Auburn Islamic Center

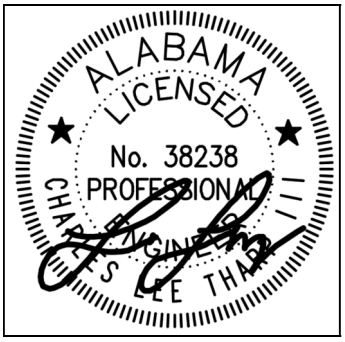
Auburn, Alabama

S|S|&|L

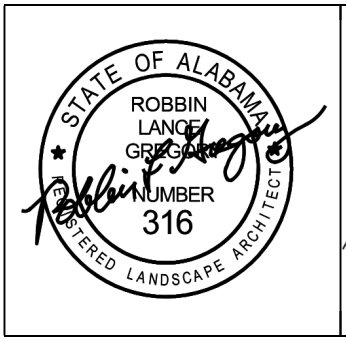
Seay, Seay & Litchfield Architects
Auburn, Alabama

SS&L Job No. 22073

Architectural



Civil



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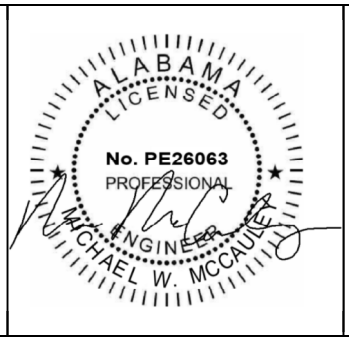

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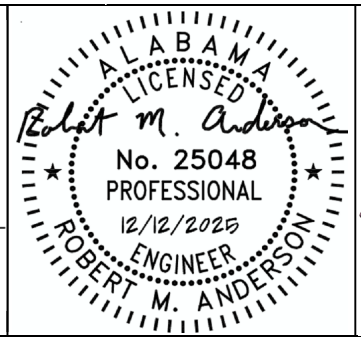
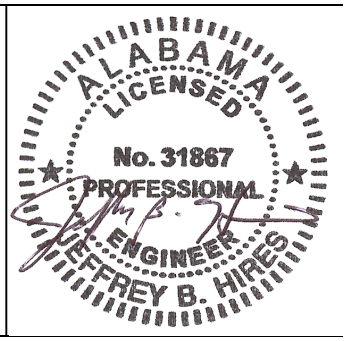


Mechanical/Plumbing/Fire Protection



Electrical

December 2025
Conformance Documents

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SUPPLEMENTARY INSTRUCTIONS TO BIDDERS

TO THE INSTRUCTIONS TO BIDDERS, AIA A701 – 2018

The following supplements modify, change, delete from or add to "Instructions to Bidders", AIA Document A701, 2018. Where an Article, Paragraph, Subparagraph or Clause of General Conditions is modified or deleted by Supplementary Instructions, unaltered provisions of that Article, Paragraph, Subparagraph or Clause shall remain in effect. In the event of conflict between the Instructions to Bidders or these Supplementary Instructions, the more stringent shall prevail.

Add, Replace, or Remove the following subparagraphs:

ARTICLE 1 – DEFINITIONS

Replace Section 1.1: Bidding Documents include the Bidding Requirements and the proposed Contract Documents. The Bidding Requirements consist of the Advertisement or Invitation to Bid, Instructions to Bidders, Supplementary Instructions to Bidders, the bid form, and other sample bidding and contract forms. The proposed Contract Documents consist of the form of Agreement between the Owner and Contractor, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, Report of Subsurface Exploration and Geotechnical Evaluation (provided by Owner), and all Addenda issued prior to execution of the Contract.

ARTICLE 2 – BIDDER'S REPRESENTATIONS

Add Section 2.1.7: The Bidder has investigated all required fees, permits, and regulatory requirements of authorities having jurisdiction and has properly included in the submitted bid the cost of such fees, permits, and requirements not otherwise indicated as provided by Owner.

ARTICLE 3 – BIDDING DOCUMENTS

Replace Section 3.1.1: Bidders may only obtain complete digital sets of the Bidding Documents at no expense to the Bidder by contacting **Nick Vansyoc** at nvansyoc@sslarch.com. Additionally, bid documents are available on the City of Opelika's website at www.opelika-al.gov/bids.aspx.

Remove Section 3.1.2: Paragraph deleted in its entirety.

Replace Section 3.1.3: Bidders shall use complete sets of Bidding Documents in preparing Bids; neither the Owner nor Architect assumes responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.

Replace Section 3.2.2: Bidders requiring clarification or interpretation of the Bidding Documents shall make a written/electronic request to by contacting **Nick Vansyoc** at nvansyoc@sslarch.com, and shall be submitted by no later than **__xxxxxxxxxx___** at 12:00 PM CST.

Replace Section 3.3.2.1: No substitution will be considered prior to receipt of Bids unless written request for approval has been received by SS&L Architects, at least two days prior to the date for receipt of Bids.

Replace Section 3.3.2.2: Submit material and product substitutions on CSI Substitution Request Form (During the Bidding Stage).

Remove Section 3.3.2.3: Paragraph deleted in its entirety.

Add Section 3.3.6: Questions regarding the work should be directed to **Nick Vansyoc** at nvansyoc@sslarch.com. All other questions related to this bid should be directed to this same address.

Replace Section 3.4.2: All Addenda will be issued by SS&L Architects to all prospective bidders via email.

Replace 3.4.3: Clarification will be made by Addendum sent to all prospective bidders or, if time does not permit announced at the place where, and before the time, bids are opened.

ARTICLE 4 – BIDDING PROCEDURES

Remove Section 4.1.6: Paragraph deleted in its entirety.

Add Section 4.1.10: Bidders are required to indicate all unit costs, when unit cost are required by the contract documents. Bidders failing to bid all Unit Costs risk disqualification of their bid.

Add Section 4.1.11: The Proposal shall be signed properly by the Bidder. If the Bidder is an individual, his name and post office address must be shown; if a firm or partnership, the name and post office address of each member of the firm or partnership must be shown; if a corporation, the president, vice-president, or secretary shall sign and affix the authorization from the president, vice-president or secretary of the corporation. The Proposal must show the name of the corporation, the name of the state under the laws of which the corporation is chartered and the names, titles, and business addresses of the officers.

Replace Section 4.2.1: Each Bid shall be accompanied by a bid security in the form and amount required if so stipulated in the Instructions to Bidders. The bid security shall insure that the Bidder will enter into a contract with the Awarding Authority and that the bidder will furnish the Specified Performance and Payment Bonds and Evidence of Insurance at the signing of the Contract.

Replace Section 4.2.4: The Owner will have the right to retain the bid security of Bidders to whom an award is being considered until (a) the Contract has been executed and bonds, if required, have been furnished; (b) the specified time has elapsed so that Bids may be withdrawn; of (c) all Bids have been rejected. However, if no Contract has been awarded or a Bidder has not been notified of the acceptance of its bid, a bidder may, beginning 60 days after the opening of Bids, withdraw its Bid and request the return of its bid security.

Replace Section 4.3.1: Bids shall be submitted by the date and time and the place indicated in the Bid Notice for Floral Park Renovations, Bid Inquiry 24006.

Add Section 4.3.6: Enclose bid in a sealed envelope. The bids must be marked with the word "BID" on the outside of the bid package along with Bid Proposal for Inquiry 24006, the bid date, name of the work, name of bidder, and the Alabama General Contractor's License Number. Prepare bid on form bound in Project Manual or copy thereof. Furnish two original copies of bid proposal. Furnish one original of certified check or bid bond payable to the City of Opelika in an amount not less than five percent (5%) of the amount of the bid, but in no event more than $10,000.00. Include one copy of General Contractor's License Certificate with Bid Proposals. Include one copy of the State of Alabama Disclosure Statement. Signature on bid must be in ink. Bids made out in pencil will NOT be accepted.

Replace Section 4.4.3: After the date and time designated for receipt of Bids, a Bidder who discovers that it made a clerical error in its Bid shall notify the Architect of such error within 24 hours of bid opening, or

pursuant to a timeframe specified by the law of the jurisdiction where the Project is located, requesting withdrawal of its Bid. Upon providing evidence of such error to the reasonable satisfaction of the Architect, the Bid shall be withdrawn and not resubmitted. If a Bid is withdrawn pursuant to this Section 4.4.3, the Owner may, at their own discretion, retain the bid security.

ARTICLE 6 – POST-BID INFORMATION

Add Section 6.3.4: Within ten days after receiving the Notice to Proceed the Contractor shall submit to the Architect a schedule of values on form provided by Architect which is a breakdown of the Contract Sum showing the value of the various parts of the Work for billing purposes. The Schedule of Values shall divide the Contract Sum into as many parts ("line items") as the Architect and Owner determine necessary to permit evaluation and to show amounts attributable to Subcontractors. The Contractor's overhead and profit are to be proportionately distributed throughout the line items of the Schedule of Values. Upon approval, the Schedule of Values shall be used as a basis for monthly Applications for Payment, unless it is later found to be in error. Approved change order amounts shall be added to or incorporated into the Schedule of Values as mutually agreed by the Contractor and Architect.

ARTICLE 7 – PERFORMANCE BOND AND PAYMENT BOND

Replace 7.2.1: Within 15 days upon notification of bid award, the undersigned shall submit the Construction Contract, Performance Bond, Payment Bond to the Architect along with the Certificate of Insurance evidencing obtainment of insurance requirements. The undersigned shall also provide all required local and State of Alabama Immigration Law E-Verify Compliance Documentation.

ARTICLE 8 – FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR

Unless otherwise required in the Bidding Documents, the Agreement for the Work will be written on AIA Document A101 – 2017, Standard Form of Agreement Between Owner and Contractor, where the Basis of Payment is a Stipulated Sum.

Add Section 8.1: No Contract is binding upon the Owner until it has been approved by the Architect and signed by the Owner. The date of the final execution of the Contract shall be the date on which it is signed by the Owner.

PROPOSAL FORM

To: **Auburn Islamic Center**

Submitted: _____, 2024. The undersigned, as Bidder, hereby declares that he has examined the site of the work and informed itself fully regarding all conditions pertaining to the place where the work is to be done; that they have examined the plans and specifications for the work and contractual documents relative thereto; and has read all Special provisions furnished prior to the opening of bids; that they have satisfied themselves relative to the work to be performed.

The Bidder proposes and agrees, if this proposal is accepted, to contract with the City of Auburn, Alabama, in the form of contract specified, to furnish all necessary materials, equipment, machinery, tools, apparatus, means of transportation, and labor necessary to complete the

AIC New Masjid
Auburn, Alabama

in full and complete accordance with the shown, noted, described, and reasonably intended requirements of the plans, specifications, and contract documents, to the full and entire satisfaction of the City of Opelika, Alabama, with a definite understanding that no money will be allowed for extra work except as set forth in the General Conditions and Contract Documents for the bid prices.

The Bidder further proposes and agrees hereby to commence the work with an adequate force, plant and equipment at the time stated in the Notice to Proceed issued by the Owner's designated representative(s) identified in the Contract Documents.

Subject to the compliance with the Invitation to Bid and the Instructions to Bidders and Supplemental Instructions to Bidders, the undersigned,

_____

(Legal Name of Bidder)

hereby proposes to furnish all labor, materials, tools and necessary equipment to perform all work required for the construction of:

WORK: The Work consists of providing all labor, materials, and equipment necessary to construct the new **AIC Masjid**, in accordance with Drawings and Specifications dated September 2025, prepared by Seay, Seay, & Litchfield, P.C.

The Bidder, which is organized and existing under the laws of the State of Alabama, having its principal offices in the City of _____,is:

☐ a Corporation ☐ a Partnership ☐ an individual ☐ (other) _____.

LISTING OF PARTNERS OR OFFICERS: If Bidder is a Partnership, list all partners and their addresses; if Bidder is a Corporation, list the names, titles, and business addresses of its officers:

_____

_____

BIDDER'S REPRESENTATION: The Bidder declares that it has examined the site of the Work, having become fully informed regarding all pertinent conditions, and that it has examined the Drawings and Specifications (including all Addenda received) for the Work and the other Bid and Contract Documents relative thereto, and that it has satisfied itself relative to the Work to be performed.

BIDDER'S ALABAMA LICENSE:
State License for General Contracting:

_____

License Number	Bid Limit	Type(s) of Work

ADDENDA: The Bidder acknowledges receipt of Addenda No. 1 through _____ inclusively.

BASE BID, ALLOWANCES, UNIT PRICES & ALTERNATES:

1. Each Bid Item includes a lump sum Base Bid.

2. Each Bid Item includes an Alternate(s) as described in Specification 01 2300.

3. The lump sum Base Bid for each Bid Item shall include all costs for stated Bid Item Allowances, as described in Specification 01 2100.

4. A Unit Prices Allowance is identified for Bid Item A and the costs for stated Unit Price Allowance Quantities, as described in Specification 01 2200, shall be included in the Base Bid.

In compliance with your Invitation for Bids, the undersigned hereby proposes to furnish the plant, labor, materials, and equipment and perform all work for the above-described project in strict accordance with the specifications, drawings, and addenda for consideration of the following prices **(Bid prices do NOT include Sales or Use Taxes in accordance with Act 2013-05, Do NOT leave any item blank):**

The Base Bid

Base Bid:	AIC New M		_____
	Lump sum cost of all Unit Price Allowance Quantities		$_____
	Base Bid Total		$_____
Alternates:	NA	ADD	$____NA____
Unit Price:	Unit Price No. 1 – 6" HDPE Underdrain (price per LF)		$_____/LF.
Unit Price:	Unit Price No. 2 – Unsuitable Soils (price per CY)		$_____/CY.

