain is located outside a mechanical room.

3.3 SYSTEM TEST

A. Hydrostatically test entire system in accordance with NFPA 14.

B. Test shall be witnessed by authority having jurisdiction. Architect/Engineer shall be notified.

3.4 QUALIFICATIONS

A. A licensed Fire Protection Contractor shall design, detail and install a fire protection sprinkler system to cover the new and/or remodeled areas.

B. The Fire Protection Contractor shall provide a flow test and furnish complete detailed CAD working drawings of the system and shall submit them to the Fire Marshal, Architect/Engineer and all agencies required by Code for review and approval.

END OF SECTION

MAI: 2022-01072

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, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions.

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:
   1. ABS: Acrylonitrile-butadiene-styrene plastic.
   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.

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 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 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 <u>not</u> 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 plumbing, 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).

1.29 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.

1.30 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.

1.31 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.

1.32 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.

1.33 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.

4. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

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.

1.34 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:

Pipe Size	Steel Pipe	Copper Pipe	PVC Pipe	Rod Size
½ to ¾ inch	6 feet	5 feet	4 feet	3/8”
1 inch	7 feet	5 feet	4 feet	3/8”
1 ¼ inch	7 feet	7 feet	4 feet	3/8”
1½ inch	7 feet	7 feet	4 feet	1/2”
2 inch	10 feet	8 feet	4 feet	1/2"
2½ inch	11 feet	9 feet	4 feet	5/8”
3 inch	11 feet	9 feet	4 feet	5/8”
3 ½ inch	13 feet	11 feet	4 feet	5/8”
4 inch	14 feet	12 feet	4 feet	5/8”

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.

F. Hangers for Hot Pipe Sizes thru 4 Inches: 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.

I. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.

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.

1.35 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.

1.36 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.

1.37 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.

1.38 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.

1.39 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.

1.40 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

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 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, 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 (50ppm) 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. Pressure Test
   1. Pressure test shall be per the current adopted edition of the International Fuel Gas Code.

   2. The test pressure shall not be less than 1.5 times the working pressure but not less than 3 PSIG. Where the test pressure exceeds 125 psig, the test pressure shall not exceed a value that produces a hoop stress in the piping greater than 50 percent of the specified minimum yield strength of the pipe. The test duration shall be not less than ½ hour for each 500 FT3 of pipe volume. If testing a system with less than 10 FT3 of pipe volume the test shall not be less than 10 minutes.

3. The test medium shall be air, nitrogen, carbon dioxide or an inert gas. Oxygen shall not be used.

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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SYSTEMS COMPLETION CHECKLIST						
Inspection/Review Item	**Notice Required**	**Installing Contractor**		**Date**	**Owner's Representative Signature**	**Remarks**
		Name	**Signature**			
Plumbing Systems						
Testing of Sanitary Systems	48 hours					Tested per specification
Testing of Domestic CW, HW and HWR Piping.	48 hours					Tested per specification
Disinfection of Domestic CW, HW & HWR Piping.	48 hours					Disinfect per specification and all applicable codes.
Domestic Water Sample and Approval	When submitted					Submit sample for review and approval by local authorities.
Natural Gas Piping	7 days					Tested per specifications.
Domestic water heater system, completely installed, checked, tested and started	7 days					Verify system installation complete, operation correct. Includes verification of hot water recirculating pump system and flow balance. Check, test and startup by Manufacturer's Rep.
Valving	When completed					Verify that valves have been installed at all branch piping locations
Piping and Fitting Insulation	When Completed					Verify all piping and fitting are insulated per specification.
Reduced Pressure Backflow Preventer Tested	48 hours					Verify Reduced Pressure Backflow Preventer installed and completely operational.

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.

SYSTEMS COMPLETION CHECKLIST						
Inspection/Review Item	**Notice Required**	**Installing Contractor**		**Date**	**Owner's Representative Signature**	**Remarks**
		Name	**Signature**			
Plumbing Systems, Continued						
Pipe Labeling and Valve Tagging Identification	When completed					Verify system identification is complete per specification and valve chart submitted.
Owner's Training	7 days					Verify that Owner has been instructed on operation and maintenance of systems.

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.

SECTION 22 05 53

PLUMBING SYSTEM IDENTIFICATION

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.

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 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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SECTION 22 06 00

PLUMBING SPECIALTIES

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

2. Plumbing Fixtures - American Standard, Bradley, Crane, Elkay, Fiat, Florestone, Just, Kohler, Mansfield, Moen Commercial, ProFlo, Sloan, Stern-Williams, Zurn.

3. Plumbing Specialties – Schier, Watts, Wilkins, Zurn.

4. Flush Valves - Delany, Delta, Sloan (Royal), Zurn, American Standard.

5. Faucets - American Standard, Chicago, Delta, Sloan, T & S, Woodford, Zurn.

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.

8. Electric Water Coolers and Drinking Fountains: Elkay, Halsey Taylor, Haws, Oasis.

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.

2.7 SUMP AND SEWAGE PUMPS

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:

Fixture	Waste	Vent	C.W.	H.W.
Lavatory	1¼”	1¼”	½”	½”
Sinks (General)	1½”	1½”	½”	½”
Janitor’s Service Sink	3”	2”	½”	½”
Water Closet-Flush Valve	4”	2”	1¼”	---
Urinal-Flush Valve	2”	2”	1”	---
Wall Hydrants (Hose Bibb)	---	---	¾”	---
Drinking Fountain	1½”	1½”	½”	---
Showers	2”	2”	¾”	¾”

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. 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.

N. 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.

O. Flashings: Vent pipe flashings shall be by roofing contractor. Provide lead sleeves for vents.

P. Pipe relief from backflow preventer to nearest drain.

Q. Install water hammer arrestors as required by Code, complete with means for access if so required by the Plumbing Inspector.

R. 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.

S. 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.

T. Install shutoff valves on all branches. All water supplies to fixtures shall have valve on supply line to the fixture.

U. All plumbing fixtures shall be installed, vented, piped, trapped, etc. in accordance with all codes and regulations pertaining to this projects location.

V. 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.

W. 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

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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. Valves and fittings.

C. 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:
   1. ASTM C547, "Standard Specification for Mineral Fiber Preformed Pipe Insulation"
   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 105ºF and higher.
   2. Cold Piping – Piping systems with fluids below 105ºF. (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 (12007), "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 +150ºF. 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, 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):

1. Closure Materials - Butt strips, bands, wires, staples, mastics, adhesives; pressure-sensitive tapes.

2. Field-applied jacketing materials - Sheet metal, plastic, canvas, fiberglass cloth, insulating cement; PVC fitting covers.

3. Support materials - Hanger straps, hanger rods, saddles.

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:

Piping System	Pipe Size	Insulation Thickness	Insulation Conductivity BTU-in $H\text{-}FT^2\text{-}F$
Domestic cold water	All sizes	1"	0.28
Domestic hot water and hot water return (140°F and under)	Up thru 1¼ ” 1½” and larger	1" 1½"	0.28
Domestic hot water and Hot water return (140°F to 200°F)	Up to 1¼” 1½” and larger	1 ½” 2”	0.28

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: 2022-01072

SECTION 22 10 00

PLUMBING PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Sanitary piping system.

B. Domestic water piping system

C. Natural gas piping system.

D. 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.

L. ASME B16.26 - Cast Bronze Fittings for Flared Copper Tubes.

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.

AD. ASTM D2235 - Solvent Cement for Acrylonitrile - Butadiene - Styrene (ABS) Plastic Pipe and Fittings.

AE. ASTM D2241 - Poly (Vinyl Chloride) (PVC) Plastic Pipe (SDR-PR).

AF. ASTM D2466 - Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.

AG. ASTM D2564 - Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings.

AH. ASTM D2680 - Acrylonitrile-Butadiene-Styrene (ABS) Composite-Sewer Piping.

AI. ASTM D2683 - Socket-Type Polyethylene Fillings for Outside Diameter-Controlled Polyethylene Pipe.

AJ. ASTM D2729 - Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

AK. ASTM D2751 - Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings.

AL. ASTM D2846 - Chlorinated Polyvinyl Chloride (CPVC) Pipe, Fittings, Solvent Cements and Adhesives for Potable Hot Water Systems.

AM. ASTM D2855 - Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.

AN. ASTM D3033 - Type PSP Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

AO. ASTM D3034 - Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

AP. ASTM D3309 - Polybutylene (PB) Plastic Hot Water Distribution System.

AQ. ASTM F477 - Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

AR. ASTM F493 - Solvent Cements for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe and Fittings.

AS. ASTM F891, Schedule 40 Cellular Core PVC-DWV Pipe.

AT. AWS A5.8 - Brazing Filler Metal.

AU. AWWA C105 - Polyethylene Encasement for Ductile Iron Piping for Water and Other Liquids.

AV. AWWA C110 - Ductile - Iron and Gray - Iron Fittings 3 in. through 48 in., for Water and Other Liquids.

AW. AWWA C111- Rubber-Gasket Joints for Ductile Iron and Gray-Iron Pressure Pipe and Fittings.

AX. AWWA C151 - Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water or Other Liquids.

AY. AWWA C606 – Grooved and Shouldered Joints.

AZ. AWWA C651 - Disinfecting Water Mains.

BA. CISPI 301 - Cast Iron Soil Pipe and Fittings for Hubless Cast Iron Sanitary Systems.

BB. CISPI 310 - Joints for Hubless Cast Iron Sanitary Systems.

BC. NCPWB - Procedure Specifications for Pipe Welding.

BD. NFPA 54 - National Fuel Gas Code.

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 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.
   2. Joints: Hub-and-spigot, CISPI HSN compression type with ASTM C564 neoprene gaskets.

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.
   2. Joints: ASTM D2855, solvent weld with ASTM D2564 solvent cement.

2.2 SANITARY 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.
2. Joints: Neoprene gaskets and stainless steel clamp-and-shield assemblies.

C. Gravity Steel Pipe: ASTM A53 Schedule 40, galvanized.
1. Cast Iron Fittings: ASME B16.1, flanges and fittings; ASME B16.4, screwed fittings.
2. Malleable Iron Fittings: ASME B16.3, screwed type. ASTM A47.
3. Ductile Iron Fittings: Grooved end, ASTM A536.
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.
2. Joints: ASTM D2855, solvent weld with ASTM D2564 solvent cement.

E. CPVC Pipe: ASTM D2846 (When approved by the Architect/Engineer).
1. Fittings: ASTM D2846, CPVC
2. Joints: ASTM D2846, solvent weld with ASTM F493 solvent cement.

2.3 DOMESTIC WATER PIPING, BURIED BEYOND 5 FEET OF BUILDING (Must be approved by governing authorities)

A. Ductile Iron Pipe: ANSI/AAWWA C151/A21.51 rated 350 psi with Class 350 fittings.

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)
3. Pipe Joints: Push on, ANSI/AWWA C1533/A21.53, with Tyton gaskets.
4. Fitting Joints: Mechanical, compact, ANSI/AWWA 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 manufacturer’s 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.
2. Joints: AWS A5.8, BCuP silver braze if allowed by code, otherwise ASTM B32 solder, lead free Grade 95-5 tin-antimony or tin-silver, with melting range of 430 to 535 degrees F.

C. Polyethylene Pipe 1½” or smaller

1. Pipe - Polyethylene (PE) flexible plastic, ASTM D2239 rated 160 psi minimum.
2. Fittings - PE barbed insert fittings.
3. Joints - Stainless steel clamps over barbed insert fittings.

D. PVC Pipe:
1. 2½" and 3" - ASTM D2241, SDR 21 - Class 200 AWWA C900.
2. 4" and Larger - ASTM D2241, DR18-Class 150 AWWA C900.
3. Fittings: ASTM D2466, PVC
4. Joints: ASTM D3139, integral bell and gasket seal installed with concrete thrust block or ASTM D2855, solvent weld with ASTM D2564 solvent cement.

2.4 DOMESTIC WATER PIPING, BURIED WITHIN 5 FEET OF BUILDING (Must be approved by governing authorities)

A. Ductile Iron Pipe: ANSI/AAWWA C151/A21.51 rated 350 psi. with Class 350 fittings.

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)
3. Pipe Joints: Push on, ANSI/AWWA C1533/A21.53, with Tyton gaskets.
4. Fitting Joints: Mechanical, compact, ANSI/AWWA 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.
2. Joints: AWS A5.8, BCuP silver braze.
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.
4. Joints: ASTM D2855, solvent weld with ASTM D2564 solvent cement.

2.5 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 -30ºF to +230ºF 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.

2.6 NATURAL GAS PIPING, ABOVE GRADE INSIDE OF BUILDING OR OUTDOORS EXPOSED

A. Steel Pipe: ASTM A53, Schedule 40 black.
1. Fittings: ASME B16.3, malleable iron or ASTM A234, forged steel welding type.
2. Joints: NFPA 54, threaded or welded to ANSI B31.1, ANSI B31.2, ANSI B31.9, ASME Sec. 9.
3. If both ends of the pipe sleeve within the same building terminate indoors, the pipe sleeve shall not be sealed or vented.
4. If one end of the pipe sleeve terminates outdoors and the other terminates indoors, the pipe sleeve shall be sealed and vented.
5. Exterior piping shall be painted with paint for steel pipe and outdoor rated.

2.7 NATURAL GAS PIPING INSIDE BUILDING, BELOW GROUND, INSIDE SOLID WALLS OR SOLID FLOORS

A. Steel pipe, ASTM A53, Schedule 80, black iron with welded joints, encased in a Schedule 40 steel, wrought iron, PVC or ABS pipe sleeve. The sleeve shall be sealed and capable of containing full gas pressure in the event of a leak in the gas pipe. The sleeve shall be vented to a vent located 12” min. above the roof with a cap to prevent the entrance of water and insects. All gas piping shall be in conformance with the National Fuel Gas Code NFPA 54, the requirements of the State Building Code, the local Fire Marshal and the Office of Fire Safety (OFS).

1. The gas shutoff valves serving the Science Rooms shall be made accessible from the Corridor. Each shutoff valve shall be located in a recessed box furnished and installed by the General Contractor. Each shutoff valve shall serve to shut off all gas outlets in the one adjacent room only.

2. All gas piping located below the floor shall be located under the concrete, not in the concrete, and shall be located a minimum of 12” below the top of the floor.

2.8 NATURAL GAS PIPING IN CONCEALED LOCATIONS

A. Steel pipe, ASTM A53, Schedule 80, black iron with welded joints.

1. A concealed location is a location that cannot be accessed without damaging permanent parts of the building structure or finish surface. Spaces above, below or behind removable panels or doors shall not be considered concealed.

2.9 PIPE HANGERS AND SUPPORTS

A. Refer to Section 22 05 00.

2.10 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.

2.11 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.

2.12 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).

2.13 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.

2.14 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.

2.15 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™.

2.16 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.

C. Manual (Multiple Turn Balancing Valves): Victaulic Series 786/787/78K circuit balancing valve.

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 warrantee to guarantee all materials and workmanship. See drawings for flow rate of valve.

2.17 SWING CHECK VALVES

A. Up to and including 3 Inches: Bronze swing disc, solder or screwed ends.

2.18 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.

2.19 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. Valve shall be as manufactured by Bell and Gossett.

2.20 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.

2.21 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. Grooved-End Strainers: Size 2 inch through 12 inch, 300 psig working pressure, Y-pattern with 1/16 or 1/8 inch stainless steel perforated screen. Victaulic Series 732.

2.22 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.

2.23 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 ¼" 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 wht 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 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.

3.6 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.

3.7 SERVICE CONNECTIONS

A. 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.

B. 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.

C. Contractor shall pay all fees, costs, etc. to local authorities for tap-ins, inspections, etc. as required.

3.8 NATURAL GAS PIPING

A. Natural gas piping located outdoors shall be prime painted and finish painted with rust prohibitor paint that includes zinc. Color shall be selected by the Architect.

B. Natural gas piping supports shall occur on 8’-0” centers and at changes in direction.

C. Natural gas piping installed outdoors on the roof shall be supported at a minimum of 3½” above roof level.

D. Roof supports shall be a manufactured support similar to PHP-SS8 or equal by Miro.

E. 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.

F. Do not encase fitting joints and flanges.

END OF SECTION

MAI: 2022-01072

SECTION 23 05 00

HVAC 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 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, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and 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.

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, 40ºC 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.

4. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

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:

Pipe Size	Steel Pipe	Copper Pipe	PVC Pipe	Rod Size
½ to ¾ inch	6 feet	5 feet	4 feet	3/8”
1 inch	7 feet	5 feet	4 feet	3/8”
1 ¼ inch	7 feet	7 feet	4 feet	3/8”
1½ inch	7 feet	7 feet	4 feet	1/2”
2 inch	10 feet	8 feet	4 feet	1/2"
2½ inch	11 feet	9 feet	4 feet	5/8”
3 inch	11 feet	9 feet	4 feet	5/8”
3 ½ inch	13 feet	11 feet	4 feet	5/8”
4 inch	14 feet	12 feet	4 feet	5/8”

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.

F. Hangers for Hot Pipe Sizes thru 4 Inches: 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.

I. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.

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. Floor Support for Hot Pipe Sizes 5 Inches and Over: Adjustable cast iron roll and stand, steel screws, 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.

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

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SECTION 23 05 53

HVAC IDENTIFICATION

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.
   5. Ductwork and Equipment: 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. 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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SECTION 23 05 93

TESTING, ADJUSTING, AND BALANCING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Testing, adjustment, and balancing of air systems.

B. 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.

C. ASHRAE 111 - Practices for Measurement, Testing, Adjusting, and Balancing of Building Heating, Ventilation, Air-conditioning, and Refrigeration Systems.

D. NEBB - Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems.

E. SMACNA - HVAC Systems Testing, Adjusting, and Balancing.

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)

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.

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.

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 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. 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
7. Electric Duct Heater:
   a. Manufacturer
   b. Identification/number
   c. Location
   d. Model number
   e. Design kW
   f. Number of stages
   g. Phase, voltage, amperage
   h. Test voltage (each phase)
   i. Test amperage (each phase)
   j. Air flow, specified and actual

k. Temperature rise, specified and actual

8. 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
   j. Inlet pressure
   k. Discharge pressure
   l. Sheave Make/Size/Bore
   m. Number of Belts/Make/Size
   n. Fan RPM
9. 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
10. 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
11. 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

12. 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
13. 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
14. 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

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.

D. All ducts located in unconditioned attic spaces.

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"
      b. ASTM C553, "Standard Specification for Mineral Fiber Blanket and Felt 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
3.	National Fire Protection Association	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. 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 AND STACKS 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 stables 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. Ductwork Located in Attic Space

a. Rectangular, round or oval ductwork: Fiberglas All-Service duct wrap, light density glass fiber insulation in roll form, 2" 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 stables 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 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.

4. 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.

5. 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 insulaiton.

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.

6. Ductwork Located In Unconditioned Attic Space

a. All ductwork routed through unconditioned attic spaces shall be insulated, even if not called to be insulated, when located in an unconditioned space. Supply air ductwork insulation thickness in an unconditioned attic space shall be twice (double) the insulation thickness listed in the specification.

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 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 30 00

AIR DISTRIBUTION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Metal ductwork

B. Nonmetal ductwork.

C. Single wall spiral duct and fittings

D. Dampers.

E. Duct cleaning.

F. V.A.V. box with electric heat.

G. Roof hoods, exhaust fans, grilles and louvers.

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.

C. ASTM A167 - Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.

D. ASTM A366 - Steel, Sheet, Carbon, Cold Rolled, Commercial Quality.

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.

L. NFPA 54 - National Fuel Gas Code.

M. NFPA 70 - National Electric Code.

N. NFPA 90A - Installation of Air Conditioning and Ventilating Systems.

O. NFPA 90B - Installation of Warm Air Heating and Air Conditioning Systems.

P. SMACNA - HVAC Air Duct Leakage Test Manual.

Q. SMACNA - HVAC Duct Construction Standards - Metal and Flexible.

R. SMACNA - Fibrous Glass Duct Construction Standards.

S. UL 33 - Heat Responsive Links for Fire Protection Systems.

T. UL 181 - Factory-Made Air Ducts and Connectors.

U. UL 555 - Fire Dampers and Ceiling Dampers.

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

A. Galvanized Steel Ducts: ASTM A525 and ASTM A527 galvanized steel sheet, lock-forming quality, having G60 zinc coating of in conformance with ASTM A90.

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

a. All ductwork including supply air, outside air, return air, exhaust air and relief air ductwork shall have joints sealed.

b. Ductwork designed at SMACNA 6" pressure shall meet SMACNA Class "A" seal requirements.

c. 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:

DEGREE OF ELBOW	NUMBER OF GORES
less than 36°	2
37° thru 71°	3
72° thru 90°	5

Where it is necessary to use two-piece mitered elbows, they shall have a minimum number of vanes in accordance with the following:

DUCT DIAMETER	NUMBER OF VANES
3" thru 9"	2
10" thru 20"	3
21" and up	5

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 1¼” x 1¼” 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 2½”x2½” 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.
   2. Net Fabric Width: Approximately 3 inches wide.
   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 it's 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 VOLUME BOX TERMINAL UNITS WITH ELECTRIC HEAT

A. Casting: 22 gage galvanized steel.

B. Insulation: Interior surface of unit casing shall be acoustically and thermally lined with foil faced ½" insulation with R-value of 2.2 and density of 1.9 lb/cu ft. Insulation shall be UL 181 approved and meet NFPA-90A and bacteriological standard ASTM C665.

C. Primary Air Valve: Cylindrical flow control device with an integral electric actuator. Valve inlet shall be die cast aluminum and tapered to fit standard round flexible ductwork. Maximum leak rate shall be 1 percent at 4 inches w.g. inlet static pressure. Integral multiple point, averaging flow sensing ring to provide primary air flow measurement with ± 5 percent of unit rated airflow with 1½ diameters of straight duct upstream of unit. Provide integral flow taps and calibration chart on each unit.

D. Outlet Connection: Flanged connection for electric heat V.A.V. box.

E. All V.A.V. boxes with electric heat shall be U.L listed.

F. Electric Heater: Factory furnished and mounted, UL recognized, 3 stage resistance open-type heater with air flow switch, disc-type automatic thermal primary safety device, and manual reset thermal secondary safety device. Heater element material shall be nickel-chromium. Terminal connections shall be plated steel with ceramic or phenolic insulators.

G. Electric Heat Contactors: Contactors shall be 3 stage mercury contactors. Contactors shall be an integral part of the control panel.

H. Transformer: Furnish 24 VAC for controls as an integral component of the control panel.

I. Access Panel: Furnish an access panel in the bottom of the unit to provide access to the air valve.

J. Disconnects: Furnish a fused disconnect on the interlocking door handle of heater control box.

2.14 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.

2.15 ROOF AIR INTAKE HOODS OR RELIEF AIR HOODS

A. See schedules on drawings and furnish all.

2.16 EXHAUST FANS

A. See schedules on drawings and furnish all.

2.17 DIFFUSERS AND GRILLES

A. See schedules on drawings and furnish all.

2.18 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

MAI: 2022-01072

SECTION 23 74 00

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 RTU - Trane Packaged Gas/Electric Convertible, 1½ - 5 ton

A. General

1. All units shall be factory assembled, piped, internally wired and fully charged with R-410A. All units shall be designed to operate at outdoor ambient temperatures as high as 115°F. Cooling capacities shall be rated in accordance with A.R.I. standards. The YCC-F heating/cooling unit design is certified by the American Gas Association (A.G.A.) or Canadian Standards Association C.S.A.) specifically for outdoor applications using propane or natural gas. All units shall be designed for outdoor rooftop or ground level installation. Exterior surfaces of

all units shall be phosphatized, zinc-coated steel with epoxy resin primer and baked enamel finish. Shipped for horizontal application, convertible to downflow.

B. Casing: All panels shall be 20 gauge steel, gasketed and insulated. Foil faced glass fiber insulation shall be in the heat exchanger section. Mat faced insulation shall be in the evaporator section. Base pan and mounting rails shall be 18 gauge.

C. Controls: Refrigeration cycle controls shall include condenser fan, evaporator fan and compressor contactors. Compressor shall be equipped with a combination internal winding thermostat/current overload. Internal high pressure relief shall also be avoided.

D. Refrigeration System

1. Compressors - All units shall have hermetically sealed Climatuff™ compressors. Compressors shall be equipped with over temperature, over current and high pressure protection. Crankcase heaters shall be standard on all three phase models.

2. Evaporator Coil - Internally enhanced 3/8 inch OD seamless copper tubing mechanically bonded to aluminum fins, factory pressure and leak tested at 250 to 300 psig.

3. Condenser Coil - Outdoor coils shall be internally enhanced 3/8 inch OD seamless copper tubing mechanically bonded to aluminum fins. Each coil shall be factory pressure and leak tested at 420 psig.

4. Indoor Air Fan - Direct drive, forward curved, centrifugal type. Motor shall have thermal overload protection. Permanently lubricated motor bearings. Motor/blower assembly isolated from unit with rubber mounts.

5. Condenser Fan - Direct drive, draw thru propeller type. Weather proofed permanent split capacitor fan motor shall have built in thermal overload and permanently lubricated motor bearings.

6. Low Ambient - Standard refrigerant system operation down to 55°F. Low ambient accessory required for operation in 0°F ambient condition.

E. Heating System

1. Gas Fired Heating Section - Models shall provide completely assembled, wired and piped gas fired heating systems within unit. Design certified by A..G.A. or C.S.A., specifically for outdoor application. Threaded gas connection on the unit.

2. Electronic Ignition System - Main burner is lit each time thermostat calls for heat. Flame sensor proves flame and keeps the main burners on. Should a loss of flame occur, the main valve closes and the spark recurs within 0.8 second. When thermostat is satisfied, main burner is extinguished.

3. Forced Combustion Blower - Insures flame stability under varying wind conditions. Gives higher combustion efficiency and location flexibility.

4. Heat Exchanger - Aluminized steel tubes. Free floating design.

5. Burners - 20 gauge aluminized steel. Multi-port inshot.

F. Downflow Accessories

1. Roof Curb - The roof curb shall be designed to mate with the unit and provide support and complete weather-tight installation when properly installed. Curb shall ship knocked down for field assembly, and include wood nailer strips.

2. Fully Modulating Economizer - This accessory shall be field installed and be composed of the following items: 0-100% fresh air damper, damper drive motor, fixed dry bulb enthalpy control, and low voltage polarized plug for electrical connections. Solid state enthalpy or differential enthalpy control is optional. Economizer operations shall be controlled by the preset position of the enthalpy control. A barometric relief damper shall be standard with the economizer and provide a pressure operated damper that shall be gravity closing and prohibit entrance of outside air on equipment “off” cycle.

3. Manual Fresh Air Hood - Manual outside air provides a fixed outside air quantity from 0 to 25 percent. Includes hood and birdscreen.

4. Low Ambient Control - Control allows cycling of compressor under low ambient cooling conditions. Required for cooling operation to 0°F.

G. Field Installed Control Options.

1. Thermostats - Two stages heating/cooling or one stage heating/cooling thermostats are available in either manual or automatic changeover.

2. Programmable Electronic Night Setback Thermostat - Heating setback and cooling setup with 7-day, 5-1-1 programming capability. Available in 2 heating/cooling or 1 heating/cooling versions with automatic changeover.

3. Economizer Controls - The standard equipment offering is a fixed dry bulb changeover control. In addition to the standard offering, there are two other field installed control accessories.