CONTRACTOR'S ESTIMATE OF SALES TAX: Failure to provide an accounting of sales tax may render the bid non-responsive. Other than determining responsiveness, sales tax accounting shall not affect the bid pricing nor be considered in the determination of the lowest responsible and responsive bidder.

Pursuant to Act 2013-05, section 1(g) the Contractor accounts for sales tax NOT in the bid form as follows:

Estimated Sales Tax Amount			
Base Bid:	Spring Villa		$_____
	Lump sum cost of all Unit Price Allowance Quantities		$_____
	Base Bid Total		$_____
Alternates:	NA	ADD	$____NA____
Unit Price:	Unit Price No. 1 – Removal and replacement for any existing below-ground foundation 400 Cubic Yard (price per CY).		$_____/CY.
Unit Price:	Unit Price No. 2 – Undercut loose soils and moisture conditioning and replacing w/ compaction: 25,000 CY (price per CY).		$_____/CY.
Unit Price:	Unit Price No. 3 – Finger drains 1,000 LF (price per LF).		$_____/LF.

BID SECURITY: The undersigned agrees to enter into a Construction Contract and furnish the prescribed Performance and Payment Bonds and evidence of insurance within **(15)** calendar days, or such other period stated in the Bid Documents, after the contract forms have been presented for signature, provided such presentation is made within **(60)** calendar days after the opening of bids, or such other period stated in the Bid Documents. As security for this condition, the undersigned further agrees that the funds represented by the Bid Bond (or cashier's check) attached hereto may be called and paid into the account of the Awarding Authority as liquidated damages for failure to so comply. No bid may be withdrawn after the scheduled closing time for receipt of bids for a period of sixty **(60)** calendar days. The Owner reserves the right to reject bid if such action is determined to be in the best interest of the Owner.

Attached hereto is a: (*Mark the appropriate box and provide the applicable information.*)

☐ Bid Bond, executed by _____as Surety,

☐ a cashier's check on the_____ Bank of _____,

for the sum of _____Dollars

($ _____) made payable to the Awarding Authority.

CERTIFICATIONS: The undersigned certifies that he or she is authorized to execute contracts on behalf of the Bidder as legally named, that this proposal is submitted in good faith without fraud or collusion with any other bidder, that the information indicated in this document is true and complete, and that the bid is made in full accord with State law. Notice of acceptance may be sent to the undersigned at the address set forth below.

The Bidder also declares that a list of all proposed major subcontractors and suppliers will be submitted at a time subsequent to the receipt of bids as established by the Architect in the Bid Documents but in no event shall this time exceed twenty-four (24) hours after receipt of bids. *

Legal Name of Bidder _____

Mailing Address_____

* **By (Legal Signature)**_____

* Name (type or print) _____ (Seal)

* Tile_____

Telephone Number _____

* If other than the individual proprietor, or an above named member of the Partnership, or the above named president, vice-president, or secretary of the Corporation, attach written authority to bind the Bidder. Any modification to a bid shall be over the initials of the person signing the bid, or of an authorized representative.

SUPPLEMENTARY CONDITIONS TO THE GENERAL CONDITIONS
TO THE STANDARD FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR, AIA 101 - 2017

The following supplements modify, change, delete from or add to "General Conditions of the Contract for Construction", AIA A201, 2017. Where an Article, Paragraph, Subparagraph or Clause of General Conditions is modified or deleted by Supplementary Conditions, unaltered provisions of that Article, Paragraph, Subparagraph or Clause shall remain in effect. In the event of conflict between the General Conditions or these Supplementary Conditions, the latter shall prevail.

Add, Modify, Replace or Remove the following subparagraphs:

ARTICLE 1 – GENERAL PROVISIONS

Section 1.1.1: Modify as follows: Delete the last sentence and replace with the following: Unless specifically enumerated in the Agreement, the Contract Documents do not include sample forms, or the Contractor's bid or any proposal submitted therewith. Bidding requirements, as enumerated in the Specifications, shall apply to the Work of this Contract to the extent of bidders' responsibilities indicated. Regardless of Owner's right to waive irregularities or technical errors, such irregularities and/or modifications in the Bidder's responsiveness to the stated requirements shall not change the requirements of the Contract Documents.

Section 1.7: Delete and replace with the following: Protocols governing the transmission and use of Instruments of Service or any other information or documentation in digital form shall be to the Architect's sole discretion.

Section 1.8: Delete and replace with the following: Any use of, or reliance on, all or a portion of the Instruments of Service shall be at the using or relying party's sole risk and without liability to the other party and its contractors or consultants, the authors of, or contributors to, and each of their agents and employees.

Add Section 3.1.4: Contractor is responsible for discharging the following obligations: (1) All materials and equipment for the Project shall be of good quality and new unless otherwise required or permitted by the Contract Documents, (2) all work performed on the Project will be free from defects not inherent in the quality required or permitted, and (3) all work performed on the Project will conform to the requirements of the Contract Documents. Work performed on the Project not conforming to these requirements is defective work. For a period of one (1) year following final completion of the project, or such longer period as may be specifically required in the Contract Documents, Contractor shall honor all warranty obligations for defective work.

Section 3.2.1: Delete and replace as follows: Execution of this Contract by the Contractor is a representation that the Contractor has visited the site, become familiar with the local conditions under which the Work is to be performed, has correlated personal observations with the requirements of the Contract Documents, work being performed by the Owner, work being performed under separate contracts, and has raised and resolved all ambiguities, defects and deficiencies therein.

Add Section 3.10.4: If Contractor's progress of the Work is behind the approved Project Schedule, the Contractor shall act on each portion which is not in general accordance with the Project Schedule, to whatever extent is required to move progress of the Work back into general accordance with the Project Schedule, at no additional cost to the Owner.

Add Section 3.10.5: If Contractor's progress of the Work is delayed by the acts or omissions of another contractor employed by the Owner, then Contractor shall take all steps necessary to complete the Work in accordance with the Project Schedule and within the Contract Time. If the Contractor causes a delay to another contractor, then Contractor shall immediately reimburse such other contractor all damages resulting from such delay. Every contract between the Owner and a contractor relating to the Project will contain a reciprocal provision and all other contractors shall be deemed a third-party beneficiary of each such contract, but only for the purpose of enforcing this specific provision. The obligations set forth in this paragraph shall be guaranteed by the Contractor's performance bond, whether or not the bond so states, and shall be enforceable against the surety as if expressly incorporated into the language of the bond.

Add Section 3.10.6: Under no circumstances shall the Owner be required to pay Contractor for damages resulting from a delay or interruption to its Work or to the Project. If the Contractor is delayed or interrupted as a result of any action or omission by the Owner, then Contractor shall receive, as full compensation for such delay or interruption, an extension of the Contract Time.

Add Section 3.13.1: Contractor shall store all materials only in the locations designated by the Owner. The Contractor will make provisions to store materials necessary to complete the Work. Materials stored in locations other than designated by the Owner at the end of the workday will be removed at the expense of the Contractor and such expense will be deducted from the Contract Sum.

Add Section 3.15.3: The Contractor is responsible for keeping its part of the site clean and in an orderly fashion, including daily cleanup and disposal of its debris to an off-site location.

Section 6.2.3: Modify as follows: Delete the last sentence and replace with the following: If the Contractor is delayed or interrupted as a result of any action or omission by the Owner, or Separate Contractor's delays, then Contractor shall receive, as full compensation for such delay or interruption, an extension of the Contract Time.

Section 6.3: Delete and replace with the following: If a dispute arises among the Contractor, Separate Contractors, and the Owner as to the responsibility under their respective contracts for maintaining the premises and surrounding area free from waste materials and rubbish, the Owner may clean up and the Owner may allocate the cost among those responsible**.**

Add Section 9.1.1: Add the following the Section 9.1.1: The Contract Sum excludes taxes for which an exemption has been obtained. The Contractor shall pay all taxes, for which no exemption is in place, and shall secure and pay for all permits, fees and licenses necessary for the execution of the Work.

Section 9.2: Delete and replace with the following: Within ten days after receiving the Notice to Proceed the Contractor shall submit to the Architect a schedule of values on form provided by Architect which is a breakdown of the Contract Sum showing the value of the various parts of the Work for billing purposes. The Schedule of Values shall divide the Contract Sum into as many parts ("line items") as the Architect and Owner determine necessary to permit evaluation and to show amounts attributable to Subcontractors. The Contractor's overhead and profit are to be proportionately distributed throughout the line items of the Schedule of Values. Upon approval, the Schedule of Values shall be used as a basis for monthly Applications for Payment, unless it is later found to be in error. Approved change order amounts shall be added to or incorporated into the Schedule of Values as mutually agreed by the Contractor and Architect.

Add Section 9.3.3: Based on the approved Schedule of Values, Application and Certificate for Payment

shall show the Contractor's estimate of the value of Work performed in each line item as of the end of the billing period. The Contractor's cost of materials and equipment not yet incorporated into the Work, but delivered and suitably stored on the site, may be considered in monthly Applications for Payment. One payment application per month may be submitted. Each Application and Certificate for Payment shall match to the penny and be accompanied by an attached Schedule of Values. The Contractor's estimate of the value of Work performed and stored materials must represent such reasonableness as to warrant certification by the Architect to the Owner. Each monthly Application for Payment shall be supported by such data as will substantiate the Contractor's right to payment, including without limitation copies of requisitions from subcontractors and material suppliers.

Add Section 9.3.4: Unless otherwise provided in the Contract Documents, the Contractor's cost of materials and equipment to be incorporated into the Work, which are stored off the site, may also be considered in monthly Applications for Payment under the following conditions:

1. the contractor has received written approval from the Architect and Owner to store the materials or equipment off site in advance of delivering the materials to the off-site location.
2. A Certificate of Insurance is furnished to the Architect evidencing that a special insurance policy, or rider to an existing policy, has been obtained by the Contractor providing all-risk property insurance coverage, specifically naming the materials or equipment stored, and naming the Owner as an additionally insured party.
3. The Architect is provided with a detailed inventory of the stored materials or equipment and the materials or equipment are clearly marked in correlation to the inventory to facilitate inspection and verification of the presence of the materials or equipment by the Architect.
4. The materials or equipment are properly and safely stored in a bonded warehouse, or a facility otherwise approved in advance by the Architect and Owner; and
5. Compliance by the Contractor with procedures satisfactory to the Owner to establish the Owner's title to such materials and equipment or otherwise protect the Owner's interest.

Add Section 9.3.5: Retainage is defined as the money earned and, therefore, belonging to the Contractor (subject to final settlement of the Contract) which has been retained by the Owner conditioned on final completion and acceptance of all Work required by the Contract Documents. Retainage shall not be relied upon by Contractor (or Surety) to cover or off-set unearned monies attributable to uncompleted or uncorrected Work. In making progress payments the Owner shall retain 5% of the estimated value of Work performed and the value of the materials stored for the Work; but after retainage has been held upon fifty percent of the Contract Sum, no additional retainage will be withheld.

Section 9.8.5: Delete and replace with the following: The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in such Certificate. Upon such acceptance and consent of surety, if any, the Owner shall make payment sufficient to increase the total payments to 98-percent (98%) of the Contract Sum applying to such Work or designated portion thereof. Such payment shall be adjusted for Work that is incomplete or not in accordance with the requirements of the Contract Documents.

Section 9.10.2: Add the following: (7) The Contractor, immediately after being notified by the Architect that all other requirements of the Contract have been completed, shall give public notice of completion of the Contract by having an Advertisement for Completion, published for a period of four successive weeks in some newspaper of general circulation published within the city or county where the Work was performed. Proof of publication of the Advertisement for Completion shall be made by the Contractor to the Architect by affidavit of the publisher, in duplicate, and a printed copy of the Advertisement for Completion published, in duplicate. If no newspaper is published in the county where the work was done,

the notice may be given by posting at the Court House for thirty days and proof of same made by Probate Judge or Sheriff and the Contractor. Final payment shall not be due until thirty days after this public notice is completed.

Section 11.1.1: Add the following: The Contractor, at its sole expense, shall obtain and maintain in full force the following insurance to protect the Contractor, Owner, Architect, their officers, appointees, agents, consultants and employees as additional insureds at limits and coverages specified below. These limits and coverages specified are the minimum to be maintained and are not intended to represent the correct insurance to fully and adequately protect the Contractor.

A. GENERAL:

1. **RESPONSIBILITY:** The Contractor shall be responsible to the Owner from the time of the signing of the Construction Contract or from the beginning of the first work, whichever shall be earlier, for all injury or damage of any kind resulting from any negligent act or omission or breach, failure or other default regarding the work by the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, regardless of who may be the owner of the property.

2. **INSURANCE PROVIDERS:** Each of the insurance coverages required below shall be issued by an insurer licensed by the Insurance Commissioner to transact the business of insurance in the State of Alabama for the applicable line of insurance, and such insurer (or, for qualified self-insureds or group self-insureds, a specific excess insurer providing statutory limits) must have a Best Policyholders Rating of "A-" or better and a financial size rating of Class V or larger.

3. **NOTIFICATION ENDORSEMENT:** Each policy shall be endorsed to provide that the insurance company agrees that the policy shall not be canceled, changed, allowed to lapse or allowed to expire for any reason until thirty days after the Owner has received written notice by certified mail as evidenced by return receipt or until such time as other insurance coverage providing protection equal to protection called for in the Contract Documents shall have been received, accepted and acknowledged by the Owner. Such notice shall be valid only as to the Project as shall have been designated by Project Name and Number in said notice.

4. **INSURANCE CERTIFICATES:** The Contractor shall procure the insurance coverages identified below, or as otherwise required in the Contract Documents, at the Contractor's own expense, and to evidence that such insurance coverages are in effect, the Contractor shall furnish the Owner an insurance certificate(s) acceptable to the Owner and listing the Owner as the certificate holder. The insurance certificate(s) must be delivered to the Owner with the Construction Contract and Bonds for final approval and execution of the Construction Contract. The insurance certificate must provide the following:
    a. Name and address of authorized agent of the insurance company
    b. Name and address of insured
    c. Name of insurance company or companies
    d. Description of policies
    e. Policy Number(s)
    f. Policy Period(s)
    g. Limits of liability
    h. Name and address of Owner as certificate holder

i. Project Name and Number, if any
j. Signature of authorized agent of the insurance company
k. Telephone number of authorized agent of the insurance company
l. Mandatory thirty-day notice of cancellation / non-renewal / change

5. **MAXIMUM DEDUCTIBLE**: Self-insured retention, except for qualified self-insurers or group self-insurers, in any policy shall not exceed $25,000.00.

B. INSURANCE COVERAGES: Unless otherwise provided in the Contract Documents, the Contractor shall purchase the types of insurance coverages with liability not less than as follows:

1. **WORKERS' COMPENSATION and EMPLOYER'S LIABILITY INSURANCE:**
   a. Part One: Workers' Compensation coverage shall be provided in accordance with the statutory coverage required in Alabama. A group insurer must submit a certificate of authority from the Alabama Department of Industrial Relations approving the group insurance plan. A self-insurer must submit a certificate from the Alabama Department of Industrial Relations stating the Contractor qualifies to pay its own workers' compensation claims
   b. Part Two: Employer's Liability Insurance Limits shall be at least:
      i. Bodily Injury by Accident - $1,000,000 each accident
      ii. Bodily Injury by Disease - $1,000,000 each employee

2. **COMMERCIAL GENERAL LIABILITY INSURANCE:**
   a. Commercial General Liability Insurance, written on an ISO Occurrence Form (current edition as of the date of Advertisement for Bids) or equivalent, shall include, but need not be limited to, coverage for bodily injury and property damage arising from premises and operations liability, products and completed operations liability, blasting and explosion, collapse of structures, underground damage, personal injury liability and contractual liability. The Commercial General Liability Insurance shall provide at minimum the following limits:

Coverage	Limit
i. General Aggregate	$2,000,000 per Project
ii. Products, Completed Operations Aggregate	$2,000,000 per Project
iii. Personal and Advertising Injury	$1,000,000 per Occurrence
iv. Each Occurrence	$1,000,000 per Project

   b. Additional Requirement for Commercial General Liability Insurance:
      i. The policy shall name the Owner, Architect, its officers, appointees, agents, consultants and employees as additional insureds, state that this coverage shall be primary insurance for the additional insureds; and contain no exclusion of the additional insureds relative to job accidents.
      ii. The policy must include separate per project aggregate limits.

3. **COMMERCIAL BUSINESS AUTOMOBILE LIABILITY INSURANCE:**
   a. Commercial Business Automobile Liability Insurance which shall include coverage for bodily injury and property damage arising from the operation of any owned, non-owned or hired automobile. The Commercial Business Automobile Liability Insurance Policy shall provide not less than $1,000,000 Combined Single Limits (bodily injury and property damage combined) for each occurrence.

b. The policy shall name the Owner, Architect, its officers, appointees, agents, consultants and employees as additional insureds.

4. **COMMERCIAL UMBRELLA LIABILITY INSURANCE:**
   a. Commercial Umbrella Liability Insurance to provide excess coverage above the Commercial General Liability, Commercial Business Automobile Liability and the Workers' Compensation and Employer's Liability to satisfy the minimum limits set forth herein.
   b. Minimum Combined Primary Commercial General Liability and Commercial/Excess Umbrella Limits of:
      i. $5,000,000 per Occurrence
      ii. $5,000,000 Aggregate
   c. Additional Requirements for Commercial Umbrella Liability Insurance:
      i. The policy shall name the Owner, Architect, its officers, appointees, agents, consultants and employees as additional insureds.
      ii. The policy must be on an "Occurrence" Basis.

5. **BUILDER'S RISK INSURANCE:**
   a. The Builder's Risk Policy shall be made payable to the Owner and Contractor, as their interests may appear. The policy amount shall be equal to 100% of the Contract Sum, written on a Causes of Loss - Special Form (current edition as of the date of Advertisement for Bids), or its equivalent. All deductibles shall be the sole responsibility of the Contractor.
   b. The policy shall be endorsed as follows: The following may occur without diminishing, changing, altering or otherwise affecting the coverage and protection afforded the insured under this policy:
      i. Furniture and equipment may be delivered to the insured premises and installed in place ready for use; or
      ii. Partial or complete occupancy by Owner; or
      iii. Performance of work in connection with construction operations insured by the Owner, by agents or lessees or other contractors of the Owner, or by contractors of the lessee of the Owner."

C. SUBCONTRACTOR'S INSURANCE:

1. **WORKERS' COMPENSATION and EMPLOYER'S LIABILITY INSURANCE:** The Contractor shall require each Subcontractor to obtain and maintain Workers' Compensation and Employer's Liability Insurance coverages as described in preceding Paragraph B, or to be covered by the Contractor's Workers' Compensation and Employer's Liability Insurance while performing Work under the Contract.

2. **LIABILITY INSURANCE**: The Contractor shall require each Subcontractor to obtain and maintain adequate General Liability, Automobile Liability, and Umbrella Liability Insurance coverages similar to those described in preceding Paragraph B. Such coverage shall be in effect at all times that a Subcontractor is performing Work under the Contract.

3. **ENFORCEMENT RESPONSIBILITY:** The Contractor shall have responsibility to enforce its Subcontractors' compliance with these or similar insurance requirements; however, the Contractor shall, upon request, provide the Architect or Owner acceptable evidence of

insurance for any Subcontractor.

D. TERMINATION OF OBLIGATION TO INSURE

Unless otherwise expressly provided in the Contract Documents, the obligation to insure as provided herein shall continue as follows:

1. **BUILDER'S RISK INSURANCE.** The obligation to insure under Subparagraph B.5 shall remain in effect until the Date of Substantial Completion as shall be established in the Certificate of Substantial Completion. In the event that multiple Certificates of Substantial Completion covering designated portions of the Work are issued, Builder's Risk coverage shall remain in effect until the Date of Substantial Completion as shall be established in the last issued Certificate of Substantial Completion. However, in the case that the Work involves separate buildings, Builder's Risk coverage of each separate building may terminate on the Date of Substantial Completion as established in the Certificate of Substantial Completion issued for each building.

2. **PRODUCTS and COMPLETED OPERATIONS.** The obligation to carry Products and Completed Operations coverage specified under Subparagraph B.2 shall remain in effect for two years after the Date(s) of Substantial Completion.

3. **ALL OTHER INSURANCE.** The obligation to carry other insurance coverages specified under Subparagraphs B.1 through B.4 and Paragraph C shall remain in effect after the Date(s) of Substantial Completion until such time as all Work required by the Contract Documents is completed. Equal or similar insurance coverages shall remain in effect if, after completion of the Work, the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, returns to the Project to perform warranty or maintenance work pursuant to the terms of the Contract Documents.

E. WAIVERS OF SUBROGATION

The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents and employees, each of the other, and (2) the Architect, Architect's consultants, separate contractors performing construction or operations related to the Project, if any, and any of their subcontractors, sub-subcontractors, agents and employees, for damages caused by fire or other causes of loss. But said waiver shall apply only to the extent the loss or damage is covered by builder's risk insurance applicable to the Work or to other property located within or adjacent to the Project, except such rights as they may have to proceeds of such insurance held by the Owner or Contractor as fiduciary. The Owner or Contractor, as appropriate, shall require of the Architect, Architect's consultants, separate contractors, if any, and the subcontractor, sub-subcontractors, suppliers, agents and employees of any of them, by appropriate agreements, written where legally required for validity, similar waivers each in favor of other parties enumerated herein. The Policies shall provide such waivers of subrogation by endorsement or otherwise. A waiver of subrogation shall be effective as to the person or entity even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, did not pay the insurance premium directly or indirectly, and whether or not the person or entity had an insurable interest in the property damaged. The waivers provided for in this paragraph shall not be applicable to loss or damage that occurs after final acceptance of the Work.

F. CERTIFICATE OF INSURANCE

A Certificate of Insurance evidencing the above minimum requirements must be provided to and

accepted by the Owner PRIOR to commencement of any work on the contract. Each policy shall be endorsed by the issuing insurer to provide thirty (30) days prior written notice of cancellation to the Owner.

Section 11.1.2: Add the following:

1. General: Upon signing and returning the Construction Contract to the Owner for final approval and execution, the Contractor shall, at the Contractor's expense, furnish to the Owner a Performance Bond and a Payment Bond (P&P Bonds), AIA Document A312 Performance Bond and AIA Document A312 Payment Bond, each in a penal sum equal to 100% of the Contract Sum. Each bond shall be on the AIA form referenced in the Project Manual, shall be executed by a surety company (Surety) acceptable to the Owner and duly authorized and qualified to make such bonds in the State of Alabama in the required amount. There shall be six original P&P Bonds submitted with original signatures for each of the six contracts required. The P&P bonds must be signed either on the same day or after the construction contract date. Each P&P Bond shall have attached thereto an original power of attorney (POA) of the signing official. The POA signature date must be the same day as the P&P Bond's signature date. All signatures must be present.

2. Performance Bond: Through the Performance Bond, the Surety's obligation to the Owner shall be to assure the prompt and faithful performance of the Contract and Contract Change Orders. The Penal Sum shall remain equal to the Contract Sum as the Contract Sum is adjusted by Contract Change Orders. In case of default on the part of the Contractor, the Surety shall take charge of and complete the Work in accordance with the terms of the Performance Bond. Any reasonable expenses incurred by the Owner as a result of default on the part of the Contractor, including architectural, engineering, administrative, and legal services, shall be recoverable under the Performance Bond

3. Payment Bond: Through the Payment Bond the Surety's obligation to the Owner shall be to guarantee that the Contractor and its Subcontractors shall promptly make payment to all persons supplying labor, materials, or supplies for, or in, the prosecution of the Work, including the payment of reasonable attorneys fees incurred by successful claimants or plaintiffs in civil actions on the Bond. Any person or entity indicating that they have a claim of nonpayment under the Bond shall, upon written request, be promptly furnished a certified copy of the Bond and Construction Contract by the Contractor, Architect, or Owner, whomever is recipient of the request.

4. Change Orders: The Penal Sum shall remain equal to the Contract Sum as the Contract Sum is adjusted by Contract Change Orders. All Contract Change Orders involving an increase in the Contract Sum will require consent of Surety by endorsement of the Contract Change Order form. The Surety waives notification of any Contract Change Orders involving only extension of the Contract Time.

5. Expiration: The obligations of the Contractor's performance bond surety shall be coextensive with the contractor's performance obligations under the Contract Documents; provided, however, that the surety's obligation shall expire at the end of the one-year warranty period(s).

Section 11.2.1: Add the following: The Owner shall be responsible for purchasing and maintaining the Owner's usual liability insurance.

Add Section 13.1.1: Scheduled Inspections and Conferences:

1. Scheduled Inspections and Conferences are conducted by the Architect, scheduled by the Architect in coordination with the Contractor and Owner's Inspector, and are attended by the Contractor and

applicable subcontractors, suppliers and manufacturers, and the Owner's Inspector. Scheduled Inspections and Conference of this Contract include:

a. Pre-construction Conference.
b. Pre-roofing Conference.
c. Above Ceiling Inspection(s).
d. Final Inspection(s): A final inspection shall establish that the Work, or a designated portion of the Work, is Substantially Complete in accordance with the Contract Documents and accepted by the Architect, Owner, and Owner's Inspector as being ready for the Owner's occupancy or use. At the conclusion of this inspection, items requiring correction or completion ("punch list" items) shall be minimal and require only a short period of time for accomplishment to establish Final Acceptance of the Work. If the Work, or designated portion of the Work, includes the installation, or modification, of a fire alarm system or other life safety systems essential to occupancy, such systems shall have been tested and appropriately certified before the Final Inspection.
e. Year-end Inspection(s): An inspection of the Work, or each separately completed portion thereof, is required near the end of the Contractor's one year warranty period(s). The subsequent delivery of the Architect's report of this inspection will serve as confirmation that the Contractor was notified of Defective Work found within the warranty period.

Add Section 13.1.2: Liquidated Damages

1. Time is the essence of the Contract. Any delay in the completion of the Work required by the Contract Documents may cause inconvenience to the public and loss and damage to the Owner including but not limited to interest and additional administrative, architectural, inspection and supervision charges. By executing the Construction Contract, the Contractor agrees that the Contract Time is sufficient for the achievement of Substantial Completion.

2. The Contract Documents may provide in the Construction Contract or elsewhere for a certain dollar amount for which the Contractor and its Surety (if any) will be liable to the Owner as liquidated damages for each calendar day after expiration of the Contract Time that the Contractor fails to achieve Substantial Completion of the Work. If such daily liquidated damages are provided for, Owner and Contractor, and its Surety, agree that such amount is reasonable and agree to be bound thereby.

3. If a daily liquidated damage amount is not otherwise provided for in the Contract Documents, a time charge equal to six percent interest per annum on the total Contract Sum may be made against the Contractor for the entire period after expiration of the Contract Time that the Contractor fails to achieve Substantial Completion of the Work.