4. Enthalpy Control - Replaces the dry bulb control with a solid state dry bulb and wet bulb changeover controller which has a fully adjustable set point. Enthalpy control offers a higher level of energy savings potential than the standard dry bulb control due to the additional wet bulb sensing capability.

5. Differential Enthalpy - Replaces the standard dry bulb control with two enthalpy sensors that compare total heat content of the indoor air and outdoor air to determine the most efficient entering air source. This control option offers the highest level of energy efficiency available.

H. 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.

2.2 ROOFTOP RTU - Trane Packaged Precedent 3 - 10 ton

A. General

1. Units shall be convertible airflow. Operating range shall be between 115°F and 0°F cooling as standard from the factory for units with microprocessor controls. Operating range for units with electromechanical controls shall be between 115°F and 40°F. 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 with ANSIZ21.47 for gas fired central furnaces and UL 1995/CAN/CSA NO. 236-M90 for central cooling air conditioners. Canadian units shall be CSA certified.

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 1000 hours in a salt 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 while providing a water and air tight seal. All exposed vertical panels and top covers in the indoor air section shall be insulated with a cleanable foil faced, fire retardant permanent, odorless glass fiber material. The base of the unit shall be insulated with ½ inch, 1 pound density foil faced, closed cell material. All insulation edges shall be either captured or sealed. The unit's base pan shall have no penetrations within the perimeter of the curb other than the raised 1 1/8 inch high downflow 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, with forklift capabilities on three sides of the unit.

C. Unit Top

1. The top cover shall be one piece construction or, where seams exist, it shall be double-hemmed and gasket-sealed. The ribbed top adds extra strength and prevents water from poling on unit top.

D. Filters

1. One inch, throwaway filters shall be standard on all 3-5 ton units. The filter rack can be converted to two inch capability. Two inch filters shall be factory supplied on all 6-10 ton units.

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.

E. Compressors

1. All 3 ton standard efficiency units shall have direct drive, hermetic, reciprocating type compressors. The reciprocating type compressors have a 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. The compressor shall have internal spring isolation and sound muffling to minimize vibration transmission and noise. Low pressure switches shall be standard.

2. 3 ton high efficiency, 4 and 10 ton standard and high efficiency units shall have direct drive, hermetic, scroll type compressors with centrifugal type oil pumps. Motor shall be suction gas cooled and have a voltage utilization range of plus or minus 10 percent of unit nameplate voltage. Internal overloads shall be provided with the scroll compressors.

F. Refrigerant Circuits

1. Each refrigerant circuit offers a choice of independent fixed orifice expansion device or thermal expansion valve. Service pressure ports, and refrigerant line filter driers shall be factory installed as standard. An area shall be provided for replacement suction line driers.

G. Evaporator and Condenser Coils

1. Internally finned, 5/16” copper tubes mechanically bonded to a 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. The condensate coil shall have a patent pending 1+1+1 hybrid design with slight gaps for ease of cleaning. A removable, reversible, double sloped condensate drain pan is standard. Provision for through the base condensate drain is standard.

H. Gas Heating Section

1. The heating section shall have a progressive tubular heat exchanger design using stainless steel burners and corrosion resistant steel throughout. An induced draft combustion blower shall be used to pull the combustion products through the firing tubes. The heater shall use a direct spark ignition (DSI) system. On initial call for heat, the combustion blower shall purge the heat exchanger for 20 seconds before ignition. After three unsuccessful ignition attempts, the entire heating system shall be locked out until manually reset at the thermostat/zone sensor. Units shall be suitable for use with natural gas or propane (field installed kit) and also comply with the California requirement for low NOx emissions.

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 shall be permanently lubricated and shall have built-in thermal overload protection.

J. Indoor Fan

1. All 3 ton 3-phase units offer a choice of direct drive, FC, centrifugal fans or belt driven, FC centrifugal fans with adjustable motor sheaves. All 3-5 ton 1-phase units shall be direct drive motor only. All 6-10 ton units shall have belt drive motors. Units with belt drive motors shall have an adjustable idler arm assembly for quick adjustment to fan belts and motor sheaves. All motors shall be thermally protected. Direct drive oversized motors shall be available for high static operations. All indoor fan motors meet the U.S. Energy Policy Act of 1992 (EPACT).

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 an external location for mounting a fused disconnect device.

2. A choice of micro-processor controls or electromechanical controls shall be available.

3. Microprocessor controls provide for all 24 volt control functions. With the microprocessor controls, 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 set point, and provides better building comfort. A centralized microprocessor shall provide anti-short cycle timing and time delay between compressors to provide a higher level of machine protection.

4. 24 volt electromechanical control circuit shall include control transformer and contactor pressure lugs for power wiring. Unit shall have single point power entry as standard.

L. Accessories/Options

1. Roof Curb - The roof curb shall be designed to mate with the unit's downflow supply and return openings and provide support and a watertight installation when installed properly. The roof curb design shall allow field fabricated rectangular supply/return ductwork to be connected directly to the curb. Curb design shall comply with NRCA requirements. Curb shall be shipped knocked down for field assembly and shall include wood nailer strips.

2. Economizer - This accessory shall be either field or factory installed and is available with or without barometric relief. The assembly includes fully modulating 0-100 percent motor and dampers, minimum position setting, preset linkage, wiring harness with plug, and fixed dry bulb control. Optional solid state enthalpy and differential enthalpy control shall be either factory or field installed. The factory installed economizer arrives in the shipping position and shall be moved to the operating position by the installing contractor.

3. Remote Potentiometer - Field installed, the minimum position setting of economizer shall be adjusted with this accessory.

4. Motorized Outside Air Dampers - Factory or field installed 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.

5. Manual Outside Air Damper - Factory or field installed rain hood and screen shall provide up to 50 percent outside air.

6. Oversized Motors - Factory or field installed direct drive oversized motors shall be available for high static applications.

7. Powered Exhaust - The field installed powered exhaust, available for 6-10 ton units, shall provide exhaust of return air, when using an economizer, to maintain better building pressurization.

8. Discharge Air Sensing - This factory or field option provides true discharge air sensing in heating models. This sensor is a status indicator readable through Tracer® or Tracker®. This option is available for microprocessor controlled units.

9. Coil Guards - Hail protection quality coil guards shall be either factory or field installed for condenser coil protection.

10. Through the Base Electrical Access - An electrical service entrance shall be factory provided allowing electrical access for both control and main power connections inside the curb and through the base of the unit. Option will allow

for field installation of liquid tight conduit and an external field installed disconnect switch.

11. Through the Base Electrical with Disconnect Switch - Factory installed 3 pole, molded case disconnect switch with provisions for through the base electrical connections are available. The disconnect switch will be installed in the unit in a water tight enclosure with access through a swinging door. Factory wiring will be provided from the switch to the unit high voltage terminal block. The switch will be UL/CSA agency recognized. Note: the disconnect switch will be sized per NEC and UL guidelines but will not be used in place of unit overcurrent protection.

12. Through the Base Electrical with Circuit Breaker - This option is a factory installed thermal magnetic, molded case, HACR Circuit Breaker with provisions for through the base electrical connections. The circuit breaker will be installed in a water tight enclosure in the unit with access through a swinging door. Factory wiring will be provided from a switch to the unit high voltage terminal block. The circuit breaker will provide overcurrent protection, be sized per NEC and UL guidelines, and be agency recognized by UL/CSA.

13. Powered or Unpowered Convenience Outlet - This factory installed option is a GFCI, 120V/15 amp, 2 plug, convenience outlet, either powered or unpowered. When the convenience outlet is powered, a service receptacle disconnect will be available. The convenience outlet is powered from the line side of the disconnect or circuit breaker, and therefore will not be affected by the position of the disconnect or circuit breaker. This option can only be ordered when the Though the Base Electrical with either the Disconnect Switch, or Circuit Breaker option is ordered.

14. Through the Base Gas Piping - The unit shall include a standard through the base gas provision. This factory installed option shall have all piping necessary including a pre-assembled, black steel, manual gas shut-off valve shall include a 1/8” NPT pressure tap. This assembly will require minor field labor to install.

15. Fan Failure/Clogged Filter Switches - These factory or field-installed options allow for individual fan failure and dirty filter indication in microprocessor controlled units. The fan failure switch will disable all unit functions and “flash” the Service LED on the zone sensor. The dirty filter switch will light the Service LED on the zone sensor and will allow continued unit operation.

16. Reference or Comparative Enthalpy - Reference or Comparative Enthalpy option shall be available when a factory installed downflow economizer is ordered. This option is available for micro controlled units.

17. High Pressure Cutout - This factory installed option is offered for units that do not have high pressure cutout as standard. All 3-phase models with scroll compressors include high pressure cutout as standard.

18. Hinged Access Doors - Sheet metal hinges are available factory installed on the filter/evaporator access door, indoor fan/heat exchanger door, and the compressor/control access door.

19. Supply and/or Return Air Smoke Detector - With this option installed, if smoke is detected, all unit operation will be shut down. Reset will be manual at the unit. Return air smoke detectors require minimum allowable airflow when used with certain models. See the Installation, Operation, and Maintenance (IOM) manual for the models affected and the minimum allowable airflow required. This option is available for micro controlled units.

20. 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. Control Options

1. COMM3/4 Communication Interface - This factory or field installed option shall be provided to interface microprocessor controlled units with the Trane Integrated Comfort™ systems.

2. Comm-5 LonTalk Communication Interface - This factory or field installed option shall be provided to allow the unit to communicate as a Trane Comm-5 device or directly with generic LonTalk Network Building Automation System Controls.

3. Zone Sensor - Field installed, this accessory shall be provided to interface with the Micro equipped units and shall be available in either manual, automatic programmable with night setback, with system malfunction lights or remote sensor options.

4. Thermostats - Two stage heating and cooling operation or one stage heating and cooling shall be available, for field installation, in either manual or automatic changeover. Automatic programmable electronic with night set back shall also be available.

5. Novar Unit Controls - Optional Novar rooftop unit controls shall be factory installed and tested. The Novar electronic thermostat module will interface with the unit microprocesser and will control the unit to the desired stage of cooling or heating.

6. Novar Return Air Sensor - This option, when used in conjunction with Novar Controls, will contain a factory provided and wired zone temperature sensor located in the return air stream.

7. Enthalpy Control - Replaces the dry bulb control with a wet bulb changeover controller which has a fully adjustable setpoint. Enthalpy control offers a higher level of comfort control, along with energy savings potential, then the standard dry bulb control. This is due to the additional wet bulb sensing capability. This option shall be available for microprocessor controlled units. It can be field installed or factory installed with the factory installed economizer.

8. Differential Enthalpy - Replaces standard dry bulb control with two enthalpy sensors that compare total heat content of the indoor air and outdoor air to determine the most efficient air source. This control option offers the highest level of comfort control, plus energy efficiency, available. This option shall be available for microprocessor controlled units. It can be field installed or factory installed with the factory installed economizer.

9. Low Ambient Cooling - All microprocessor units shall have cooling capabilities down to 0°F as standard. Electromechanical models have cooling capabilities to 40°F as built, or to 0°F by adding the optional low ambient (frostat) control.

10. Thermal Expansion Valve - All units shall have a short orifice refrigerate control metering device. For more exact refrigerant flow, when using unit in low airflow applications, a Thermal Expansion Valve option shall be available.

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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SECTION 26 00 00

BASIC ELECTRICAL REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Basic electrical Requirements specifically applicable to Division 26 & 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 & 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 advising that all of the Division 26 & 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's Office. 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's Office.

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. Division 26 & 28 Contractor shall be responsible to coordinate with the site Restoration Contractor for the new underground electrical work.

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. Exposed work is defined as non-finished spaces, such as mechanical / electrical rooms or as indicated on architectural room schedules. All finished spaces, installation shall be concealed. Refer to Architectural drawing for room finish schedules.

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 INTERFERENCES

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 countertop, furniture layouts 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.

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. Division 26 & 28 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. Division 26 & 28 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 & 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

A. Conform to requirements of 2015 Michigan Building Code, 2017 Electrical Code Rules Part 8, 2009 ICC/ANSI 117.1 and local code requirements.

1.10 SUBMITTALS

A. Submit electronic shop drawing files.

B. Proposed Products List: Include Products specified in the following Sections:

1. Section 26 05 36 - Cable Tray
2. Section 26 09 23 - Occupancy Sensor Controls
3. Section 26 24 16 - Panelboards
4. Section 26 32 00 - Packaged Generator/Transfer Switch
5. Section 26 51 13 - Interior Luminaires
6. Section 28 31 00 - Fire Alarm

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.

B. Conform to requirements of 2015 Michigan Building Code, 2017 National Electrical Code, 2017 State of Michigan Code Rules Part 8, 2009 ICC/ANSI 117.1 and local code requirements.

C. Equipment: U.L. tested and approved for its purpose for compliance to 2017 NEC 110.3(c).

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.

E. Equipment: Conform to requirements of 2015 Michigan Building Code, 2017 National Electrical Code, 2017 State of Michigan Code Rules Part 8, 2009 ICC/ANSI 117.1 and local code requirements.

F. Life Safety NFPA 101 – The State of Michigan current adopted edition.

G. 2015 Michigan Energy Code.

H. ASHRAE 90.1 2013 Edition.

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 & 28.

END OF SECTION

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SECTION 26 05 05

SELECTIVE DEMOLITION FOR ELECTRICAL

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Electrical demolition per plans and specifications.

B. Conduit supports.

C. Data.

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.

C. Upon removal of the existing ceiling, the Electrical Trades shall immediately notify the construction manager, Architect and Engineer in writing regarding existing conduits scheduled to remain that are not properly supported. Conduit evaluation shall be conducted with the Owner, Architect and Engineer. Failure for the Electrical Trades to submit a written conduit support condition will obligate the trade to support the conduits to meet current Code methods at no additional cost to the Owner.

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. Remove all electrical as noted or shown on the demolition plans.

B. Mechanical trades or BAS Contractor shall remove all associated temperature components, and associated conduit and wiring.

C. Electrical Trades shall remove all of the existing electrical branch panelboards as noted, scheduled and shown on the drawings and specifications. Confirm all outages with the Owner to starting the replacement work.

D. Remove all unused conduits and wiring serving lighting and power being removed from the finished ceiling space. Remove all abandoned low voltage cables from accessible portions 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).

E. The Owner shall be responsible for main incoming internet and voice service to the building.

F. The Owner shall be responsible for main incoming cable TV service to the building.

G. Electrical Contractors are responsible to confirm all demolition quantities. Make pre-bid site visit arrangements as deemed necessary.

H. Remove all existing data cables.

END OF SECTION

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SECTION 26 05 19

LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Building wire and cable.

B. Fire rated cables.

C. 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

A. Conform to requirements of 2015 Michigan Building Code, 2017 National Electrical Code, 2017 State of Michigan Code Rules Part 8, 2009 ICC/ANSI 117.1 and local code requirements.

1.4 PROJECT CONDITIONS

A. Verify that field measurements are as shown on Drawings.

B. Conductor sizes are based on copper.

C. Routing shown on Drawings is approximate unless dimensioned. Field route as required to best suit Project Conditions.

D. Where wire and cable routing is not shown, and only a load destination is shown, determine exact routing and lengths required.

1.5 COORDINATION

A. Coordinate Work under provisions of Division 1.

B. Determine required separation between cable and other work.

C. Determine cable routing to avoid interference with other work.

1.6 REGULATORY REQUIREMENTS

A. Conform to requirements of 2015 Michigan Building Code, 2017 National Electrical Code, 2017 State of Michigan Code Rules Part 8, 2009 ICC/ANSI 117.1 and local code 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.

2.3 FIRE RATED CABLE

A. Provide fire rated type cables for generator control conductors.

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 stranded conductors for control circuits.

C. Use conductor size not smaller than 12 AWG for power and lighting circuits.

D. Use 10 AWG conductors for 20 ampere, 120 volt branch circuits longer than 100 feet.

E. Pull all conductors into raceway at same time.

F. Protect exposed cable from damage.

G. Support cables above accessible ceiling, using spring metal clips or plastic cable ties to support cables from structure. Do not rest cable on ceiling panels.

H. Use suitable cable fittings and connectors.

I. Neatly train and lace wiring inside boxes, equipment, and panelboards.

J. Clean conductor surfaces before installing lugs and connectors.

K. Splices are not permitted.

L. All power wiring shall be installed in conduit. Low-voltage wiring shall utilize the cable management methods that meet industry standards as noted on the drawings. Conduit drops for fire alarm devices, card readers, power assisted doors, and outlets shall be required. Electrical Trades shall be responsible for coordinating with the Owner's low-voltage system and drawings for required raceway. Low voltage cables installed in accessible ceiling space need not to be in conduit. However, the cables must be properly secured to the ceiling structure.

M. Refer to Section 26 09 23 for Occupancy Sensors wiring.

N. Refer to Section 26 32 00 for Generator Control Conductor.

O. Refer to Section 28 31 00 for Fire Alarm wiring.

P. 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.

Q. Shared neutrals for lighting and power circuits are not permitted.

R. MC cable shall only be acceptable as the final connection to light fixtures installed in accessible ceilings. Maximum cable shall not exceed 6 feet. MC cable shall not be used for homeruns or feeders.

3.3 INTERFACE WITH OTHER PRODUCTS

A. Identify wire and cable under provisions of Section 26 05 53.

B. Identify each conductor with its circuit number or other designation indicated on Drawings.

C. Generator control conductors between the transfer switch and generator shall be independent from all other wiring. Provide 2 hour rated wiring.

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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SECTION 26 05 26

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Equipment grounding conductors.

B. Bonding.

C. Building foundation grounding.

D. Server room isolated ground bar.

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. Conform to requirements of 2015 Michigan Building Code, 2017 National Electrical Code, 2017 State of Michigan Code Rules Part 8, 2009 ICC/ANSI 117.1 and local code requirements.

1.4 REGULATORY REQUIREMENTS

A. Conform to requirements of 2015 Michigan Building Code, 2017 National Electrical Code, 2017 State of Michigan Code Rules Part 8, 2009 ICC/ANSI 117.1 and local code 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

3.2 INSTALLATION

A. Furnish and install copper ground bar and stand-off bracket for the server room.

B. Bond server entrance grounding conductor to MDP panel, main water service, and foundation rebar.

C. Provide bonding to meet Regulatory Requirements.

D. Provide supplemental and service entrance grounding in accordance with 2017 NEC Section 250. Refer to Table 250-66.

E. Equipment Grounding Conductor: Provide a separate grounding conductor for lighting and power circuits as noted or specified on the drawings.

F. Bond the cable tray to the server room ground bar.

G. Complete the grounding conductor to the building foundation rebar in accordance with 2017 NEC 250-52 (3) requirements.

H. As shown and noted on the drawings, provide ground conductor from the new addition's foundation rebar back to the building's main distribution panel service ground bar. Provide minimum #4 grounding conductor from the main service enclosed circuit breaker to the data racks.

I. Bond wire mesh tray as noted on the drawings.

3.3 FIELD QUALITY CONTROL

A. Inspect grounding and bonding system conductors and connections for tightness and proper installation.

END OF SECTION

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SECTION 26 05 29

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Conduit and equipment supports.

B. Anchors and fasteners.

C. Generator pad.

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. Conform to requirements of 2015 Michigan Building Code, 2017 National Electrical Code, 2017 State of Michigan Code Rules Part 8, 2009 ICC/ANSI 117.1 and local code requirements.

1.4 REGULATORY REQUIREMENTS

A. Conform to requirements of 2015 Michigan Building Code, 2017 National Electrical Code, 2017 State of Michigan Code Rules Part 8, 2009 ICC/ANSI 117.1 and local code 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.

3. Concrete Surfaces: Use self-drilling anchors and expansion anchors.
4. Hollow Masonry, Plaster, and Gypsum Board Partitions: Use toggle bolts and hollow wall fasteners.
5. Solid Masonry Walls: Use expansion anchors.
6. Sheet Metal: Use sheet metal screws.
7. Wood Elements: Use wood screws.

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 cabinets and panelboards with minimum of four anchors.

I. Use sheet metal channel to bridge studs above and below cabinets and panelboards recessed in hollow partitions.

J. Construct generator concrete pad as detailed on the drawings.

END OF SECTION

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SECTION 26 05 33.13

CONDUIT FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Metal conduit.

B. Liquidtight flexible non-metallic conduit.

C. Electrical metallic tubing.

D. Nonmetal conduit.

E. Flexible nonmetallic conduit.

F. Fittings and conduit bodies.

G. MC Cable.

H. Conduit seals (foundation walls).

1.2 REGULATORY REQUIREMENTS

A. Conform to requirements of 2015 Michigan Building Code, 2017 National Electrical Code, 2017 State of Michigan Code Rules Part 8, 2009 ICC/ANSI 117.1 and local code 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.

D. Conform to requirements of 2015 Michigan Building Code, 2017 National Electrical Code, 2017 State of Michigan Code Rules Part 8, 2009 ICC/ANSI 117.1 and local code requirements.

E. NEMA TC 2 - Electrical Plastic Tubing (EPT) and Conduit (EPC-40 and EPC-80).

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

A. Conform to requirements of 2015 Michigan Building Code, 2017 National Electrical Code, 2017 State of Michigan Code Rules Part 8, 2009 ICC/ANSI 117.1 and local code 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 noted on the drawings.

B. Underground Installations:

1. Use Schedule 40 PVC conduit for general underground installation.

C. Outdoor Locations, Above Grade: Use rigid steel conduit.

D. Wet and Damp Locations: Use rigid conduit or liquid-tight non-metallic flexible conduit.

E. Dry Locations:

1. Concealed: Use electrical metallic tubing.
2. Exposed: Use electrical metallic tubing.
3. Use minimum 1” conduit for voice/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 wet or exterior location as final wiring connections to motors or electrical equipment, etc.

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 MC CABLE

A. Corrugated steel tubing with integral conductors.

B. Use MC cable as noted on the drawings or as specified in Building Wire and Cable Specification 26 05 19.

C. MC cable is not permitted for homeruns or feeders or branch device drops.

2.6 CONDUIT SEALS (FOUNDATION WALLS)

A. Modular elastomer type. EDM seal element. Nylon reinforcement. Pressure plate zinc plated bolts and nuts. Follow manufacturer's sizing chart and installation manual. Eaton Link Seal or equal.

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. Maintain 12 inch clearance between conduit and surfaces with temperatures exceeding 104 degrees F.

L. Use suitable caps to protect installed conduit against entrance of dirt and moisture.

M. Ground and bond conduit under provisions of Section 26 05 26.

N. Firestop the conduits passing thru fire rated walls. Electrical Contractor shall be responsible to review the Architectural Life Safety drawings for fire rated wall locations.

O. The control system contractor shall be responsible to adhere to the mechanical plans and/or temperature control system drawings to establish conduit routes.

P. Electrical Contractor shall be required to install new conduit (concealed) in all finished areas, etc. Saw cut, channel and patch the walls. Firestop all conduits passing through fire rated walls, floors or separation barriers.

Q. All power, fire alarm, and occupancy sensor lighting wiring installed in exposed spaces shall be installed in conduit.

R. Low-voltage data conduit drops shall only be required to be extended into the accessible ceiling space.

S. Contractor shall provide separate raceway for the emergency power distribution system and generator control conductors between transfer switch and the generator.

T. Electrical Contractor shall identify emergency power. Identify all of the junction box cover plates with panelboard source ID and circuit number(s). Provide engraved label. Handwritten on the junction box cover plate is not acceptable.

U. Provide empty conduit for power assisted doors as noted and shown on the drawings.

V. Provide empty conduit for security system as noted and shown on the drawings.

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. Contractor is responsible to review the Architectural drawings to determine fire rated locations.

B. Route conduit through roof openings for piping and ductwork or through suitable roof jack with pitch pocket or detail to match roof type specified.

END OF SECTION

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SECTION 26 05 33.16

BOXES FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Wall and ceiling outlet boxes (general project requirement).

B. Floor boxes.

C. Pull and junction boxes.

D. Card reader, camera and WiFi empty rough-in 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).

D. Conform to requirements of 2015 Michigan Building Code, 2017 National Electrical Code, 2017 State of Michigan Code Rules Part 8, 2009 ICC/ANSI 117.1 and local code requirements.

1.4 SUBMITTALS FOR REVIEW

A. Floor boxes only.

1.5 REGULATORY REQUIREMENTS

A. Conform to requirements of 2015 Michigan Building Code, 2017 National Electrical Code, 2017 State of Michigan Code Rules Part 8, 2009 ICC/ANSI 117.1 and local code 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: NEMA OS 2. (Not permitted).

C. Cast Aluminum Boxes: for exterior location us a single gang shallow box with thread hub connection. Provide gasketed cover by box manufacturer.

D. Use masonry box in masonry walls.

E. Use 4” octagon box for ceiling smoke detectors.

2.2 FLOOR BOXES

A. As scheduled on the drawing.

2.3 PULL AND JUNCTION BOXES

A. Sheet Metal Boxes

1. NEMA 1 enclosure for interior location.
2. NEMA 3R for exterior location.
4. Non-metallic pull and junction boxes are not permitted for this project.

2.4 CARD READERS, CAMERAS AND WIFI

A. Use 4” square box.

PART 3 EXECUTION

3.1 INSTALLATION

A. As required for wire pulling, equipment connections and compliance with regulatory requirements.

B. Set wall mounted boxes at elevations to accommodate mounting heights indicated.

C. Electrical boxes are shown on Drawings in approximate locations unless dimensioned.

D. Orient boxes to accommodate wiring devices oriented as specified in Section 26 27 26.

E. Maintain headroom and present neat mechanical appearance.

F. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.

G. Inaccessible Ceiling Areas: Install outlet and junction boxes no more than 6 inches from ceiling access panel or from removable recessed luminaire.

H. Install boxes to preserve fire resistance rating of partitions and other elements.

I. Coordinate mounting heights and locations of outlets for counters, backsplashes, benches in casework and workstations.

J. Locate outlet boxes to allow luminaires positioned as shown.

K. Align adjacent wall mounted outlet boxes for switches, etc.

L. Use flush mounting outlet box in finished areas. Surface mounted boxes are acceptable for non-finished spaces.

M. Locate flush mounting box in masonry wall to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat opening.

N. 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.

O. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.

P. Use stamped steel bridges to fasten flush mounting outlet box between studs.

Q. Install flush mounting box without damaging wall insulation or reducing its effectiveness.

R. Use adjustable steel channel fasteners for hung ceiling outlet box.

S. Do not fasten boxes to ceiling support wires.

T. Support boxes independently of conduit.

U. Use gang box where more than one device is mounted together. Do not use sectional box.

V. Use gang box with plaster ring for single device outlets.

W. Install floor boxes flush with the finished floor.

X. Use cast floor boxes for installations in slab on grade; formed steel boxes are acceptable for other installations. Set floor boxes level.

Y. Large Pull Boxes: Provide screwed cover or hinged enclosure in interior dry locations as noted or specified on the drawing.

Z. Junction box cover plates installed above the ceiling shall be facing down.

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.

3.3 ADJUSTING

A. Adjust floor box flush with finish flooring material.

B. Adjust flush-mounting outlets to make front flush with finished wall material.

C. Install knockout closures in unused box openings.

END OF SECTION

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SECTION 26 05 36

CABLE TRAYS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Cable trays and accessories.

B. 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

A. Conform to requirements of 2015 Michigan Building Code, 2017 National Electrical Code, 2017 State of Michigan Code Rules Part 8, 2009 ICC/ANSI 117.1 and local code requirements.