4. The amount of liquidated damages due under either paragraph 1 or 2, above, may be deducted by the Owner from the moneys otherwise due the Contractor in the Final Payment, not as a penalty, but as liquidated damages sustained, or the amount may be recovered from Contractor or its Surety. If part of the Work is substantially completed within the Contract Time and part is not, the stated charge for liquidated damages shall be equitably prorated to that portion of the Work that the Contractor fails to substantially complete within the Contract Time. It is mutually understood and agreed between the parties hereto that such amount is reasonable as liquidated damages.

End of Supplementary Conditions

SECTION 012000
PRICE AND PAYMENT PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Procedures for preparation and submittal of applications for progress payments.

B. Documentation of changes in Contract Sum and Contract Time.

1.02 SCHEDULE OF VALUES

A. Use Schedule of Values Form: AIA G703, edition stipulated in the Agreement.

B. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit draft to Architect for approval.

C. Forms filled out by hand will not be accepted.

D. Revise schedule to list approved Change Orders, with each Application For Payment.

1.03 APPLICATIONS FOR PROGRESS PAYMENTS

A. Payment Period: Submit at intervals stipulated in the Agreement.

B. Use Form AIA G702 and Form AIA G703, edition stipulated in the Agreement.

C. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit sample to Architect for approval.

D. Forms filled out by hand will not be accepted.

E. Execute certification by signature of authorized officer.

F. Submit one electronic and three hard-copies of each Application for Payment.

1.04 MODIFICATION PROCEDURES

A. For minor changes not involving an adjustment to the Contract Sum or Contract Time, Architect will issue instructions directly to Contractor.

B. For other required changes, Architect will issue a document signed by Owner instructing Contractor to proceed with the change, for subsequent inclusion in a Change Order.
   1. The document will describe the required changes and will designate method of determining any change in Contract Sum or Contract Time.
   2. Promptly execute the change.

C. For changes for which advance pricing is desired, Architect will issue a document that includes a detailed description of a proposed change with supplementary or revised drawings and specifications, a change in Contract Time for executing the change with a stipulation of any overtime work required and the period of time during which the requested price will be considered valid. Contractor shall prepare and submit a fixed price quotation within no more than seven (7) business days.

D. Contractor may propose a change by submitting a request for change to Architect, describing the proposed change and its full effect on the work, with a statement describing the reason for the change, and the effect on the Contract Sum and Contract Time with full documentation. Document any requested substitutions in accordance with Section 016000.

E. Computation of Change in Contract Amount: As specified in the Agreement and Conditions of the Contract.

F. Substantiation of Costs: Provide full information required for evaluation.
   1. On request, provide the following data:
      a. Quantities of products, labor, and equipment.
      b. Taxes, insurance, and bonds.
      c. Overhead and profit.
      d. Justification for any change in Contract Time.

G. Execution of Change Orders: Architect will issue Change Orders for signatures of parties as provided in the Conditions of the Contract.

H. After execution of Change Order, promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as a separate line item and adjust the Contract Sum.

I. Promptly revise progress schedules to reflect any change in Contract Time, revise sub-schedules to adjust times for other items of work affected by the change, and resubmit.

J. Promptly enter changes in Project Record Documents.

1.05 APPLICATION FOR FINAL PAYMENT

A. Prepare Application for Final Payment as specified for progress payments, identifying total adjusted Contract Sum, previous payments, and sum remaining due.

B. Application for Final Payment will not be considered until the following have been accomplished:

1. All closeout procedures specified in Section 017000.

END OF SECTION

SECTION 012200
UNIT PRICES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. List of unit prices, for use in preparing Bids.

B. Measurement and payment criteria applicable to Work performed under a unit price payment method.

1.02 RELATED REQUIREMENTS

A. Section 01 1000 - Summary

B. Section 01 2000 - Price and Payment Procedures: Additional payment and modification

C. procedures.

D. Proposal Form

1.03 COSTS INCLUDED

A. A unit price is an amount propsosed by Bidders and stated on the Bid Form as a price per unit of measurement for materials or services that will be added or deducted from the Contract Sum by Change Order in the event the estimated quantities of work required by the Contract Document are increased or decreased per the unit cost listed ont the contractor's bid proposal form.

B. Unit Prices included on the Bid Form shall include full compensation for all required labor, products, tools, equipment, plant, transportation, services and incidentals; erection, application or installation of an item of the Work; overhead and profit.

1.04 UNIT QUANTITIES SPECIFIED

A. Quantities indicated in the Unit Price Schedule are for bidding and contract purposes.

1.05 MEASUREMENT OF QUANTITIES

A. Take all measurements and compute quantities. Measurements and quantities will be verified by Architect, Geotech Engineer, or Owner, depending on trades invovled.

B. Assist by providing necessary equipment, workers, and survey personnel as required.

C. Stipulated Price Measurement: Items measured by weight, volume, area, or linear means or combination, as appropriate, as a completed item or unit of the Work.

1.06 PAYMENT

A. Payment for Work governed by unit prices will be made on the basis of the actual measurements and quantities of Work that is incorporated in or made necessary by the Work and accepted by the Architect, multiplied by the unit price.

B. Sale taxes are not included in the unit prices per Act 2013-205 signed into law May 9th, 2013.

C. Payment will not be made for any of the following:
   1. Products wasted or disposed of in a manner that is not acceptable.
   2. Products determined as unacceptable before or after placement.
   3. Products not completely unloaded from the transporting vehicle.
   4. Products placed beyond the lines and levels of the required Work.
   5. Products remaining on hand after completion of the Work.
   6. Loading, hauling, and disposing of rejected Products.

1.07 SCHEDULE OF UNIT PRICES

A. **Unit Price No. 1: Removal and replacement for any existing below-ground foundation.**
   1. State a unit price (US dollar per Unit) designated on the Bid Form for removal of any existing below-ground foundation and replacement with engineered soil.
   2. Unit of Measure: Cubic Yard (cu/yd).

3. The contractor shall include in their base bid a cost of 400 cubic yards for removal of unsuitable soils.
4. This unit price shall include all cost associated with removing any existing below-ground foundation from below “cut line” elevations and off-site disposal of the foundation.

B. **Quantity Allowance for unsuitable soils and replacement. See Civil Engineering Specifications, Section 312000, Earth Moving, in the Project Manual.**

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 012500
SUBSTITUTION PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Procedural requirements for proposed substitutions.

1.02 RELATED REQUIREMENTS

A. Section 013000 - Administrative Requirements: Submittal procedures, coordination.

B. Section 016000 - Product Requirements: Fundamental product requirements, product options, delivery, storage, and handling.

1.03 DEFINITIONS

A. Substitutions: Changes from Contract Documents requirements proposed by Contractor to materials, products, assemblies, and equipment.
   1. Substitutions for Cause: Proposed due to changed Project circumstances beyond Contractor's control.
      a. Unavailability.
      b. Regulatory changes.

1.04 REFERENCE STANDARDS

A. CSI/CSC Form 1.5C - Substitution Request (During the Bidding/Negotiating Stage); Current Edition.

B. CSI/CSC Form 13.1A - Substitution Request (After the Bidding/Negotiating Phase); Current Edition.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

A. A Substitution Request for products, assemblies, materials, and equipment constitutes a representation that the submitter:
   1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product, equipment, assembly, or system.
   2. Agrees to provide the same warranty for the substitution as for the specified product.
   3. Agrees to provide same or equivalent maintenance service and source of replacement parts, as applicable.
   4. Agrees to coordinate installation and make changes to other work that may be required for the work to be complete, with no additional cost to Owner.
   5. Waives claims for additional costs or time extension that may subsequently become apparent.
   6. Agrees to reimburse Owner and Architect for review or redesign services associated with re-approval by authorities.

B. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents. Burden of proof is on proposer.

C. Content: Include information necessary for tracking the status of each Substitution Request, and information necessary to provide an actionable response.
   1. Forms indicated in the Project Manual are adequate for this purpose, and must be used.

D. Limit each request to a single proposed substitution item.
   1. Submit an electronic document, combining the request form with supporting data into single document.

3.02 SUBSTITUTION PROCEDURES DURING PROCUREMENT

A. Submittal Time Restrictions:

1. Instructions to Bidders specifies time restrictions and the documents required for submitting substitution requests during the bidding period.

B. Submittal Form (before award of contract):

3.03 SUBSTITUTION PROCEDURES DURING CONSTRUCTION

A. Submittal Form (after award of contract):
   1. Submit substitution requests by completing CSI/CSC Form 13.1A - Substitution Request (After Bidding/Negotiating). See this form for additional information and instructions. Use only this form; other forms of submission are unacceptable.

B. Architect will consider requests for substitutions only within 15 days after date of Agreement.

C. Submit request for Substitution for Cause within 14 days of discovery of need for substitution, but not later than 14 days prior to time required for review and approval by Architect, in order to stay on approved project schedule.

D. Submit request for Substitution for Convenience within 14 days of discovery of its potential advantage to the project, but not later than 14 days prior to time required for review and approval by Architect, in order to stay on approved project schedule.
   1. In addition to meeting general documentation requirements, document how the requested substitution benefits the Owner through cost savings, time savings, greater energy conservation, or in other specific ways.
   2. Document means of coordinating of substitution item with other portions of the work, including work by affected subcontractors.
   3. Bear the costs engendered by proposed substitution of:
      a. Owner's compensation to the Architect for any required redesign, time spent processing and evaluating the request.
      b. Other construction by Owner.
      c. Other unanticipated project considerations.

E. Substitutions will not be considered under one or more of the following circumstances:
   1. When they are indicated or implied on shop drawing or product data submittals, without having received prior approval.
   2. Without a separate written request.
   3. When acceptance will require revisions to Contract Documents.

3.04 RESOLUTION

A. Architect may request additional information and documentation prior to rendering a decision. Provide this data in an expeditious manner.

B. Architect will notify Contractor in writing of decision to accept or reject request.

3.05 ACCEPTANCE

A. Accepted substitutions change the work of the Project. They will be documented and incorporated into work of the project by Change Order, Construction Change Directive, Architectural Supplementary Instructions, or similar instruments provided for in the Conditions of the Contract.

3.06 CLOSEOUT ACTIVITIES

A. See Section 017800 - Closeout Submittals, for closeout submittals.

END OF SECTION

SECTION 013000
ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Electronic document submittal service.

B. Preconstruction meeting.

C. Site mobilization meeting.

D. Progress meetings.

E. Construction progress schedule.

F. Contractor's daily reports.

G. Progress photographs.

H. Submittals for review, information, and project closeout.

I. Submittal procedures.

1.02 RELATED REQUIREMENTS

A. Section 016000 - Product Requirements: General product requirements.

B. Section 017000 - Execution and Closeout Requirements: Additional coordination requirements.

1.03 GENERAL ADMINISTRATIVE REQUIREMENTS

A. Comply with requirements of Section 017000 - Execution and Closeout Requirements for coordination of execution of administrative tasks with timing of construction activities.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 ELECTRONIC DOCUMENT SUBMITTAL SERVICE

A. All documents transmitted for purposes of administration of the contract are to be in electronic (PDF, MS Word, or MS Excel) format, as appropriate to the document, and transmitted via an Internet-based submittal service that receives, logs and stores documents, provides electronic stamping and signatures, and notifies addressees via email.

1. Besides submittals for review, information, and closeout, this procedure applies to Requests for Interpretation (RFIs), progress documentation, contract modification documents (e.g. supplementary instructions, change proposals, change orders), applications for payment, field reports and meeting minutes, Contractor's correction punchlist, and any other document any participant wishes to make part of the project record.
2. Contractor and Architect are required to use this service.
3. It is Contractor's responsibility to submit documents in allowable format.
4. Subcontractors, suppliers, and Architect's consultants will be permitted to use the service at no extra charge.
5. Users of the service need an email address, internet access, and PDF review software that includes ability to mark up and apply electronic stamps (such as Adobe Acrobat, www.adobe.com, or Bluebeam PDF Revu, www.bluebeam.com), unless such software capability is provided by the service provider.
6. Paper document transmittals will not be reviewed; emailed electronic documents will not be reviewed.
7. All other specified submittal and document transmission procedures apply, except that electronic document requirements do not apply to samples or color selection charts.

B. Submittal Service: The selected service is:

1. Newforma ConstructEx: www.newforma.com/our-solutions/constructex/#sle.

C. Training: One, one-hour, web-based training session will be arranged for all participants, with representatives of Architect and Contractor participating; further training is the responsibility of the user of the service.

D. Project Closeout: Architect will determine when to terminate the service for the project and is responsible for obtaining archive copies of files for Owner.

3.02 PRECONSTRUCTION MEETING

A. Attendance Required:
   1. Owner.
   2. Architect.
   3. Contractor.

B. Agenda:
   1. Execution of Owner-Contractor Agreement.
   2. Submission of executed bonds and insurance certificates.
   3. Distribution of Contract Documents.
   4. Submission of list of subcontractors, list of products, schedule of values, and progress schedule.
   5. Designation of personnel representing the parties to Contract, Owner Representative and Architect.
   6. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
   7. Scheduling.

C. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.03 SITE MOBILIZATION MEETING

A. Contractor will schedule meeting at the Project site prior to Contractor occupancy.

B. Attendance Required:
   1. Contractor.
   2. Owner.
   3. Architect.
   4. Contractor's superintendent.
   5. Major subcontractors.

C. Agenda:
   1. Use of premises by Owner and Contractor.
   2. Owner's requirements.
   3. Construction facilities and controls provided by Owner.
   4. Temporary utilities provided by Owner.
   5. Survey and building layout.
   6. Security and housekeeping procedures.
   7. Schedules.
   8. Application for payment procedures.
   9. Procedures for testing.
   10. Procedures for maintaining record documents.
   11. Requirements for start-up of equipment.
   12. Inspection and acceptance of equipment put into service during construction period.

D. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.04 PROGRESS MEETINGS

A. Schedule and administer meetings throughout progress of the work at maximum bi-monthly intervals.

B. Make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.

C. Project CoordinatorContractor will make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.

D. Attendance Required:
   1. Contractor.
   2. Owner.
   3. Architect.
   4. Contractor's superintendent.
   5. Major subcontractors.

E. Agenda:
   1. Review minutes of previous meetings.
   2. Review of work progress.
   3. Field observations, problems, and decisions.
   4. Identification of problems that impede, or will impede, planned progress.
   5. Review of submittals schedule and status of submittals.
   6. Maintenance of progress schedule.
   7. Corrective measures to regain projected schedules.
   8. Planned progress during succeeding work period.
   9. Maintenance of quality and work standards.
   10. Effect of proposed changes on progress schedule and coordination.
   11. Other business relating to work.

F. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.05 CONSTRUCTION PROGRESS SCHEDULE

A. If preliminary schedule requires revision after review, submit revised schedule within 10 days.

B. Within 20 days after review of preliminary schedule, submit draft of proposed complete schedule for review.
   1. Include written certification that major contractors have reviewed and accepted proposed schedule.

C. Within 10 days after joint review, submit complete schedule.

D. Submit updated schedule with each Application for Payment.

3.06 DAILY CONSTRUCTION REPORTS

A. Include only factual information. Do not include personal remarks or opinions regarding operations and/or personnel.

B. Prepare a daily construction report recording the following information concerning events at Project site and project progress:
   1. Date.
   2. High and low temperatures, and general weather conditions.
   3. Safety, environmental, or industrial relations incidents.
   4. Meetings and significant decisions.
   5. Stoppages, delays, shortages, and losses. Include comparison between scheduled work activities (in Contractor's most recently updated and published schedule) and actual activities. Explain differences, if any. Note days or periods when no work was in progress and explain the reasons why.
   6. Testing and/or inspections performed.
   7. Signature of Contractor's authorized representative.

3.07 PROGRESS PHOTOGRAPHS

A. Submit photographs with each application for payment, taken not more than 3 days prior to submission of application for payment.

B. Photography Type: Digital; electronic files.

C. Provide photographs of site and construction throughout progress of work produced by an experienced photographer, acceptable to Architect.

D. In addition to periodic, recurring views, take photographs of each of the following events:

E. Views:
   1. Provide non-aerial photographs from four cardinal views at each specified time, until date of Substantial Completion.
   2. Consult with Architect for instructions on views required.
   3. Provide factual presentation.
   4. Provide correct exposure and focus, high resolution and sharpness, maximum depth of field, and minimum distortion.

F. Digital Photographs: 24 bit color, minimum resolution of 1024 by 768, in JPG format; provide files unaltered by photo editing software.
   1. Delivery Medium: Via email.
   2. File Naming: Include project identification, date and time of view, and view identification.
   3. PDF File: Assemble all photos into printable pages in PDF format, with 2 to 3 photos per page, each photo labeled with file name; one PDF file per submittal.
   4. Hard Copy: Printed hardcopy (grayscale) of PDF file and point of view sketch.

3.08 SUBMITTALS FOR REVIEW

A. When the following are specified in individual sections, submit them for review:
   1. Product data.
   2. Design data.
   3. Shop drawings.
   4. Samples for selection.
   5. Samples for verification.
   6. Performance Data.

B. Submit to Architect for review for the limited purpose of checking for compliance with information given and the design concept expressed in Contract Documents.

C. Samples will be reviewed for aesthetic, color, or finish selection.

D. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 017800 - Closeout Submittals.

3.09 SUBMITTALS FOR INFORMATION

A. When the following are specified in individual sections, submit them for information:
   1. Design data.
   2. Certificates.
   3. Test reports.
   4. Inspection reports.
   5. Manufacturer's instructions.
   6. Manufacturer's field reports.
   7. Other types indicated.

B. Submit for Architect's knowledge as contract administrator or for Owner.

3.10 SUBMITTALS FOR PROJECT CLOSEOUT

A. Submit Correction Punch List for Substantial Completion.

B. Submit Final Correction Punch List for Substantial Completion.

C. When the following are specified in individual sections, submit them at project closeout in compliance with requirements of Section 017800 - Closeout Submittals:
   1. Project record documents.
   2. Operation and maintenance data.
   3. Warranties.
   4. Bonds.
   5. Other types as indicated.

D. Submit for Owner's benefit during and after project completion.

3.11 SUBMITTAL PROCEDURES

A. General Requirements:

B. Shop Drawing Procedures:
   1. Prepare accurate, drawn-to-scale, original shop drawing documentation by interpreting Contract Documents and coordinating related work.
   2. Generic, non-project-specific information submitted as shop drawings do not meet the requirements for shop drawings.

C. Transmit each submittal with a copy of approved submittal form.

D. Sequentially number the transmittal form. For revised submittals use original number and a sequential alphabetic suffix.

E. Identify: Project; Contractor; subcontractor or supplier; pertinent drawing and detail number; and specification section number and article/paragraph, as appropriate on each copy.

F. Apply Contractor's stamp, signed or initialed certifying that review, approval, 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.

G. Schedule submittals to expedite the Project, and coordinate submission of related items.

H. For each submittal for review, allow 15 days excluding delivery time to and from the Contractor.

I. Identify variations from Contract Documents and product or system limitations that may be detrimental to successful performance of the completed work.

J. Provide space for Contractor and Architect review stamps.

K. When revised for resubmission, identify all changes made since previous submission.

L. Distribute reviewed submittals. Instruct parties to promptly report inability to comply with requirements.

M. Submittals not requested will not be recognized or processed.

END OF SECTION

SECTION 014000
QUALITY REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Submittals.

B. Quality assurance.

C. Testing and inspection agencies and services.

D. Contractor's construction-related professional design services.

E. Control of installation.

F. Manufacturers' field services.

G. Defect Assessment.

1.02 RELATED REQUIREMENTS

A. Section 013000 - Administrative Requirements: Submittal procedures.

B. Section 014216 - Definitions.

C. Section 016000 - Product Requirements: Requirements for material and product quality.

1.03 REFERENCE STANDARDS

A. ASTM C1021 - Standard Practice for Laboratories Engaged in Testing of Building Sealants; 2008 (Reapproved 2023).

B. ASTM C1077 - Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation; 2025a.

C. ASTM C1093 - Standard Practice for Accreditation of Testing Agencies for Masonry; 2023.

D. ASTM D3740 - Standard Practice for Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction; 2023.

E. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection; 2025a.

F. ASTM E543 - Standard Specification for Agencies Performing Nondestructive Testing; 2021.

G. ASTM E699 - Standard Specification for Agencies Involved in Testing, Quality Assurance, and Evaluating of Manufactured Building Components; 2016.

H. IAS AC89 - Accreditation Criteria for Testing Laboratories; 2021.

1.04 DEFINITIONS

A. Design Data: Design-related, signed and sealed drawings, calculations, specifications, certifications, shop drawings and other submittals provided by Contractor, and prepared directly by, or under direct supervision of, appropriately licensed design professional.

1.05 CONTRACTOR'S CONSTRUCTION-RELATED PROFESSIONAL DESIGN SERVICES

A. Coordination: Contractor's professional design services are subject to requirements of project's Conditions for Construction Contract.

B. Provide such engineering design services as may be necessary to plan and safely conduct certain construction operations, pertaining to, but not limited to the following:

1. Where required by individual specification sections.

1.06 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Designer's Qualification Statement: Submit for Architect's knowledge as contract administrator, or for Owner's information.

1. Include information for each individual professional responsible for producing, or supervising production of, design-related professional services provided by Contractor.
    a. Full name.
    b. Professional licensure information.
    c. Statement addressing extent and depth of experience specifically relevant to design of items assigned to Contractor.

C. Design Data: Submit for Architect's knowledge as contract administrator for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents, or for Owner's information.
1. Include calculations that have been used to demonstrate compliance to performance and regulatory criteria provided, and to determine design solutions.
2. Include required product data and shop drawings.
3. Include a statement or certification attesting that design data complies with criteria indicated, such as building codes, loads, functional, and similar engineering requirements.
4. Include signature and seal of design professional responsible for allocated design services on calculations and drawings.

D. Test Reports: After each test/inspection, promptly submit two copies of report to Architect and to Contractor.
1. Include:
    a. Date issued.
    b. Project title and number.
    c. Name of inspector.
    d. Date and time of sampling or inspection.
    e. Identification of product and specifications section.
    f. Location in the Project.
    g. Type of test/inspection.
    h. Date of test/inspection.
    i. Results of test/inspection.
    j. Compliance with Contract Documents.
    k. When requested by Architect, provide interpretation of results.

1.07 TESTING AND INSPECTION AGENCIES AND SERVICES

A. Contractor shall employ and pay for services of an independent testing agency to perform other specified testing.

B. Employment of agency in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.

C. Contractor Employed Agency:
1. Testing agency: Comply with requirements of ASTM E329, ASTM E543, ASTM E699, ASTM C1021, ASTM C1077, ASTM C1093, and ASTM D3740
2. Inspection agency: Comply with requirements of ASTM D3740 and ASTM E329.
3. Laboratory Qualifications: Accredited by IAS according to IAS AC89.
4. Laboratory: Authorized to operate in the State in which the Project is located.
5. Laboratory Staff: Maintain a full time registered Engineer on staff to review services.
6. Testing Equipment: Calibrated at reasonable intervals either by NIST or using an NIST established Measurement Assurance Program, under a laboratory measurement quality assurance program.

PART 3 EXECUTION

2.01 CONTROL OF INSTALLATION

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

B. Comply with manufacturers' instructions, including each step in sequence.

C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect before proceeding.

D. Comply with specified standards as minimum quality for the work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

E. Have work performed by persons qualified to produce required and specified quality.

F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.

G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

2.02 TESTING AND INSPECTION

A. Testing Agency Duties:
   1. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
   2. Perform specified sampling and testing of products in accordance with specified standards.
   3. Ascertain compliance of materials and mixes with requirements of Contract Documents.
   4. Promptly notify Architect and Contractor of observed irregularities or non-compliance of Work or products.
   5. Perform additional tests and inspections required by Architect.
   6. Submit reports of all tests/inspections specified.

B. Limits on Testing/Inspection Agency Authority:
   1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
   2. Agency may not approve or accept any portion of the Work.
   3. Agency may not assume any duties of Contractor.
   4. Agency has no authority to stop the Work.

C. Contractor Responsibilities:
   1. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
   2. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.
   3. Provide incidental labor and facilities:
      a. To provide access to Work to be tested/inspected.
      b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
      c. To facilitate tests/inspections.
      d. To provide storage and curing of test samples.
   4. Notify Architect and laboratory 24 hours prior to expected time for operations requiring testing/inspection services.
   5. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
   6. Arrange with Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.

D. Re-testing required because of non-compliance with specified requirements shall be performed by the same agency on instructions by Architect.

E. Re-testing required because of non-compliance with specified requirements shall be paid for by Contractor.

2.03 MANUFACTURERS' FIELD SERVICES

A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust, and balance equipment as applicable, and to initiate instructions when necessary.

B. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

2.04 DEFECT ASSESSMENT

A. Replace Work or portions of the Work not complying with specified requirements.

END OF SECTION

SECTION 016116
VOLATILE ORGANIC COMPOUND (VOC) CONTENT RESTRICTIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Requirements for Indoor-Emissions-Restricted products.

B. Requirements for VOC-Content-Restricted products.

1.02 RELATED REQUIREMENTS

A. Section 013000 - Administrative Requirements: Submittal procedures.

B. Section 014000 - Quality Requirements: Procedures for testing and certifications.

C. Section 015719 - Temporary Environmental Controls: Procedures and testing.

D. Section 016000 - Product Requirements: Fundamental product requirements, substitutions and product options, delivery, storage, and handling.

E. Section 079200 - Joint Sealants: Emissions-compliant sealants.

1.03 DEFINITIONS

A. Indoor-Emissions-Restricted Products: All products in the following product categories, whether specified or not:
   1. Interior paints and coatings applied on site.
   2. Interior adhesives and sealants applied on site, including flooring adhesives.
   3. Flooring.

B. VOC-Content-Restricted Products: All products in the following product categories, whether specified or not:
   1. Interior paints and coatings applied on site.
   2. Interior adhesives and sealants applied on site, including flooring adhesives.

C. Interior of Building: Anywhere inside the exterior weather barrier.

D. Adhesives: All gunnable, trowelable, liquid-applied, and aerosol adhesives, whether specified or not; including flooring adhesives, resilient base adhesives, and pipe jointing adhesives.

E. Sealants: All gunnable, trowelable, and liquid-applied joint sealants and sealant primers, whether specified or not; including firestopping sealants and duct joint sealers.

F. Inherently Non-Emitting Materials: Products composed wholly of minerals or metals, unless they include organic-based surface coatings, binders, or sealants; and specifically the following:
   1. Concrete.
   2. Clay brick.
   3. Metals that are plated, anodized, or powder-coated.
   4. Glass.
   5. Ceramics.

1.04 REFERENCE STANDARDS

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; Current Edition.