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 PROJECT RECORD DOCUMENTS

A. Record actual routing of cable tray and locations of supports.

1.6 REGULATORY REQUIREMENTS

A. Conform to requirements of 2015 Michigan Building Code, 2017 National Electrical Code, 2017 State of Michigan Code Rules Part 8, 2009 ICC/ANSI 117.1 and local code 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. Husky.

B. B-Line - Flex tray.

C. Wiremold Fieldmate

D. 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 #4 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 servers 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 data cable systems.

H. Provide a center support rod for the tray support or a wall bracket mounting, or trapeze hanger. Provide all hardware, mounting brackets. Welding is not permitted to any roof steel beams or joists.

I. Stop the cable tray short of the wall opening and use a fire rated framed cable transit barrier or fire rated wireway to free air the cables from the tray to fire rated assembly. Acceptable cable transit barriers are Rox System or equal Nelson. Acceptable wireway – EZ Path or approved equal.

END OF SECTION

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SECTION 26 05 53

IDENTIFICATION FOR ELECTRICAL SYSTEMS

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

A. Conform to requirements of 2015 Michigan Building Code, 2017 National Electrical Code, 2017 State of Michigan Code Rules Part 8, 2009 ICC/ANSI 117.1 and local code requirements.

1.4 REGULATORY REQUIREMENTS

A. Conform to requirements of 2015 Michigan Building Code, 2017 National Electrical Code, 2017 State of Michigan Code Rules Part 8, 2009 ICC/ANSI 117.1 and local code 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. Emergency power panels and associated equipment shall be white letters on red.

B. Locations:
   1. Each electrical distribution panelboard, and panelboard.
   2. Each disconnect.
   3. Automatic transfer switch.
   4. Emergency circuit junction box cover plates.
   5. Each VFD.

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. Control Circuits: Control wire numbers.

E. Legend:

   1. Emergency Power Supply Panel Feeder.

2.4 LABELING METHODS AND STANDARDS

A. Engraved Labels

1. All electrical panels, starters, disconnect switches, terminal cabinets, fire alarm panel, nurse call system cabinet, personnel patient TV system cabinet or similar central system cabinet shall be permanently identified using engraved labels. These labels shall be secured with double face type or mechanically fastened in applications where the tape may have a tendency to fail.

2. Normal power fed systems shall have white labels with black lettering. Emergency power fed systems shall have red labels with white lettering.

3. 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
Starters, Disconnects, VFDs	1/2" high minimum
Manual Motor Starters	1/4" high minimum

4. 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.

2.5 FIRE ALARM/EMERGENCY DISTRIBUTION JUNCTION BOX COVER

A. Provide red printed coverplates. Use “FA” for fire alarm.

2.6 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. Panelboards, 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

POWER SYSTEM STUDIES

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 new distribution equipment including the emergency generator distribution.

1.2 RELATED SECTIONS

A. Drawings and general provisions of the Contract.

1.3 REFERENCES

A. Institute of Electrical and Electronics Engineers, Inc. (IEEE):

1. IEEE 141 – Recommended Practice for Electric Power Distribution and Coordination of Industrial and Commercial Power Systems.
2. IEEE 242 – Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems.
3. IEEE 399 – Recommended Practice for Industrial and Commercial Power System Analysis.
4. IEEE 241 – Recommended Practice for Electric Power Systems in Commercial Buildings.
5. IEEE 1015 – Recommended Practice for Applying Low-Voltage Circuit Breakers Used in Industrial and Commercial Power Systems.
6. IEEE 1584 – Guide for Performing Arc-Flash Hazard Calculations.

B. American National Standards Institute (ANSI):

1. ANSI C57.12.00 – Standard General Requirements for Liquid-Immersed Distribution, Power, and Regulating Transformers.
2. ANSI C37.13 – Standard for Low Voltage AC Power Circuit Breakers Used in Enclosures.
3. ANSI C37.010 – Standard Application Guide for AC High Voltage Circuit Breakers Rated on a Symmetrical Current Basis.
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. NFPA 70 -National Electrical Code, latest edition.
2. NFPA 70E – Standard for Electrical Safety in the Workplace.

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.
6. Time-Current Coordination Graphs and Recommendations.
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. Electrical distribution manufacturer 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.

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:

1. UL969 – Standard for Marking and Labeling Systems.
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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SECTION 26 05 83

WIRING CONNECTIONS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Mechanical equipment.

B. Utility CT cabinet connection.

C. Occupancy sensor system.

D. Owner furnished servers.

E. Electric water cooler.

F. Blank feed thru GFI test device.

G. Generator docking station.

H. Generator/transfer switch.

I. Fire alarm system.

J. Occupancy sensor system.

K. Lighting control relay panels.

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.

C. Conform to requirements of 2015 Michigan Building Code, 2017 National Electrical Code, 2017 State of Michigan Code Rules Part 8, 2009 ICC/ANSI 117.1 and local code requirements.

1.4 COORDINATION

A. Coordinate work under provisions of Division 1.

B. Obtain and review shop drawings, product data, and manufacturer's instructions for equipment furnished under other sections.

C. Determine connection locations and requirements.

D. Sequence rough-in of electrical connections to coordinate with installation schedule for equipment.

E. Sequence electrical connections to coordinate with start-up schedule for equipment.

F. Provide a 120 volt power supply in a junction box for use by the sprinkler contractor to connect to main sprinkler riser flow switch.

G. Mechanical Trades shall be responsible to furnish and install all temperature control components, associated conduit, wiring and 120 volt power supplies. Electrical Trades shall reserve 120 volt circuit breaker as scheduled in the panels for this purpose.

H. All VFD programming shall be completed as part of the Mechanical Trades work.

1.5 REGULATORY REQUIREMENTS

A. Conform to requirements of 2015 Michigan Building Code, 2017 National Electrical Code, 2017 State of Michigan Code Rules Part 8, 2009 ICC/ANSI 117.1 and local code 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 conditions under provisions of Division 1.

B. 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. Make conduit connections to equipment using metallic flexible conduit for all dry interior locations. Use liquid tight non-metallic flexible conduit with watertight connectors in damp or wet locations.

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.

G. Complete fire alarm system wiring.

H. Complete incoming service installation, conductors, CT cabinet in accordance with the utility requirements.

I. Complete all lighting controls.

J. Complete generator system wiring.

3.3 BLANK FEED THRU GFI

A. Install a remote blank feed thru GFI where a refrigerator, freezer or other equipment that blocks access to the receptacle located within 6 feet of a sink.

END OF SECTION

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SECTION 26 09 23

LIGHTING CONTROL DEVICES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Power packs.

B. Occupancy sensor.

C. Relay panels.

D. Low voltage push button stations.

E. CAT 5E wiring.

F. Electrical equipment and/or areas for lighting controls defined by NEC 110.26(D).

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.

B. Conform to requirements of 2015 Michigan Building Code, 2017 National Electrical Code, 2017 State of Michigan Code Rules Part 8, 2009 ICC/ANSI 117.1 and local code requirements.

C. 2015 Michigan Energy Code.

1.4 SUBMITTALS

A. Provide submittal as listed in Section 26 00 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.

B. Conform to requirements of 2015 Michigan Building Code, 2017 National Electrical Code, 2017 State of Michigan Code Rules Part 8, 2009 ICC/ANSI 117.1 and local code requirements.

C. Products: Furnish products listed or labeled to conform to requirements of 2017 National Electric Code, 2017 State of Michigan Electric Code Rules Part 8, and local authority having jurisdiction.

D. 2015 Michigan Energy Code.

E. 2017 NEC 110.26(D).

PART 2 PRODUCTS – Acceptable manufacturer's – as scheduled on the drawings.

2.1 OCCUPANCY SENSORS

A. As scheduled on the drawings.

2.2 POWER PACKS

A. As scheduled on the drawings.

2.3 CEILING MOUNTED OCCUPANCY SENSORS

A. As scheduled on the drawings.

2.4 WALL SWITCH TYPE OCCUPANCY SENSORS

A. As scheduled on the drawings.

2.5 RELAY PANEL

A. As scheduled on the drawings.

2.6 CAT 5E WIRING

A. Green jacketed cable color.

2.7 LOW VOLTAGE DIGITAL CONTROL STATION

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.

C. Automatic lighting control shall not be permitted in working areas for electrical and/or areas that contain electrical driven machinery and/or areas that contain mechanical equipment that may require serving while electrically energizes.

3.2 SYSTEM TRAINING

A. Include (1) 2 hours 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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SECTION 26 24 16

PANELBOARDS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Main distribution panel.

B. Branch circuit panelboards.

C. Surge Protective Device (SPD) for emergency generator 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.

F. Conform to requirements of 2015 Michigan Building Code, 2017 National Electrical Code, 2017 State of Michigan Code Rules Part 8, 2009 ICC/ANSI 117.1 and local code requirements.

1.4 SUBMITTALS

A. Provide submittal as listed in Section 26 00 00.

B. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, integrated short circuit ampere rating, circuit breaker 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

A. Conform to requirements of 2015 Michigan Building Code, 2017 National Electrical Code, 2017 State of Michigan Code Rules Part 8, 2009 ICC/ANSI 117.1 and local code requirements.

B. Furnish products listed and classified by UL as suitable for purpose specified and indicated.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. As scheduled on the drawings.

2.2 DISTRIBUTION PANELBOARDS

A. As scheduled on the drawings.

2.3 BRANCH CIRCUIT 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.

F. Provide (4) ¾" spare conduits out of each recessed panelboard to an accessible location above ceiling. Identify each as SPARE.

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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SECTION 26 27 26

WIRING DEVICES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Wall switches.

B. Receptacles.

C. Device plates.

D. Floor box service fittings.

E. Poke-through service fittings.

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.

C. Conform to requirements of 2015 Michigan Building Code, 2017 National Electrical Code, 2017 State of Michigan Code Rules Part 8, 2009 ICC/ANSI 117.1 and local code requirements.

D. ADA - Americans with Disabilities Act - As amended.

1.4 REGULATORY REQUIREMENTS

A. Conform to requirements of 2015 Michigan Building Code, 2017 National Electrical Code, 2017 State of Michigan Code Rules Part 8, 2009 ICC/ANSI 117.1 and local code requirements.

B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and indicated.

1.5 SUBMITTALS

A. Only furnish floor box submittal.

PART 2 PRODUCTS

2.1 WALL SWITCHES

A. Manufacturers:

1. Pass & Seymour, Hubbell, Leviton or equal.

B. Description: NEMA WD 1, Heavy-Duty, AC only general-use snap switch.

C. Ratings:

1. Voltage: 120/277 volts, AC.

2. Current: 20 amperes.

D. Boiler Emergency Power Off

1. Provide EPO station as scheduled on the drawings.

2.2 RECEPTACLES

A. Manufacturers:

1. Hubbell, Pass & Seymour, Leviton, or equal

B. Description: NEMA WD 1, Heavy-duty specification grade duplex receptacle.

C. Configuration: NEMA WD 6, type as specified and indicated.

D. Convenience Receptacle: Type 5-20.

E. Emergency receptacles shall be red with matching cover plate and shall be provided with LED power indicating light.

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”.

2.3 WALL PLATES

A. Cover Plate: Color to be determined from standard colors by the Architect.

B. Use “in use” weather proof metallic covers at exterior locations as indicated on the drawings to meet 2017 NEC Section 406.

C. Provide blank metal cover plates on abandoned boxes.

D. Provide stamped metal cover plate for unfinished spaces.

2.4 FLOOR BOX

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 switches with OFF position down.

C. Install receptacles with grounding pole on bottom.

D. Connect wiring device grounding terminal to outlet box with bonding jumper or branch circuit equipment grounding conductor where specified.

E. Install plates on switch, receptacle, and blank outlets in finished areas.

F. Connect wiring devices by wrapping conductor around screw terminal.

G. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface mounted outlets.

H. Install protective rings on active flush cover service fittings.

I. 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. Install convenience receptacle 16 inches to bottom of box above finished floor.

D. Install convenience receptacle 6 inches above backsplash of counter.

E. 18” mounting height is lieu of the 16” minimum specified is acceptable pending masonry course lines.

F. Electrical Trades shall review 2009 ANSI 117.1 for ADA requirements. Obtain a copy as required.

G. 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.

H. Refer to section 283100 and drawing notes for fire alarm device mounting heights.

3.5 FIELD QUALITY CONTROL

A. Inspect each wiring device for defects.

B. Operate each wall switch with circuit energized and verify proper operation.

C. Verify that each receptacle device is energized.

D. Test each receptacle device for proper polarity.

E. 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

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SECTION 26 32 00

PACKAGED ENGINE GENERATOR/TRANSFER SWITCH

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Packaged engine generator set.

B. Battery and charger.

C. Remote annunciator.

D. Transfer switch.

E. Gen set enclosure.

F. Building automation system interface (Owner installation).

G. Remote emergency stop station.

H. Start wire monitor unit.

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 specificaiton 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

A. Provide complete factory assembled generator set equipment with transfer switches and controls in accordance with plans and specifications.

B. Provide factory test, startup by a supplier authorized by the manufacturer, and on-site testing of the system.

C. The generator set manufacturer shall warrant all equipment provided under this section, whether or not is manufactured by the generator set manufacturer, so that there is one source for warranty and product service.