B. ASTM D3960 - Standard Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings; 2025.

C. CARB (SCM) - Suggested Control Measure for Architectural Coatings; California Air Resources Board; 2020.

D. SCAQMD 1113 - Architectural Coatings; 1977, with Amendment (2016).

E. SCAQMD 1168 - Adhesive and Sealant Applications; 1989, with Amendment (2022).

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: For each VOC-restricted product used in the project, submit evidence of compliance.

1.06 QUALITY ASSURANCE

A. VOC Content Test Method: 40 CFR 59, Subpart D (EPA Method 24), or ASTM D3960, unless otherwise indicated.
   1. Evidence of Compliance: Acceptable types of evidence are:
      a. Report of laboratory testing performed in accordance with requirements.

B. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

PART 2 PRODUCTS

2.01 MATERIALS

A. VOC-Content-Restricted Products: VOC content not greater than required by the following:
   1. Adhesives, Including Flooring Adhesives: SCAQMD 1168 Rule.
   2. Joint Sealants: SCAQMD 1168 Rule.
   3. Paints and Coatings: Each color; most stringent of the following:
      a. 40 CFR 59, Subpart D.
      b. SCAQMD 1113 Rule.
      c. CARB (SCM).

PART 3 EXECUTION

3.01 FIELD QUALITY CONTROL

A. Owner reserves the right to reject non-compliant products, whether installed or not, and require their removal and replacement with compliant products at no extra cost to Owner.

B. Additional costs to restore indoor air quality due to installation of non-compliant products will be borne by Contractor.

END OF SECTION

SECTION 017000
EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1.01 RELATED REQUIREMENTS

A. Section 078400 - Firestopping.

1.02 COORDINATION

A. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.

B. Notify affected utility companies and comply with their requirements.

C. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.

D. Coordinate space requirements, supports, and installation of mechanical and electrical work that are indicated diagrammatically on drawings. Follow routing indicated for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

E. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.

F. Coordinate completion and clean-up of work of separate sections.

G. After Owner occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

PART 2 PRODUCTS

2.01 PATCHING MATERIALS

A. New Materials: As specified in product sections; match existing products and work for patching and extending work.

B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.

C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 016000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.

B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.

C. Examine and verify specific conditions described in individual specification sections.

D. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.

E. Verify that utility services are available, of the correct characteristics, and in the correct locations.

F. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

3.02 PREPARATION

A. Clean substrate surfaces prior to applying next material or substance.

B. Seal cracks or openings of substrate prior to applying next material or substance.

C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

3.03 GENERAL INSTALLATION REQUIREMENTS

A. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.

B. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.

C. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.

D. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.

E. Make neat transitions between different surfaces, maintaining texture and appearance.

3.04 CUTTING AND PATCHING

A. Whenever possible, execute the work by methods that avoid cutting or patching.

B. Perform whatever cutting and patching is necessary to:
   1. Complete the work.
   2. Fit products together to integrate with other work.
   3. Provide openings for penetration of mechanical, electrical, and other services.
   4. Match work that has been cut to adjacent work.
   5. Repair areas adjacent to cuts to required condition.
   6. Repair new work damaged by subsequent work.
   7. Remove samples of installed work for testing when requested.
   8. Remove and replace defective and non-complying work.

C. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.

D. Employ original installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.

E. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.

F. Restore work with new products in accordance with requirements of Contract Documents.

G. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

H. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Section 078400, to full thickness of the penetrated element.

I. Patching:
   1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
   2. Match color, texture, and appearance.
   3. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.

3.05 PROGRESS CLEANING

A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.

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

C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.

D. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.

3.06 PROTECTION OF INSTALLED WORK

A. Protect installed work from damage by construction operations.

B. Provide special protection where specified in individual specification sections.

C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.

D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.

E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.

F. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.

G. Remove protective coverings when no longer needed; reuse or recycle coverings if possible.

3.07 ADJUSTING

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

3.08 FINAL CLEANING

A. Use cleaning materials that are nonhazardous.

B. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.

C. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.

D. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.

E. Clean filters of operating equipment.

F. Clean debris from roofs, gutters, downspouts, scuppers, overflow drains, area drains, and drainage systems.

G. Clean site; sweep paved areas, rake clean landscaped surfaces.

H. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

3.09 CLOSEOUT PROCEDURES

A. Make submittals that are required by governing or other authorities.

B. Accompany Project Coordinator on preliminary inspection to determine items to be listed for completion or correction in the Contractor's Correction Punch List for Contractor's Notice of Substantial Completion.

C. Notify Architect when work is considered ready for Architect's Substantial Completion inspection.

D. Submit written certification containing Contractor's Correction Punch List, that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Architect's Substantial Completion inspection.

E. Conduct Substantial Completion inspection and create Final Correction Punch List containing Architect's and Contractor's comprehensive list of items identified to be completed or corrected and submit to Architect.

F. Correct items of work listed in Final Correction Punch List and comply with requirements for access to Owner-occupied areas.

G. Notify Architect when work is considered finally complete and ready for Architect's Substantial Completion final inspection.

H. Complete items of work determined by Architect listed in executed Certificate of Substantial Completion.

3.10 MAINTENANCE

END OF SECTION

SECTION 032000 - CONCRETE REINFORCING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Steel reinforcement bars.
2. Welded-wire reinforcement.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data: For the following:

1. Each type of steel reinforcement.
2. Bar supports.

B. Shop Drawings: Comply with ACI SP-066:

1. Include placing drawings that detail fabrication, bending, and placement.
2. Include bar sizes, lengths, materials, grades, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, location of splices, lengths of lap splices, details of mechanical splice couplers, details of welding splices, tie spacing, hoop spacing, and supports for concrete reinforcement.

C. Construction Joint Layout: Indicate proposed construction joints required to build the structure.

1. Location of construction joints is subject to approval of Architect.

1.4 INFORMATIONAL SUBMITTALS

A. Material Certificates: For each of the following, signed by manufacturers:

1. Epoxy-Coated Reinforcement: CRSI's "Epoxy Coating Plant Certification."

B. Material Test Reports: For the following, from a qualified testing agency:

1. Steel Reinforcement:

C. Field quality-control reports.

D. Minutes of preinstallation conference.

1.5 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A615/A615M, Grade 60, deformed.

B. Headed-Steel Reinforcing Bars: ASTM A970/A970M.

C. Plain-Steel Welded-Wire Reinforcement: ASTM A1064/A1064M, plain, fabricated from as-drawn steel wire into flat sheets.

D. Deformed-Steel Welded-Wire Reinforcement: ASTM A1064/A1064M, flat sheet.

E. Galvanized-Steel Welded-Wire Reinforcement: ASTM A1064/A1064M, plain, fabricated from galvanized-steel wire into flat sheets.

1.6 REINFORCEMENT ACCESSORIES

A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place.

1. Manufacture bar supports from steel wire, plastic, or precast concrete in accordance with CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:

a. For concrete surfaces exposed to view, where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire, all-plastic bar supports, or CRSI Class 2 stainless steel bar supports.

B. Steel Tie Wire: ASTM A1064/A1064M, annealed steel, not less than 0.0508 inch in diameter.

1.7 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

PART 2 - EXECUTION

2.1 PREPARATION

A. Protection of In-Place Conditions:

1. Do not cut or puncture vapor retarder.
2. Repair damage and reseal vapor retarder before placing concrete.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that reduce bond to concrete.

2.2 INSTALLATION OF STEEL REINFORCEMENT

A. Comply with CRSI's "Manual of Standard Practice" for placing and supporting reinforcement.

B. Accurately position, support, and secure reinforcement against displacement.

1. Locate and support reinforcement with bar supports to maintain minimum concrete cover.
2. Do not tack weld crossing reinforcing bars.

C. Preserve clearance between bars of not less than 1 inch, not less than one bar diameter, or not less than 1-1/3 times size of large aggregate, whichever is greater.

D. Provide concrete coverage in accordance with ACI 318.

E. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

F. Splices: Lap splices as indicated on Drawings.

1. Bars indicated to be continuous, and all vertical bars to be lapped not less than 36 bar diameters at splices, or 24 inches, whichever is greater.
2. Stagger splices in accordance with ACI 318.

G. Install welded-wire reinforcement in longest practicable lengths.

1. Support welded-wire reinforcement in accordance with CRSI "Manual of Standard Practice."

a. For reinforcement less than W4.0 or D4.0, continuous support spacing to not exceed 12 inches.

2. Lap edges and ends of adjoining sheets at least one wire spacing plus 2 inches for plain wire and 8 inches for deformed wire.
3. Offset laps of adjoining sheet widths to prevent continuous laps in either direction.
4. Lace overlaps with wire.

2.3 JOINTS

A. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

1. Place joints perpendicular to main reinforcement.
2. Continue reinforcement across construction joints unless otherwise indicated.
3. Do not continue reinforcement through sides of strip placements of floors and slabs.

2.4 INSTALLATION TOLERANCES

A. Comply with ACI 117.

2.5 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a special inspector to perform field tests and inspections and prepare test reports.

B. Testing Agency: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.

C. Inspections:

1. Steel-reinforcement placement.

END OF SECTION 032000

SECTION 03 3300 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:

1. Footings.
2. Foundation walls.
3. Slabs-on-grade.

1.03 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, and ground granulated blast-furnace slag; subject to compliance with requirements.

1.04 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

1. Indicate amounts of mixing water to be withheld for later addition at Project site.

C. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.

D. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.

1. Location of construction joints is subject to approval of the Architect.

E. Samples: For waterstops and vapor retarder.

1.05 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer, manufacturer, and testing agency.

B. Welding certificates.

C. Material Certificates: For each of the following, signed by manufacturers:

1. Cementitious materials.
2. Admixtures.
3. Steel reinforcement and accessories.
4. Waterstops.
5. Curing compounds.
6. Floor and slab treatments.
7. Bonding agents.
8. Adhesives.
9. Vapor retarders.
10. Semirigid joint filler.
11. Joint-filler strips.
12. Repair materials.

D. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:

1. Aggregates.

E. Floor surface flatness and levelness measurements indicating compliance with specified tolerances.

F. Field quality-control reports.

G. Minutes of preinstallation conference.

1.06 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.

B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

C. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II.

D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.

E. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:

1. ACI 301, "Specifications for Structural Concrete," Sections 1 through 5.
2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

F. Concrete Testing Service: Owner shall engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

G. Preinstallation Conference: Conduct conference at Project site.

1. Review special inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, construction contraction and isolation joints, and joint-filler strips, semirigid joint fillers, forms and form removal limitations, shoring and reshoring procedures, vapor-retarder installation, anchor rod and anchorage device installation tolerances, steel reinforcement installation, floor and slab flatness and levelness measurement, concrete repair procedures, and concrete protection.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.

B. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

PART 2 - PRODUCTS

2.01 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

1. Plywood, metal, or other approved panel materials.

B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

C. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.

D. Rustication Strips: Wood, metal, PVC, or rubber strips, kerfed for ease of form removal.

E. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

1. Formulate form-release agent with rust inhibitor for steel form-facing materials.

F. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

1. Furnish units that will leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
2. Furnish ties that, when removed, will leave holes no larger than 1 inch in diameter in concrete surface.
3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

2.02 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.

B. Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, plain, fabricated from as-drawn steel wire into flat sheets.

2.03 REINFORCEMENT ACCESSORIES

A. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60, plain-steel bars, cut true to length with ends square and free of burrs.

B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:

1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.

2.04 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:

1. Portland Cement: ASTM C 150, Type I/II, gray. Supplement with the following:
   a. Fly Ash: ASTM C 618, Class F or C.
   b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.

B. Normal-Weight Aggregates: ASTM C 33, Class 3M coarse aggregate or better, graded. Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials.

1. Maximum Coarse-Aggregate Size: 3/4 inch nominal.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Water: ASTM C 94/C 94M and potable.

2.05 ADMIXTURES

A. Air-Entraining Admixture: ASTM C 260.

B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
2. Retarding Admixture: ASTM C 494/C 494M, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.

4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

2.06 WATERSTOPS

A. Flexible Rubber Waterstops: CE CRD-C 513, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.

2.07 VAPOR RETARDERS

A. Sheet Vapor Retarder: ASTM E 1745, Class A, not less than 15 mils thick. Include manufacturer's recommended adhesive or pressure-sensitive tape.

B. Granular Fill: Clean mixture of crushed stone or crushed or uncrushed gravel; ASTM D 448, Size 57, with 100 percent passing a 1-1/2-inch sieve and 0 to 5 percent passing a No. 8 sieve.

2.08 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.

C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

D. Water: Potable.

E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.

F. : ASTM C 1315, Type 1, Class A.

2.09 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.

B. Bonding Agent: ASTM C 1059/C 1059M, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

C. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:

1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

D. Reglets: Fabricate reglets of not less than 0.022-inch-thick, galvanized-steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.

E. Dovetail Anchor Slots: Hot-dip galvanized-steel sheet, not less than 0.034 inch thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.

2.10 REPAIR MATERIALS

A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.

1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.
4. Compressive Strength: Not less than 4100 psi at 28 days when tested according to ASTM C 109/C 109M.

B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch and that can be filled in over a scarified surface to match adjacent floor elevations.

1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
4. Compressive Strength: Not less than 5000 psi at 28 days when tested according to ASTM C 109/C 109M.

2.11 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.

1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.

B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:

1. Fly Ash: 25 percent.
2. Combined Fly Ash and Pozzolan: 25 percent.
3. Ground Granulated Blast-Furnace Slag: 50 percent.
4. Combined Fly Ash or Pozzolan and Ground Granulated Blast-Furnace Slag: 50 percent portland cement minimum, with fly ash or pozzolan not exceeding 25 percent.