D. Provide on-site commissioning.

E. The generator manufacturer shall list all differences that do not meet the specification.

F. Provide on-site acceptance test in accordance with NFPA 110 requirements.

1.4 CODES AND STANDARDS

A. The generator set and its installation and on-site testing shall conform to the requirements of the following codes and standards:

1. CSA C22.2, No. 14 – M91 Industrial Control Equipment.
2. CSA 282, 1989 Emergency Electrical Power Supply for Buildings
3. EN50082-2, Electromagnetic Compatibility – Generic Immunity Requirements, Part 2: Industrial.
4. EN55011, Limits and Methods of Measurement of Radio Interference Characteristics of Industrial, Scientific and Medical Equipment.
5. FCC Part 15, Subpart B.
6. IEC8528 part 4. Control Systems for Generator Sets
7. IEC Std 801.2, 801.3, and 801.5 for susceptibility, conducted, and radiated electromagnetic emissions.
8. IEEE446 – Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications
9. IEEE587 for voltage surge resistance.
10. NEMA ICS10-1993 – AC Generator sets.
11. NFPA70 – National Electrical Code 2017.
12. UL508. The entire control system of the generator set shall be UL508 listed and labeled.
13. 2013 edition NFPA 110 Emergency and Standby Power Systems. Level 1, Type 10 classification for Life Safety.
14. 2018 NFPA 37 Standards for Combustion Engines.
15. Generator to be UL 2200 listed.
16. 2017 NEC 701.12.
17. 2017 NEC 700.3(F).

1.5 REGULATORY REQUIREMENTS

A. Conform to requirements of 2015 Michigan Building Code, 2017 National Electrical Code, 2017 State of Michigan Code Rules Part 8, 2009 ICC/ANSI 117.1 and local code requirements.

B. Furnish products listed or labeled to conform to requirements of 2017 National Electric Code, 2017 State of Michigan Electric Code Rules Part 8, and local codes.

1.6 SUBMITTALS

A. Provide submittals as listed in Section 26 00 00.

B. Shop Drawings: Indicate electrical characteristics and connection requirements. Show plan and elevation views with overall and interconnection point dimensions, fuel consumption rate curves at various loads, ventilation and combustion air requirements, electrical diagrams including schematic and interconnection diagrams.

C. Product Data: Provide data showing dimensions, weights, ratings, interconnection points, and internal wiring diagrams for engine, generator, control panel, battery, battery rack, battery charger, exhaust silencer, vibration isolators, fuel tank and automatic transfer switch. Failure to provide cut sheets either arrowed or marked with

catalog numbers will be cause for returning the submittals at no delays or extra costs to the district.

D. 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.

E. Manufacturer's Certificate: Certify that Products meet or exceed specified requirements.

1.7 OPERATION AND MAINTENANCE DATA

A. Operation Data: Include instructions for normal operation.

B. Maintenance Data: Include instructions for routine maintenance requirements, service manuals for engine, oil sampling and analysis for engine wear, and emergency maintenance procedures.

1.8 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, protect and handle products to site.

B. Accept unit on site on skids. Inspect for damage.

C. Protect equipment from dirt and moisture by securely wrapping in heavy plastic.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Cummins. Base Bid. Other manufacturer may quote as a voluntary alternate.

2.2 GENERATOR SET

A. Ratings

1. The generator set shall operate at 1800 rpm and at a voltage of: 120/208 Volts AC, Three phase, four-wire, 60 hertz.
2. The generator set shall be rated at 125 kW, minimum 156.25 kVA at 0.8 power factor.
3. The generator set rating shall be based on emergency/standby service as scheduled on the drawings.
4. Generator shall include a factory installed 400 amp main circuit breaker for emergency distribution.
5. 80 degree C riser over 40 degree C ambient.

B. Performance

1. Voltage regulation shall be plus or minus 0.5 percent for any constant load between no load and rated load for both parallel and non-parallel applications.

Random voltage variation with any steady load from no load to full load shall not exceed plus or minus 0.5 percent.

2. Frequency regulation shall be isochronous from steady state no load to steady state rated load. Random frequency variation with any steady load from no load to full load shall not exceed plus or minus 0.25%.
3. The natural gas fueled engine-generator set shall be capable of single step load pick up of 100% nameplate kW and power factor, less applicable derating factors, with the engine-generator set at operating temperature.
4. The alternator shall produce a clean AC voltage waveform, with not more than 5% total harmonic distortion at full linear load, when measured from line to neutral, and with not more than 3% in any single harmonic. Telephone influence factor shall be less than 40.

C.Construction

1. The engine-generator set shall be mounted on a heavy-duty steel base to maintain alignment between components. The base shall incorporate a battery tray with hold-down clamps within the rails
2. All switches, lamps, and meters in the control system shall be oil-tight and dust-tight, and the enclosure door shall be gasketed. There shall be no exposed points in the control (with the door open) that operate in excess of 50 volts.

D. Connections

1. The generator set load connections shall be composed of silver or tin plated copper bus bars, drilled to accept mechanical or compression terminations of the number and type as shown on the drawings. Sufficient lug space shall be provided for use with cables of the number and size as shown on the drawings.
2. Power connections to auxiliary devices shall be made at the devices, with required protection located at a wall-mounted common distribution panel.
3. Generator set control interfaces to other system components shall be made on a common, permanently labeled terminal block assembly.

2.3 ENGINE AND ENGINE EQUIPMENT

A. The engine shall be natural gas, 4 cycle, radiator and fan cooled. The horsepower rating of the engine at its minimum tolerance level shall be sufficient to drive the alternator and all connected accessories. Two cycle engines are not acceptable. Engine accessories and features shall include:

B. An electronic governor system shall provide automatic isochronous frequency regulation. The governing system dynamic capabilities shall be controlled as a function of engine coolant temperature to provide fast, stable operation at varying engine operating temperature conditions. The control system shall actively control the fuel rate and excitation as appropriate to the state of the generator set. Fuel rate shall be regulated as a function of starting, accelerating to start disconnect speed, accelerating to rated speed, and operating in various isochronous or parallel states.

C. Skid-mounted radiator and cooling system rated for full load operation in 122 degrees F (50 degrees C) ambient as measured at the generator air inlet, based on 0.5 in H_2O external static head. Radiator shall be sized based on a core temperature which is 20F

higher than the rated operation temperature, or prototype tested to verify cooling performance of the engine/radiator/fan operation in a controlled environment. Radiator shall be provided with a duct adapter flange. The cooling system shall be filled with a 50/50-ethylene glycol/water mixture by the equipment manufacturer. Rotating parts shall be guarded against accidental contact.

D. Electric starter(s) capable of three complete cranking cycles without overheating.

E. Positive displacement, mechanical, full pressure, lubrication oil pump.

F. Full flow lubrication oil filters with replaceable spin-on canister elements and dipstick oil level indicator.

G. An engine driven, mechanical, positive displacement fuel pump. Fuel filter with replaceable spin-on canister element. Fuel cooler, suitable for operation of the generator set at full rated load in the ambient temperature specified shall be provided if required for operation due to the design of the engine and the installation.

H. Replaceable dry element air cleaner with restriction indicator.

I. Flexible supply and return fuel lines.

J. Engine mounted battery charging alternator, ampere rated for generator size with solid-state voltage regulator.

K. Coolant heater

1. Engine mounted, thermostatically controlled, coolant heater(s) for each engine. Heater voltage shall be as shown on the project drawings. The coolant heater shall be UL499 listed and labeled.
2. The coolant heater shall be installed on the engine with silicone hose connections. Steel tubing shall be used for connections into the engine coolant system wherever the length of pipe run exceeds 12 inches. The coolant heater installation shall be specifically designed to provide proper venting of the system. The coolant heaters shall be installed using quick disconnect couplers to isolate the heater for replacement of the heater element. The quick disconnect/automatic sealing couplers shall allow the heater element to be replaced without draining the engine cooling system or significant coolant loss.
3. The coolant heater shall be provided with a 24VDC thermostat, installed at the engine thermostat housing. An AC power connection box shall be provided for a single AC power connection to the coolant heater system.
4. The coolant heater(s) shall be sized as recommended by the engine manufacturer to warm the engine to a minimum of 100F (40C) in a 40F ambient, in compliance with NFPA110 requirements, or the temperature required for starting and load pickup requirements of this specification.

L. Provide critical silencer exhaust and weather proof enclosure. Provide exhaust silencers for each engine of size and type as recommended by the generator set manufacturer and approved by the engine manufacturer. The mufflers shall be critical grade. Exhaust system shall be installed according to the engine manufacturer's recommendations and applicable codes and standards.

M. Provide a block heater sized by the manufacturer to meet low-temperature operating conditions.

2.4 AC GENERATOR

A. The AC generator shall be; synchronous, four pole, 2/3 pitch, revolving field, drip-proof construction, single pre-lubricated sealed bearing, air cooled by a direct drive centrifugal blower fan, and directly connected to the engine with flexible drive disc. All insulation system components shall meet NEMA MG1 temperature limits for Class H insulation system. Actual temperature rise measured by resistance method at full load shall not exceed 80 degrees Centigrade.

B. The generator shall be capable of delivering rated output (kVA) at rated frequency and power factor, at any voltage not more than 5 percent above or below rated voltage.

C. A permanent magnet generator (PMG) shall be included to provide a reliable source of excitation power for optimum motor starting and short circuit performance. The PMG and controls shall be capable of sustaining and regulating current supplied to a single phase or three phase fault at approximately 300% of rated current for not more than 10 seconds.

D. The sub transient reactance of the alternator shall not exceed 12 percent, based on the standby rating of the generator set.

2.5 GENERATOR SET CONTROLLER

A. The generator set shall be provided with a microprocessor-based control system that is designed to provide automatic starting, monitoring, and control functions for the generator set. The control system shall also be designed to allow local monitoring and control of the generator set, and remote monitoring and control as described in this specification.

B. The control shall be mounted on the generator set. The control shall be vibration isolated and prototype tested to verify the durability of all components in the system under the vibration conditions encountered.

C. The generator set mounted control shall include the following features and functions:

D.Control Switches

1. Mode Select Switch: The mode select switch shall initiate the following control modes. When in the RUN or Manual position the generator set shall start, and accelerate to rated speed and voltage as directed by the operator. In the OFF position the generator set shall immediately stop, bypassing all time delays. In the AUTO position the generator set shall be ready to accept a signal from a remote device to start and accelerate to rated speed and voltage.
2. Emergency Stop Switch: Switch shall be Red "mushroom-head" push-button. Depressing the emergency stop switch shall cause the generator set to immediately shut down, and be locked out from automatic restarting.

3. Reset Switch: The reset switch shall be used to clear a fault and allow restarting the generator set after it has shut down for any fault condition.
4. Panel Lamp Switch: Depressing the panel lamp switch shall cause the entire panel to be lighted with DC control power. The panel lamps shall automatically be switched off 10 minutes after the switch is depressed, or after the switch is depressed a second time.

E. Generator Set AC Output Metering. The generator set shall be provided with a metering set including the following features and functions:

1. Analog voltmeter, ammeter, frequency meter, and kilowatt (KW) meter. Voltmeter and ammeter shall display all three phases. Ammeter and KW meter scales shall be color coded in the following fashion: readings from 0-90% of generator set standby rating: green; readings from 90-100% of standby rating: amber; readings in excess of 100%: red.

2. Digital metering set, 0.5% accuracy, to indicate generator RMS voltage and current, frequency, output current, output KW, KW-hours, and power factor. Generator output voltage shall be available in line-to-line and line-to-neutral voltages, and shall display all three phase voltages (line to neutral or line to line) simultaneously.
3. Both analog and digital metering are required. The analog and digital metering equipment shall be driven by a single microprocessor, to provide consistent readings and performance.

F. Generator Set Alarm and Status Display.

1. The generator set shall be provided with alarm and status indicating lamps to indicate non-automatic generator status, and existing warning and shutdown conditions. The lamps shall be high-intensity LED type. The lamp condition shall be clearly apparent under bright room lighting conditions. The generator set control shall indicate the existence of the following alarm and shutdown conditions on an alphanumeric digital display panel:
    low oil pressure (alarm)
    low oil pressure (shutdown)
    oil pressure sender failure (alarm)
    low coolant temperature (alarm)
    high coolant temperature (alarm)
    high coolant temperature (shutdown)
    engine temperature sender failure (alarm)
    low coolant level (alarm or shutdown--selectable)
    fail to crank (shutdown)
    fail to start/overcrank (shutdown)
    overspeed (shutdown)
    low DC voltage (alarm)
    high DC voltage (alarm)
    weak battery (alarm)
    low fuel-daytank (alarm)
    high AC voltage (shutdown)
    low AC voltage (shutdown)
    under frequency (shutdown)
    over current (warning)

over current (shutdown)
short circuit (shutdown)
ground fault (alarm) (optional--when required by code or specified)
over load (alarm)
emergency stop (shutdown)

2. Provisions shall be made for indication of four customer-specified alarm or shutdown conditions. Labeling of the customer-specified alarm or shutdown conditions shall be of the same type and quality as the above specified conditions. The non-automatic indicating lamp shall be red, and shall flash to indicate that the generator set is not able to automatically respond to a command to start from a remote location.
3. Provide a remote wall mounted annunciator.

G. Engine Status Monitoring.

1. The following information shall be available from a digital status panel on the generator set control:
   engine oil pressure (psi or kPA)
   engine coolant temperature (degrees F or C)
   engine oil temperature (degrees F or C)
   engine speed (rpm)
   number of hours of operation (hours)
   number of start attempts
   battery voltage (DC volts)
2. The control system shall also incorporate a data logging and display provision to allow logging of the last 10 warning or shutdown indications on the generator set, as well as total time of operation at various loads, as a percent of the standby rating of the generator set.

H. Engine Control Functions.

1. The control system provided shall include a cycle cranking system, which allows for user selected crank time, rest time, and # of cycles. Initial settings shall be for 3 cranking periods of 15 seconds each, with 15-second rest period between cranking periods.
2. The control system shall include an idle mode control, which allows the engine to run in idle mode in the RUN position only. In this mode, the alternator excitation system shall be disabled.
3. The control system shall include an engine governor control, which functions to provide steady state frequency regulation as noted elsewhere in this specification. The governor control shall include adjustments for gain, damping, and a ramping function to control engine speed and limit exhaust smoke while the unit is starting. The governor control shall be suitable for use in paralleling applications without component changes.
4. The control system shall include time delay start (adjustable 0-300 seconds) and time delay stop (adjustable 0-600 seconds) functions.
5. The control system shall include sender failure monitoring logic for speed sensing, oil pressure, and engine temperature which is capable of discriminating between failed sender or wiring components, and an actual failure conditions.

2.6 OUTDOOR WEATHER-PROTECTIVE HOUSING

A. The generator set shall be provided with a Level 1 housing which allows the generator set to operate at full rated load in the ambient conditions previously specified.

B. The enclosure shall include hinged doors for access to both sides of the engine and alternator, and the control equipment. Key-locking and pad lockable door latches shall be provided for all doors. Door hinges shall be stainless steel.

C. The enclosure shall be provided with an exhaust silencer which is mounted inside of the enclosure, and allows the generator set package to meet specified sound level requirements. Silencer and exhaust shall include a rain cap and rain shield. Sound level shall match Level 1 enclosure.

D. All sheet metal shall be primed for corrosion protection and finish painted with the manufacturer's standard color. All surfaces of all metal parts shall be primed and painted.

E. Painting of hoses, clamps, wiring harnesses, and other non-metallic service parts shall not be acceptable. Fasteners used shall be corrosion resistant, and designed to minimize marring of the painted surface when removed for normal installation or service work.

2.7 BATTERIES

A. Batteries - battery shall be rate suitable for generator starting mode. Battery voltage shall be compatible with the starting system. The battery set shall be rated no less than 172 amphere hours. Provide all cables and clamps.

B. Battery Trays - Battery tray shall be provided for the batteries. Tray shall be treated to be battery electrolyte resistant. Tray construction shall be such to contain any spillage or boil over.

C. Battery Charger - Battery charger, current limiting type to automatically recharge batteries. Charger shall include overload protection, silicon diode full wave rectifiers, voltage surge suppressor, DC ammeter, DC volt meter and fused AC input. AC input voltage shall be 120 volts. Charger shall have LED annunciation for low DC volts, rectifier failure, loss of AC power, high DC volts. Amperage output shall be no less than ten amperes. Charger shall be factory installed as part of generator equipment. No wall mounted charger is permitted for this project.

2.8 TRANSFER SWITCH

A. Provide transfer switches as scheduled on the drawings.

B. General Transfer-Switch Product Requirements

1. Provide transfer switches in the number and ratings as specified. Apply as defined in UL 1008 for continuous loading and total system transfer.

2. Fault-Current Closing and Withstand Ratings: UL 1008 WCR ratings must be specifically listed as meeting the requirements for use with protective devices at

installation locations, under specified fault conditions. Withstand and closing ratings shall be based on use of the same set of contacts for the withstand test and the closing test.

3. Solid-State Controls: All settings should be accurate to +/- 2% or better over an operating temperature range of - 40 to + 60 degrees C (- 40 to + 140 degrees F).

4. Resistance to Damage by Voltage Transients: Components shall meet or exceed voltage-surge withstand capability requirements when tested according to IEEE C62.41. Components shall meet or exceed voltage-impulse withstand test of NEMA ICS 1.

5. Electrical Operation: Accomplished by a non-fused, momentarily energized solenoid or electric motor operator mechanism, mechanically and electrically interlocked in both directions (except that mechanical interlock is not required for closed transition switches).

6. Switch Characteristics: Designed for continuous-duty repetitive transfer of full-rated current between active power sources.

   a. Switches using molded-case switches or circuit breakers, or insulated case circuit breaker components are not acceptable.
   b. Transfer switches shall be double-throw, electrically and mechanically interlocked, and mechanically held in the Source 1 and Source 2 positions.
   c. Main switch contacts shall be high-pressure silver alloy. Contact assemblies shall have arc chutes for positive arc extinguishing. Arc chutes shall have insulating covers to prevent inter-phase flashover.
   d. Contacts shall be operated by a high-speed electrical mechanism that causes contacts to open or close within three electrical cycles from signal.
   e. The transfer switch operation shall include the ability to switch to an open position (both sources disconnected) for the purpose of load shedding from the generator set.
   f. The power transfer mechanism shall include provisions for manual operation under load with the enclosure door closed. Manual operation may be electromechanical or mechanical, but must be coordinated with control function.
   g. Transfer switch shall be provided with flame retardant transparent covers to allow viewing of switch contact operation but prevent direct contact with components that could be operating at line voltage levels.
   h. The transfer switch shall be program transition with the mechanical and control provisions necessary to allow the device to be field-configured for operating speed. Transfer switch operation with motor loads shall be as is recommended in NEMA MG1.

      1) Phase angle monitoring/timing equipment is not an acceptable substitute for this functionality

7. Factory wiring: Transfer switch internal wiring shall be composed of pre-manufactured harnesses that are permanently marked for source and destination. Harnesses shall be connected to the control system by means of locking

disconnect plug(s), to allow the control system to be easily disconnected and serviced without disconnecting power from the transfer switch mechanism.

8. Terminals: Terminals shall be pressure type and appropriate for all field wiring. Terminal arrangement and cabinet space must be such that feeder conductors can enter from the top, side or bottom of the switch, at the installer's discretion. Control wiring shall be equipped with suitable lugs, for connection to terminal strips.

C. Automatic Transfer Switches

1. Automatic Transfer Switch Control Features

a. The transfer switch control system shall be configurable in the field for any operating voltage level up to 600 VAC. Voltage sensing shall be monitored based on the normal voltage at the site. Systems that utilize voltage monitoring based on standard voltage conditions that are not field configurable are not acceptable.
b. All transfer switch sensing shall be configurable from an operator panel or from a Windows XP or later PC-based service tool. Designs utilizing DIP switches or other electromechanical devices are not acceptable.
c. The transfer switch shall be configurable to accept a relay contact signal and a network signal from an external device for load shedding purposes. On receipt of this signal, the transfer switch shall switch to a neutral position when connected to Source 2. If Source 1 is available when the load-shed signal is received, the transfer switch shall connect to Source 1.
d. The transfer switch shall be configurable to accept a relay contact signal and a network signal from an external device to prevent transfer to the generator service.
e. The transfer switch shall provide a relay contact signal prior to transfer or re-transfer. The time period before and after transfer shall be adjustable in a range of 0 to 50 seconds.
f. The control system shall be designed and prototype tested for operation in ambient temperatures from - 40 degrees C to + 60 degrees C (- 40 to +140 degrees F). It shall be designed and tested to comply with the requirements of the noted voltage and RFI/EMI standards.
g. The control shall have optically isolated logic inputs, high isolation transformers for AC inputs and relays on all outputs, to provide optimum protection from line voltage surges, RFI and EMI.
h. The transfer switch network monitoring equipment, when supplied, shall be provided with a battery-based auxiliary power supply to allow monitoring of the transfer switch when both AC power sources are non-operational. The battery power supply shall be monitored for proper condition, and the transfer switch shall include an alarm condition to indicate low battery condition.

2. Transfer Switch Control Panel: The transfer switch shall have a microprocessor-based control with a sealed membrane panel incorporating pushbuttons for operator-controlled functions, and LED lamps for system status indicators. The panel shall also include an alphanumeric display for detailed system information. Panel display and indicating lamps shall include permanent labels.

a. The indicator panel LEDs shall display:

1) Which source the load is connected to (Source 1 or Source 2)
2) Which source or sources are available
3) When switch is not set for automatic operation, because the control is disabled or the bypass switch is in use
4) When the switch is in test/exercise mode

b. The indicator shall have pushbuttons that allow the operator to activate the following functions:

1) Activate pre-programmed test sequence
2) Override programmed delays, and immediately go to the next operation
3) Reset the control by clearing any faults
4) Test all of the LEDs by lighting them simultaneously

c. The alphanumeric digital display shall be vacuum fluorescent-type, clearly visible in both bright sunlight and no-light conditions over an angle of 120 degrees, and shall display the following:

1) AC voltage for all phases, normal and emergency
2) Source status: connected or not connected.
3) Load data, including voltage, AC current, frequency, KW, KVA, and power factor.

d. The display panel shall be password-protected, and allow the operator to view and make adjustments:

1) Set nominal voltage and frequency for the transfer switch
2) Adjust voltage and frequency sensor operation set points
3) Set up time clock functions
4) Set up load sequence functions
5) Enable or disable control functions including program transition
6) View real-time clock data, operation log (hours connected, times transferred, failures) and service history

3. Control Functions: Functions managed by the control shall include:

a. Software adjustable time delays:

1) Engine start (prevents nuisance genset starts in the event of momentary power fluctuation): 0 to 120 seconds (default 3 sec)
2) Transfer normal to emergency (allows genset to stabilize before load is transferred): 0 to 120 seconds (default 3 sec)
3) Re-transfer emergency to normal (allows utility to stabilize before load is transferred from genset): 0 to 30 minutes (default 3 sec)
4) Engine cooldown: 0 to 30 minutes (default 10 min)
5) Programmed transition: 0 to 60 seconds (default 3 sec)

b. Undervoltage sensing: three-phase normal, three-phase emergency source.

1) Pickup: 85 to 98% of nominal voltage (default 90%)
2) Dropout: 75 to 98% of nominal voltage (default 90%)

3) Dropout time delay: 0.1 to 1.0 seconds (default 0.5 sec)
4) Accurate to within +/- 1% of nominal voltage

c. Over-voltage sensing: three-phase normal, three-phase emergency source.

1) Pickup: 95 to 99% of dropout setting (default 95%)
2) Dropout: 105 to 135% of nominal voltage (default 110%)
3) Dropout time delay: 0.5 to 120 seconds (default 3 sec)
4) Accurate to within +/- 1% of nominal voltage

d. Over/under frequency sensing:

1) Pickup: +/- 5 to +/-20% of nominal frequency (default 10%)
2) Dropout: +/-1% beyond pickup (default 1%)
3) Dropout time delay: 0.1 to 15.0 seconds (default 5 sec)
4) Accurate to within +/- 0.2%

e. Voltage imbalance sensing:

1) Dropout: 2 to 10% (default 4%)
2) Pickup: 90% of dropout
3) Time delay: 2.0 to 20 seconds (default 5 sec)

f. Phase rotation sensing:

1) Time delay: 100 msec

g. Loss of single-phase detection:

1) Time delay: 100 msec

4. Control features shall include:

a. Programmable genset exerciser: A field-programmable control shall periodically start the generator, transfer the load to generator for a preset time, then re-transfer and shut down the generator after a preset cool-down period.

1) Push-button programming control shall have a selection of eight different schedules for exercising generator, with or without load.

b. In event of a loss of power to the control, all control settings, real-time clock setting and the engine start-time delay setting will be retained.
c. The system continuously logs information including the number of hours each source has been connected to the load, the number of times transferred, and the total number of times each source has failed. An event recorder stores information, including time and date-stamp, for up to 50 events.
d. Transfer Override Switch: Overrides automatic re-transfer control so automatic transfer switch will remain connected to emergency power source regardless of condition of normal source. Pilot light to indicate override status.

5. Control Interface

    a. Provide two sets Form C auxiliary contacts on both sides, operated by transfer switch position, rated 10 amps 250 VAC.
    b. The transfer switch shall be provided with a network communication card, and configured to allow network-based communication with the transfer switch and other network system components, including the generator set(s) provided for the Project.
    c. Unassigned Auxiliary Contacts: Two normally open, 1-pole, double-throw contacts for each switch position, rated 10A at 240 VAC.

6. Engine Starting Contacts

    a. One isolated and normally closed, and one isolated and normally open; rated 10A at 32 VDC minimum.

2.9 SEQUENCE OF OPERATION

A. Generator set shall start on receipt of a start signal from remote equipment. The start signal shall be via hardwired connection to the generator set control and a redundant signal over the required network connection.

B. The generator set shall complete a time delay start period as programmed into the control.

C. The generator set control shall initiate the starting sequence for the generator set. The starting sequence shall include the following functions:

1. The control system shall verify that the engine is rotating when the starter is signaled to operate. If the engine does not rotate after two attempts, the control system shall shut down and lock out the generator set, and indicate “fail to crank” shutdown.
2. The engine shall fire and accelerate as quickly as practical to start disconnect speed. If the engine does not start, it shall complete a cycle cranking process as described elsewhere in this specification. If the engine has not started by the completion of the cycle cranking sequence, it shall be shut down and locked out, and the control system shall indicate “fail to start”.
3. The engine shall accelerate to rated speed and the alternator to rated voltage. Excitation shall be disabled until the engine has exceeded programmed idle speed, and regulated to prevent over voltage conditions and oscillation as the engine accelerates and the alternator builds to rated voltage.

D. On reaching rated speed and voltage, the generator set shall operate as dictated by the control system in isochronous, synchronize, load share, load demand, or load govern state.

E. When all start signals have been removed from the generator set, it shall complete a time delay stop sequence. The duration of the time delay stop period shall be adjustable by the operator.

F. On completion of the time delay stop period, the generator set control shall switch off the excitation system and shall shut down.

1. Any start signal received after the time stop sequence has begun shall immediately terminate the stopping sequence and return the generator set to isochronous operation.

2.10 FACTORY TESTING.

A. The generator set manufacturer shall perform a complete operational test on the generator set prior to shipping from the factory. A certified test report shall be provided. Equipment supplied shall be fully tested at the factory for function and performance.

B. Generator set factory tests on the equipment shall be performed at rated load and rated power factor. Generator sets that have not been factory tested at rated power factor will not be acceptable. Tests shall include: run at full load, maximum power, voltage regulation, transient and steady-state governing, single step load pickup, and function of safety shutdowns.

2.11 ON-SITE ACCEPTANCE TEST

A. The complete installation shall be tested for compliance with the specification and NFPA 110 7.13.2.1. Testing shall be conducted by representatives of the manufacturer, with required fuel supplied by Contractor. The Engineer shall be notified in advance and shall have the option to witness the tests.