C. Limit water-soluble, chloride-ion content in hardened concrete to 0.06 percent by weight of cement.

D. Admixtures: Use admixtures according to manufacturer's written instructions.

1. Use 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 for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.
4. Use corrosion-inhibiting admixture in concrete mixtures where indicated.

2.12 CONCRETE MIXTURES FOR BUILDING ELEMENTS

A. Footings: Proportion normal-weight concrete mixture as follows: As indicated.

B. Foundation Walls: Proportion normal-weight concrete mixture as follows: As indicated.

C. Slabs-on-Grade: Proportion normal-weight concrete mixture as follows: As indicated.

2.13 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.14 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M, and furnish batch ticket information.

1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.

1. For mixer capacity of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
2. For mixer capacity larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd..
3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure.

PART 3 - EXECUTION

3.01 FORMWORK

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:

1. Class A, 1/8 inch for smooth-formed finished surfaces.
2. Class B, 1/4 inch for rough-formed finished surfaces.

D. Construct forms tight enough to prevent loss of concrete mortar.

E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.

1. Install keyways, reglets, recesses, and the like, for easy removal.
2. Do not use rust-stained steel form-facing material.

F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.

G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

H. Chamfer exterior corners and edges of permanently exposed concrete.

I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.02 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."
2. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
3. Install dovetail anchor slots in concrete structures as indicated.

3.03 VAPOR RETARDERS

A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions.

1. Lap joints 6 inches and seal with manufacturer's recommended tape.
2. Place and compact a 1/2-inch-thick layer of fine-graded granular material over granular fill.

3.04 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.

1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.

D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

E. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

3.05 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:

1. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

C. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated.

2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface where joint sealants, specified in Section 079200 "Joint Sealants," are indicated.
3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

3.06 WATERSTOPS

A. Flexible Waterstops: Install in construction joints and at other joints indicated to form a continuous diaphragm. Install in longest lengths practicable. Support and protect exposed waterstops during progress of the Work. Field fabricate joints in waterstops according to manufacturer's written instructions.

3.07 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.

B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.

C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.

1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.

1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
2. Maintain reinforcement in position on chairs during concrete placement.
3. Screed slab surfaces with a straightedge and strike off to correct elevations.
4. Slope surfaces uniformly to drains where required.
5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

F. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures

1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

G. Hot-Weather Placement: Comply with ACI 301 and as follows:

1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

3.08 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces not exposed to public view.

B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces exposed to public view, to receive a rubbed finish, to be covered with a coating or covering material applied directly to concrete.

C. Rubbed Finish: Apply the following to smooth-formed finished as-cast concrete where indicated:

1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.

D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.09 FINISHING FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.

1. Apply float finish to surfaces to receive trowel finish.

C. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

1. Apply a trowel finish to podium floor surface that is not recessed..
2. Finish surfaces to the following tolerances, according to ASTM E 1155, for a randomly trafficked floor surface:
   a. For slabs on grade: Specified overall values of flatness, F(F) 25; and of levelness, F(L) 20; with minimum local values of flatness, F(F) 17; and of levelness, F(L) 15.
   b. For framed floors: Specified overall values of flatness, F(F) 25; with minimum local values of flatness, F(F) 17.

D. Trowel and Fine-Broom Finish: Apply a first trowel finish to parking deck surfaces and to recessed portion of podium. While concrete is still plastic, slightly scarify surface with a fine broom.

1. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.

E. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated.

1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

3.10 MISCELLANEOUS CONCRETE ITEMS

A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.

B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates from manufacturer furnishing machines and equipment.

D. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in inserts and accessories as shown on Drawings. Screed, tamp, and trowel finish concrete surfaces.

3.11 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.

D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.

E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
   a. Water.
   b. Continuous water-fog spray.
   c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
   a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
   b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
   c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies will not interfere with bonding of floor covering used on Project.

3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
   a. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound will not interfere with bonding of floor covering used on Project.

4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period. Provide at all concrete surfaces that are to remain exposed concrete.

3.12 JOINT FILLING

A. Prepare, clean, and install joint filler according to manufacturer's written instructions.

1. Defer joint filling until concrete has aged at least six month(s). Do not fill joints until construction traffic has permanently ceased.

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.

C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.13 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.

C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension to solid concrete. Limit cut depth to 3/4 inch. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.

D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
2. After concrete has cured at least 14 days, correct high areas by grinding.
3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.

F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.14 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Inspections:

1. Steel reinforcement placement.
2. Headed bolts and studs.
3. Verification of use of required design mixture.
4. Concrete placement, including conveying and depositing.
5. Curing procedures and maintenance of curing temperature.
6. Verification of concrete strength before removal of shores and forms from beams and slabs.

C. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. or fraction thereof of each concrete mixture placed each day.
   a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
5. Compression Test Specimens: ASTM C 31/C 31M.
   a. Cast and laboratory cure five standard cylinder specimens for each composite sample.
   b. Cast and field cure five standard cylinder specimens for each composite sample.

6. Compressive-Strength Tests: ASTM C 39/C 39M.
   a. Test one field-cured specimen at 7 days, three specimens at 28 days, and hold one specimen for testing at 56 days if required.
   b. A compressive-strength test shall be the average compressive strength from the specimens obtained from same composite sample and tested at age indicated.

7. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
8. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive

strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.

9. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
10. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
11. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.
12. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
13. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

D. Measure floor and slab flatness and levelness according to ASTM E 1155 within 24 hours of finishing.

END OF SECTION

SECTION 034943
GLASS FIBER REINFORCED CONCRETE DOMES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. A. Glass fiber reinforced concrete (GFRC) dome fabrications as indicated on the drawings.

1.02 RELATED SECTIONS

A. A. Section 05500 - Metal Fabrications: Supplementary support for large items.

B. B. Section 06100 - Rough Carpentry: Supplementary support for large items.

C. C. Section 09900 - Paints and Coatings: Field painting and sealing prior to painting.

1.03 REFERENCES

A. A. ASTM C 150 - Standard Specification for Portland Cement; 1999a.

B. B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 1999.

C. C. ASTM G 23 - Standard Practice for Operating Light-Exposure Apparatus (Carbon-Arc Type) With and Without Water for Exposure of Nonmetallic Materials; 1996.

1.04 SUBMITTALS

A. A. Submit under provisions of Section 01300.

B. B. Product Data: Manufacturer's data sheets on each product to be used, including dimensions, finishes, storage and handling requirements and recommendations, and installation recommendations.

C. C. Shop Drawings: For custom items, provide drawings showing dimensions, layout, joints, details, and interface with adjacent work; include field measured dimensions of the spaces where items are to be installed, if critical to proper installation.

D. D. Samples: For each custom finish specified, two samples, minimum size 6 inches (152.4 mm) square, representing actual product, color, and patterns.

1.05 QUALITY ASSURANCE

A. A. Manufacturer: Obtain GFRC dome(s) as manufactured by a firm specializing in the manufacture of GFRC domes, with a minimum of ten years experience.

B. B. Provide a list of projects comparable in size, scope, and complexity as indicated.

C. C. Provide verification that glass fiber reinforced concrete dome meets or exceeds products specified.

D. D. Installer Qualifications: Regularly engaged and experienced in the installation of glass fiber reinforced concrete or precast concrete units.

1.06 DELIVERY, STORAGE, AND HANDLING

A. A. Transport, lift, and handle units with care, avoiding excessive stress and preventing damage; use appropriate equipment.

B. B. Store products in manufacturer's unopened packaging until ready for installation, in a clean dry area protected from weather, moisture and damage; store units upright and not stacked unless permitted by manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. GLASS FIBER REINFORCED CONCRETE DOMES

1. Acceptable Manufacturer: Stromberg Architectural Products Inc; PO Box 8036, I-30 West, 4400 Oneal, Greenville, TX 75404. ASD. Tel: (903) 454-0904. Fax: (903) 454-3642. Email: sales@strombergarchitectural.com. www.strombergarchitectural.com.

2. Substitutions: See Section 016000 - Product Requirements.

2.02 MATERIALS

A. A. Glass Fiber Reinforced Concrete Fabrications: High density concrete made of ASTM C 150 Portland cement, crushed stone, silica sand, and polymers reinforced with glass fiber and structural reinforcing as required; asbestos free.

1. 1. Color: As selected from manufacturer's selection.
2. 2. Color: To match Architect's sample.
3. 3. Density: 140 pcf (2240 kg/cu m).
4. 4. Shell Thickness: 3/8" to ¾ inch 0.37 inch (9.5 mm), nominal.
5. 5. Surface Burning Characteristics: Flame spread index of 0, smoke developed index of 5; when tested in accordance with ASTM E84. Fuel contribution of 3.
6. 6. Weather Resistance: No significant loss in strength or change in appearance after 200 hours accelerated weathering conducted in accordance with ASTM G 23.
7. 7. Flexural Strength: 1000 to 1800 psi (12410.57 kPa).
8. 8. Modulus of Elasticity: 2 x 10^5 psi (34.47 kPa).
9. 9. Compressive Strength: Over 5000 psi (34473.80 kPa).
10. 10. Variation from Dimensions Indicated on Drawings: Plus and minus 1/8 inch (3.18 mm), maximum.
11. 11. Variation from Plane Along Edge or Surface: Plus and minus 1/16 inch (1.59 mm) per linear foot (0.06 inch (1.5 mm) in 11.81 inch (300 mm)), maximum.
12. 12. Outside Corner Radius: 1/16 inch to 1/8 inch (1.5 to 3 mm).
13. 13. Draft Angle: 3 degrees, minimum, on returns, setbacks, reveals, and grooves.
14. 14. Provide concealed anchorage points for plaster type wire anchors.
15. 15. Provide screwed or bolted anchors with reinforced holes through face of units.
16. 16. Provide anchors and reinforced anchoring points as indicated on drawings.

PART 3 EXECUTION

3.01 EXAMINATION

A. A. Do not begin installation until substrates have been properly constructed; verify that substrates are plumb and true.

B. B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

C. C. Check field dimensions before beginning installation. If dimensions vary too much from design dimensions for proper installation, notify Architect and wait for instructions before beginning installation.

3.02 PREPARATION

A. A. Clean surfaces thoroughly prior to installation.

B. B. Prepare surfaces using the methods recommended by the manufacturer to achieve the best result for the substrate under the project conditions.

C. C. Install supplementary temporary and permanent support as required for proper installation.

3.03 INSTALLATION

A. A. Install in accordance with applicable code and manufacturer's recommendations, plumb and true to line, shim where necessary.

B. B. Provide control joints at not more than 35 feet (1066.8 cm) on center if not indicated on drawings.

C. C. Provide expansion joints where moving joints in substrate occur.

D. D. Patch exposed anchor points to match color and texture of unit.

3.04 PROTECTION

A. A. Protect installed products until completion of project.

B. B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 042000
UNIT MASONRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Common brick.

B. Mortar and Grout.

C. Reinforcement and anchorage.

D. Flashings.

E. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 072100 - Thermal Insulation: Insulation for cavity spaces.

B. Section 07 2500 - Gypsum Board Weather-Resistant Barrier and Air Barrier System

C. Section 07 8401 - Firestopping: Firestopping at penetrations of fire-rated masonry and at top of fire-rated walls.

D. Section 076200 - Sheet Metal Flashing and Trim: Through-wall masonry flashings.

E. Section 079200 - Joint Sealants: Sealing control and expansion joints.

F. Section 07 6500 – Wall Flashing

1.03 REFERENCE STANDARDS

A. ACI 530.1/ASCE 6/TMS 602 - Specification For Masonry Structures; American Concrete Institute International; 2008.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.

C. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2024.

D. ASTM C62 - Standard Specification for Building Brick (Solid Masonry Units Made from Clay or Shale); 2023.

E. ASTM C67/C67M - Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile; 2023.

F. ASTM C90 - Standard Specification for Dry-Cast Loadbearing Concrete Masonry Units; 2024a.

G. ASTM C91/C91M - Standard Specification for Masonry Cement; 2025.

H. ASTM C129 - Standard Specification for Nonloadbearing Concrete Masonry Units; 2023.

I. ASTM C140/C140M - Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units; 2024a.

J. ASTM C150/C150M - Standard Specification for Portland Cement; 2024.

K. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes; 2024.

L. ASTM C216 - Standard Specification for Facing Brick (Solid Masonry Units Made from Clay or Shale); 2024.

M. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2025.

N. ASTM C404 - Standard Specification for Aggregates for Masonry Grout; 2024.

O. ASTM C476 - Standard Specification for Grout for Masonry; 2023.

P. ASTM C744 - Standard Specification for Prefaced Concrete and Calcium Silicate Masonry Units; 2021.

Q. ASTM C780 - Standard Test Methods for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry; 2025.

R. ASTM C979/C979M - Standard Specification for Pigments for Integrally Colored Concrete; 2024.

S. BIA Technical Notes No. 7 - Water Penetration Resistance – Design and Detailing; 2005.

T. BIA Technical Notes No. 13 - Ceramic Glazed Brick Exterior Walls; 2017.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by all relevant installers.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data for masonry units, fabricated wire reinforcement, mortar, and masonry accessories.

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

D. Manufacturer's Certificate: Certify that masonry units meet or exceed specified requirements.

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements, for additional provisions.

1.06 MOCK-UP

A. Construct a masonry wall as a mock-up panel sized and as indicated on drawings; include mortar and accessories, structural backup, wall openings, flashings, and wall insulation in mock-up, and other materials. Provide repurposed masonry samples as required and approved by architect.