B. Installation acceptance tests to be conducted on-site shall include a "cold start" test, a two hour full load test, and a one step rated load pickup test in accordance with NFPA 110 7.13.4.1. Provide a resistive load bank and make temporary connections for full load test.

C. Perform a power failure test on the entire installed system. This test shall be conducted by opening the power supply from the utility service, and observing proper operation of the system for at least 2 hours. Coordinate timing and obtain approval for start of test with site personnel. The authority having jurisdiction shall be given advance notice to witness the test.

D. Manufacturer shall include costs for testing and shall pay all costs.

E. A full load test shall be initiated immediately after the cooling time in accordance with NFPA 110 requirements.

F. The acceptance test shall be made available to the authority having jurisdiction, along with a letter of compliance.

2.12 WARRANTY

A. The generator set and associated equipment shall be warranted for a period of not less than 5 years from the date of commissioning against defects in materials and workmanship.

B. The warranty shall be comprehensive. No deductibles shall be allowed for travel time, service hours, repair parts cost, etc.

2.13 REMOTE ANNUNCIATOR

A. Remote annunciator shall meet NFPA 110 Level 1, Type 10 requirements.

B. RS 485 ModBus.

C. LED indicating for status. Warning and/or shutdown for NFPA 110 compliant.
1. High engine temperature warning.
2. Low coolant level/aux shut down.
3. Low cranking voltage.
4. Low oil pressure shut down
5. Over crank shut down
6. Over speed shut down.
7. Audible alarm silence
8. Lamp test
9. Master switch not-in-auto.

D. Belden 9729 and 2#14's for the remote annunciator unless noted otherwise.

2.14 REMOTE EMERGENCY STOP STATION

A. As shown on the drawings.

2.15 START WIRE MONITOR UNIT.

A. Provide a monitoring unit compliant to 2017 NEC. ASCO 5101 or equal or as scheduled on the drawings.

PART 3 OPERATION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Confirm all dimensions and coordinate with general trades for concrete pad outside of building.

C. Provide complete power wiring between panels, generator and transfer switches.

D. Generator control conductors between the transfer switch and the generator shall be kept independent of all other wiring. Provide 2 hour fire rated cables.

E. Wire the remote annunciator and e-stop as specified and noted on the drawings.

F. Equipment shall be installed by the contractor in accordance with final submittals and contract documents. Installation shall comply with applicable state and local codes as required by the authority having jurisdiction. Install equipment in accordance with manufacturer's instructions and instructions included in the listing or labeling of UL listed products

G. Installation of equipment shall include furnishing and installing all interconnecting wiring between all major equipment provided for the on-site power system. The contractor shall also perform interconnecting wiring between equipment sections (when required), under the supervision of the equipment supplier.

H. Graded mount equipment shall be installed on concrete housekeeping pads. Equipment shall be permanently fastened to the pad in accordance with manufacturer's instructions and seismic requirements of the site.

I. Equipment shall be initially started and operated by representatives of the manufacturer.

J. All equipment shall be physically inspected for damage. Scratches and other installation damage shall be repaired prior to final system testing. Equipment shall be thoroughly cleaned to remove all dirt and construction debris prior to initial operation and final testing of the system.

K. Roof mounted generator shall be installed and secured on the roof support framing. Refer to structural drawings for support details.

L. Complete start wire monitoring unit installation in accordance with the manufacturer's requirements.

M. Furnish and install a permanent switching means to connect a portable or temporary alternate source of power, which shall be available for the duration of the maintenance or repair. See the plans for the manufacturer scheduled and wiring connections.

3.2 MANUFACTURER'S FIELD SERVICES

A. Provide onsite system commissioning for initial startup, check out, running operation and load testing.

3.3 SYSTEM TRAINING

A. Include (1) onsite Owner training session.

3.4 MAINTENANCE

A. The generator vendor shall provide the Owner a maintenance list to be performed during the warranty period.

END OF SECTION

MAI: 2022-01072

SECTION 26 51 13

INTERIOR LUMINAIRES

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.

B. Conform to requirements of 2015 Michigan Building Code, 2017 National Electrical Code, 2017 State of Michigan Code Rules Part 8, 2009 ICC/ANSI 117.1 and local code requirements.

C. NFPA 101 - Life Safety Code, current adopted edition.

D. 2015 Michigan Energy Code.

E. ASHRAE 90.1 2013 Edition.

F. LED Standards LM 79 and LM 80.

G. 2017 NEC 110.26(D).

1.4 SUBMITTALS FOR REVIEW

A. Provide submittal as listed in Section 26 00 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

A. Conform to requirements of 2015 Michigan Building Code, 2017 National Electrical Code, 2017 State of Michigan Code Rules Part 8, 2009 ICC/ANSI 117.1 and local code 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.

D. 2015 Michigan Energy Code.

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 supported from swivel hangers. 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 recessed luminaires using accessories and firestopping materials to meet regulatory requirements for fire rating.

H. Install clips to secure recessed grid-supported luminaires in place at a minimum of (4) points of attachment to prevent movement.

I. Install wall mounted luminaires at height as indicated on Drawings and/or architectural drawings.

J. Install accessories furnished with each luminaire.

K. Connect emergency luminaires and exit signs to the emergency distribution or inverter as noted and shown on the drawings.

L. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within luminaire.

M. Bond products and metal accessories to branch circuit equipment grounding conductor.

N. 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. Contract Closeout: Division 1: Adjusting installed work.

B. Aim and adjust luminaires as indicated or as directed.

C. 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 light fixtures with non-working LED’s, broken or discolored lens.

3.6 PROTECTION OF FINISHED WORK

A. Contract Closeout: Protecting installed work.

END OF SECTION

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SECTION 28 31 00

FIRE ALARM SYSTEM

PART 1 GENERAL

1.1 SECTION INCLUDES

A. New point addressable main fire alarm panel, devices, and new NAC panels.

B. Fire alarm system shall not be limited to: Manual pull stations, magnetic door holders, 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.

E. Fire protection system. Electrical Trades shall complete all flow and tamper switch wiring to the fire alarm system. The flow and tamper switches shall be furnished and installed as part of the fire protection contractor's bid. Electrical Trades shall furnish and install a flush mounted backbox, an exterior horn/strobe and wiring to the fire alarm system. Electrical Trades shall be responsible to contact the fire protection contractor to confirm flow and tamper switch quantities and locations, and include all costs.

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. Conform to requirements of 2015 Michigan Building Code, 2017 National Electrical Code, 2017 State of Michigan Code Rules Part 8, 2009 ICC/ANSI 117.1 and local code requirements.

B. NFPA 72 - Current adopted code.

C. Local authorities having jurisdiction.

D. Underwriters Laboratories Inc.

E. National Fire Protection Association Standards

1. NFPA 13 – Installation of Sprinkler Systems.
2. NFPA 72 – National Fire Alarm Code.

3. NFPA 101 – Life Safety Code.

F. 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. UL864 SYZV - Releasing device control unit (water release only).
3. UL268 - Smoke detectors for fire protective signaling systems.
4. UL268A - Smoke detectors for duct application.
5. UL217 - Smoke detectors for single stations.
6. UL464 - Audible signaling appliances.
7. UL1638 - Visual signaling appliances.
8. UL38 - Manually activated signaling boxes.
9. UL346 - Waterflow indicators for fire protective signaling systems.
10. 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 00 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

A. Conform to requirements of 2015 Michigan Building Code, 2017 National Electrical Code, 2017 State of Michigan Code Rules Part 8, 2009 ICC/ANSI 117.1 and local code requirements.

B. NFPA 72 - Current adopted edition.

C. NFPA 101 - Life Safety Code, current adopted edition.

D. Local authorities having jurisdiction.

E. NFPA 90A Current Adopted Edition.

F. NFPA 92A Current Adopted Edition.

G. NFPA 92B Current Adopted Edition.

H. 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. UL864 SYZV - Releasing device control unit (water release only).
   3. UL268 - Smoke detectors for fire protective signaling systems.
   4. UL268A - Smoke detectors for duct application.
   5. UL217 - Smoke detectors for single stations.
   6. UL521 - Heat detectors for fire protective signaling systems.
   7. UL228 - Door holders for fire protective signaling systems.
   8. UL464 - Audible signaling appliances.
   9. UL1638 - Visual signaling appliances.
   10. UL38 - Manually activates signaling boxes.
   11. UL346 - Waterflow indicators for fire protective signaling systems.
   12. UL1481 - Power supplies for fire protective signaling systems.

1.9 SCOPE OF WORK

A. This bid package shall include fire alarm panel, all devices and associated NAC panel, wiring and system certification ready for interconnection to one main fire alarm control panel, and a remote annunciator panel as specified.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. JCI/Simplex, Gamewell, or Edwards. No other manufacturers will be recognized.

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 FIRE ALARM CONTROL PANEL

A. New point addressable suitable for [voice evacuation] [non-voice evacuation] [non-proprietary] sized properly with a minimum of 30% spare capacity.

B. Provide a fire alarm control panel with the following:

1. Digital display.
2. Multiple pushbutton keypad.
3. LED status indicating lights.
4. Audible status signals.
5. Output relays.
6. Battery charger and batteries.
7. RS-232 communications card.

C. Evaluate and document the appropriate notification appliance circuit class designation.

1. In general, provide Class B notification appliance circuits.
2. Size the control panel power supplies, amplifiers, and batteries for 25 percent spare capacity calculated with, 1 watt speaker loads, and 150 ma strobe light loads.
3. Provide sufficient spare capacity on each notification appliance circuit for an additional 25 percent of notification appliances.

D. The system shall supervise the following circuits and components:
1. Initiating device circuits.
2. Signaling line circuits.
3. Notification appliance circuits.
4. Addressable initiating and control devices.
5. Control output wiring.
6. Auxiliary control switches.
7. System, NAC panels, remote annunciator, and remote microphone.
8. Primary power supply.
9. Secondary power supply.

E. The system shall be capable of being programmed by the Owner on site to accommodate expansion or sequence of operation changes.

F. Provide 120 volts AC primary power to the system.

G. Provide a control panel battery charger capable of fully charging a 200 amp-hour battery within 24 hours.

H. Provide sufficient secondary power battery capacity to operate the entire system (except the door hold-open devices) upon the loss of primary power for a period of 24 hours in a normal supervisory mode followed by 5 minutes of evacuation alarm operation.

1. When emergency voice/alarm communications is provided, provide sufficient battery capacity for 24 hours of operation in a normal supervisory mode followed by 15 minutes of voice/alarm operation.
2. The system shall automatically transfer to and from the secondary power batteries upon an interruption of primary power without initiating a nuisance alarm.
3. The system shall delay initiating a trouble condition for two seconds upon a transfer to or from primary power to avoid nuisance trouble conditions during emergency generator testing.

I. Provide smoke and heat detectors as required by code and as shown, including the following.

1. Provide a smoke detector in each mechanical, electrical, telecommunications, daycare rooms, and associated egress corridors.
2. Provide duct smoke detectors where required by code. When not in plain view or when more than 10 feet above the floor, provide duct detector remote alarm indicators and test switches mounted in plain view at 48 inches above the floor.

J. Provide sufficient audible notification appliances to achieve a sound level of 15 dBA above ambient sound level, but not less than 60 dBA nor more than 110 dBA in all occupiable spaces. The sound level in mechanical rooms shall be not less than 90 dBA. The sound shall be a three-pulse temporal pattern evacuation tone.

K. Provide visual notification appliances in accordance with the intensity and spacing requirements of NFPA 72.

L. Provide individually addressable monitor modules to monitor non-addressable initiating devices and status contacts of other systems.

1. Monitor modules shall use Class B initiating device circuits to monitor the initiating devices and status contacts.

M. Provide panel auxiliary relay contacts and individually addressable control module contacts, including the required panel control logic programming, to interface with control circuits of other systems and equipment.

1. Provide normally closed duct smoke detector contacts to shut down ventilation systems.

N. Assign each initiating device and control module a unique device address. Label each device with its unique address using a clear adhesive backed nylon or Mylar tape with black text. Install the label on the base of any device with a removable or replaceable head.

O. Label each initiating device and control module that describes the type, room number/name and exact location of the device.

P. Provide transient voltage surge suppression for the system.

2.4 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.

i. 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.

G. **Visual Units:** For ceiling installation shall include vertical lettering. Horizontal lettering is not acceptable.

2.5 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.

2.6 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.

2.7 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.

2.8 REMOTE ANNUNCIATOR

A. The remote annunciator shall duplicate the backlit LCD display; the alarm acknowledge, supervisory acknowledge, trouble acknowledge, alarm silence, and system reset pushbuttons; the alarm, supervisory, and trouble audible signals; the alarm, supervisory, trouble, and power "on" LED's; and the programmable function keys of the fire alarm control panel. A key "enable" switch or door lock, keyed to match the fire alarm control panel door lock, shall permit activating or deactivating the controls.

2.9 BATTERIES

A. Batteries shall be lead calcium and supervised so that a failure produces a "TROUBLE" signal.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install fire alarm wiring in conduit for device shown storage room, mechanical rooms and similar space. Use 5'-0" minimum conduit drop in for physical protection.

B. All junction boxes for fire alarm raceway system shall be painted red labeled "FIRE ALARM". Junction boxes installed in theatrical space where the project requires a black room finish scheme, label the junction box "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. All fire alarm wiring installation that may be required to be installed through non-accessible ceiling spaces, and cannot be installed in conduit or cable tray, free air method will be acceptable for those spaces. Open wiring is acceptable method. Properly secure to ceiling structure, use J hooks or D-rings. The cable shall be plenum rated for this application.

J. 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.

K. 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.

L. 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.

M. Contractor shall be responsible to wire tamper switch to the fire alarm panel. Include fire alarm panel points as part of the overall fire alarm panel points.

N. Electrical Trades shall furnish and install a circuit breaker lock for the 120 volt circuit serving the fire alarm panel. Label the panelboard directory branch circuit text in red.

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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