B. Locate where directed.

C. Mock-up may not remain as part of the Work.

D. Refer to section 01 4000.

1.07 DELIVERY, STORAGE, AND HANDLING

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

PART 2 PRODUCTS

2.01 BRICK UNITS

A. Facing Brick: ASTM C216, Type FBS Smooth, Grade SW.
   1. Color and texture to match Architect's sample.
   2. Color and texture: ACME Americana – Modular – Heritage.
      a. Approved Equal: Southern Alabama Brick Co., Inc.
   3. Nominal size: As indicated on drawings.

2.02 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C150/C150M, Type I; color as required to produce approved color sample.

B. Hydrated Lime: ASTM C207, Type S.

C. Grout Aggregate: ASTM C404.

D. Pigments for Colored Mortar: Pure, concentrated mineral pigments specifically intended for mixing into mortar and complying with ASTM C979/C979M.
   1. Color(s): Color to be selected by Architect from manufacturer’s full range of colors as required to match architects sample.

2.03 REINFORCEMENT AND ANCHORAGE

A. Manufacturers:
   1. Hohmann & Barnard, Inc (including Dur-O-Wall brand): www.h-b.com.
   2. WIRE-BOND; _____www.wirebond.com/#sle.
   3. Substitutions: See Section 016000 - Product Requirements.

B. Reinforcing Steel: ASTM A615/A615M Grade 60 (420) deformed billet bars.

C. Masonry Veneer Anchors: 2-piece anchors that permit differential movement between masonry veneer and structural backup, hot dip galvanized to ASTM A 153/A 153M, Class B.
   1. Anchor plates: Not less than 0.075 inch (1.91 mm) thick, designed for fastening to structural backup through sheathing by two fasteners; provide design with legs that penetrate sheathing and insulation to provide positive anchorage.
   2. Wire ties: Manufacturer's standard shape, 0.1875 inch (4.75 mm) thick.
   3. Vertical adjustment: Not less than 3-1/2 inches (89 mm).
   4. For metal stud wall backup: Holman Barnard Thermal - 2 seal wing nut anchor fastener for metal stud back-up with 1-1/2" diameter washer.
   5. Provide screw pullout hold load per manufacturers requirement for back-up material. Note pullout information on submittal.

2.04 FLASHINGS

A. Thru Wall Flashing - Refer to Division 07.

2.05 ACCESSORIES

A. Preformed Control Joints: Rubber material. Provide with corner and tee accessories, fused joints.
   1. Manufacturers:
      a. Dur-O-Wal: www.dur-o-wal.com.
      b. Hohmann & Barnard, Inc; _____: www.h-b.com/#sle.
      c. WIRE-BOND; _____: www.wirebond.com/#sle.
      d. Substitutions: See Section 016000 - Product Requirements.

B. Joint Filler: Closed cell polyvinyl chloride; oversized 50 percent to joint width; self expanding; maximum lengths available.

C. Cavity Mortar Control: Semi-rigid polyethylene or polyester mesh panels, sized to thickness of wall cavity, and designed to prevent mortar droppings from clogging weeps and cavity vents and allow proper cavity drainage.
   1. Mortar Diverter: Semi-rigid mesh designed for installation at flashing locations.
      a. Manufacturers:
         1) Advanced Building Products Inc; Mortar Break: www.advancedflashing.com/#sle.
         2) Mortar Net Solutions; MortarNet: www.mortarnet.com/#sle.
         3) Substitutions: See Section 016000 - Product Requirements.

D. Weeps:
   1. Type: Extruded propylene with honeycomb design.
   2. Color(s): As selected by Architect from manufacturer's full range.

E. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.

F. Stainless Steel Termination Bar install continuous termination bar - refer to Section 07 6500.

G. Metal Drip Edge: Refer to Section 07 6500 and details.

2.06 MORTAR AND GROUT MIXING

A. Mortar for Unit Masonry: ASTM C270, using the Proportion Specification.
   1. Masonry below grade and in contact with earth: Type S.
   2. Exterior, loadbearing masonry: Type S.
   3. Exterior, non-loadbearing masonry: Type S.

B. Colored Mortar: Proportion selected pigments and other ingredients to match Architect's sample, without exceeding manufacturer's recommended pigment-to-cement ratio.

C. Grout: ASTM C476. Consistency required to fill completely volumes indicated for grouting; fine grout for spaces with smallest horizontal dimension of 2 inches (50 mm) or less; coarse grout for spaces with smallest horizontal dimension greater than 2 inches (50 mm). Provide 28 day compressive strength indicated on drawings.

D. Mixing: Use mechanical batch mixer and comply with referenced standards.

PART 3 EXECUTION

3.01 EXAMINATION

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

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

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

3.02 PREPARATION

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

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

3.03 COLD AND HOT WEATHER REQUIREMENTS

A. Maintain materials and surrounding air temperature to minimum 40 degrees F (5 degrees C) prior to, during, and 48 hours after completion of masonry work.

B. Maintain materials and surrounding air temperature to maximum 90 degrees F (32 degrees C) prior to, during, and 48 hours after completion of masonry work.

3.04 COURSING

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

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

C. Brick Units:
   1. Bond: Running.
   2. Coursing: Three units and three mortar joints to equal 8 inches (200 mm).
   3. Mortar Joints: Concave.

3.05 PLACING AND BONDING

A. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.

B. Lay hollow masonry units with face shell bedding on head and bed joints.

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

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

E. Interlock intersections and external corners, except for units laid in stack bond.

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

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

H. Cut mortar joints flush where wall tile is scheduled or resilient base is scheduled.

I. Isolate masonry partitions from vertical structural framing members with a control joint as indicated.

J. Isolate top joint of masonry partitions from horizontal structural framing members and slabs or decks with compressible joint filler.

3.06 WEEPS/CAVITY VENTS

A. Install weeps in veneer and cavity walls at 24 inches (600 mm) on center horizontally above through-wall flashing, above shelf angles and lintels, at bottom of walls, and at top of walls for ventilation.

3.07 CAVITY MORTAR CONTROL

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

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

C. Install cavity mortar control panels continuously throughout exterior masonry cavities during construction of exterior wythe, complying with manufacturer's installation instructions. Verify that airspace width is no more than 3/8 inch (9 mm) greater than panel thickness. Install horizontally between joint reinforcement. Stagger end joints in adjacent rows. Fit to perimeter construction and penetrations without voids.

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

3.08 REINFORCEMENT AND ANCHORAGE - GENERAL, SINGLE WYTHE MASONRY, AND CAVITY WALL MASONRY

A. Unless otherwise indicated on drawings or specified under specific wall type, install horizontal joint reinforcement 16 inches (400 mm) on center.

B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches (400 mm) each side of opening.

C. Lap joint reinforcement ends minimum 6 inches (150 mm).

D. Fasten anchors to structural framing and embed in masonry joints as masonry is laid. Unless otherwise indicated on drawings or closer spacing is indicated under specific wall type, space anchors at maximum of 36 inches (900 mm) horizontally and 24 inches (600 mm) vertically.

E. Cut or interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.

3.09 REINFORCEMENT AND ANCHORAGE - MASONRY VENEER

A. Stud Back-Up: Secure veneer anchors to stud framed back-up and embed into masonry veneer at maximum 16 inches (400 mm) on center vertically and 16 inches (400 mm) on center horizontally. Place additional anchors at perimeter of openings and ends of panels, so maximum spacing of anchors is 8 inches (200 mm) on center.

3.10 MASONRY FLASHINGS

A. Whether or not specifically indicated, install masonry flashing to divert water to exterior at all locations where downward flow of water will be interrupted.

B. Refer to Division 7 for flashing requirements.

3.11 GROUTED COMPONENTS

A. Reinforce bond beams with 2 scheduled bars, 1 inch (25 mm) from bottom web.

B. Lap splices minimum 24 bar diameters.

C. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch (13 mm) of dimensioned position.

D. Place and consolidate grout fill without displacing reinforcing.

E. At bearing locations, fill masonry cores with grout for a minimum 12 inches (300 mm) either side of opening.

3.12 CONTROL AND EXPANSION JOINTS

A. Do not continue horizontal joint reinforcement through control or expansion joints.

B. Install preformed control joint device in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.

3.13 BUILT-IN WORK

A. As work progresses, install built-in metal door frames and glazed frames and other items to be built into the work and furnished under other sections.

B. Install built-in items plumb, level, and true to line.

C. Bed anchors of metal door and glazed frames in adjacent mortar joints. Fill frame voids solid with grout.
   1. Fill adjacent masonry cores with grout minimum 12 inches (300 mm) from framed openings, unless noted otherwise.

D. Do not build into masonry construction organic materials that are subject to deterioration.

3.14 TOLERANCES

A. Maximum Variation from Alignment of Columns: 1/4 inch (6 mm).

B. Maximum Variation From Unit to Adjacent Unit: 1/16 inch (1.6 mm).

C. Maximum Variation from Plane of Wall: 1/4 inch in 10 ft (6 mm/3 m) and 1/2 inch in 20 ft (13 mm/6 m) or more.

D. Maximum Variation from Plumb: 1/4 inch (6 mm) per story non-cumulative; 1/2 inch (13 mm) in two stories or more.

E. Maximum Variation from Level Coursing: 1/8 inch in 3 ft (3 mm/m) and 1/4 inch in 10 ft (6 mm/3 m); 1/2 inch in 30 ft (13 mm/9 m).

F. Maximum Variation of Mortar Joint Thickness: Head joint, minus 1/4 inch, plus 3/8 inch (minus 6.4 mm, plus 9.5 mm).

G. Maximum Variation from Cross Sectional Thickness of Walls: 1/4 inch (6 mm).

3.15 CUTTING AND FITTING

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

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

3.16 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in Section 014000 - Quality Requirements.

B. Clay Masonry Unit Tests: Test each variety of clay masonry in accordance with ASTM C67/C67M requirements, sampling 5 randomly chosen units for each 50,000 installed.

C. Concrete Masonry Unit Tests: Test each variety of concrete unit masonry in accordance with ASTM C140/C140M for compliance with requirements of this specification.

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

3.17 CLEANING

A. Remove excess mortar and mortar droppings.

B. Replace defective mortar. Match adjacent work.

C. Clean soiled surfaces with cleaning solution.

D. Use non-metallic tools in cleaning operations.

3.18 PROTECTION

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

END OF SECTION

SECTION 047200
CAST STONE MASONRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Architectural cast stone.

B. Contractor responsibility to coordinate Cast Stone masonry color with architects Color selection..

C. Units required are:
   1. Exterior wall units, including wall caps. Refer to Drawings for additional requirements.

1.02 RELATED REQUIREMENTS

A. Section 042000 - Unit Masonry: Installation of cast stone in conjunction with masonry.

B. Section 079005 - Joint Sealers: Materials and execution methods for sealing soft joints in cast stone work.

C. Section 07 6526 - Self-Adhering Sheet Flashing.

1.03 REFERENCE STANDARDS

A. ACI 318 - Building Code Requirements for Structural Concrete; 2019 (Reapproved 2022).

B. ASTM C642 - Standard Test Method for Density, Absorption, and Voids in Hardened Concrete; 2021.

C. ASTM C1364 - Standard Specification for Architectural Cast Stone; 2023, with Editorial Revision (2024).

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Manufacturer's Qualification Data: Documentation showing compliance with specified requirements.

C. Product Data: Test results of cast stone components made previously by the manufacturer.
   1. Include one copy of ASTM C1364 for Architect's use.

D. Shop Drawings: Include elevations, dimensions, layouts, profiles, cross sections, reinforcement, exposed faces, arrangement of joints, anchoring methods, anchors, and piece numbers.
   1. Provide Alabama licensed structural engineer's stamp on drawings.
   2. Reuse of Architect's drawings for shop drawings in not allowed.

E. Mortar Color Selection Samples.

F. Verification Samples: Pieces of actual cast stone components not less than 12 inches (305 mm) square, illustrating range of color and texture to be anticipated in components furnished for the project.
   1. Prior to ordering materials, the Contractor shall receive written approval of color selection from the Owner and Architect.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications:
   1. A firm with a minimum of 5 years experience producing cast stone of types required for project.
   2. Adequate plant capacity to furnish quality, sizes, and quantity of cast stone required without delaying progress of the work.

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

C. Manufacturer Qualifications: A firm with a minimum of 5 years of experience in producing cast stone of the types required for project.
   1. Adequate plant capacity to furnish quality, sizes, and quantity of cast stone required without delaying progress of the work.
   2. Products previously produced by plant and exposed to weather that exhibit satisfactory appearance.

D. Comply with the requirements of the Cast Stone Institute Technical Manual.
   1. Maintain one copy of manual onsite.

1.06 MOCK-UP

A. See Section 014000 - Quality Requirements for additional requirements.
   1. Approved mock-up will become standard for appearance and workmanship.
   2. Mock-up may remain as part of the completed work.

B. Mock-Up:
   1. Refer to section 01 4000.

1.07 DELIVERY, STORAGE, AND HANDLING

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

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

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

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

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

F. Store mortar materials where contamination can be avoided.

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

PART 2 PRODUCTS

2.01 ARCHITECTURAL CAST STONE

A. Cast Stone: Architectural concrete product manufactured to simulate appearance of natural stone, complying with ASTM C1364.
   1. Compressive Strength: As specified in ASTM C1364; calculate strength of pieces to be field cut at 80 percent of uncut piece.
   2. Freeze-Thaw Resistance: Demonstrated by field experience.
   3. Surface Texture: Fine grained texture, with no bugholes, air voids, or other surface blemishes visible from distance of 20 feet (6 meters).
   4. Color: Selected by Owner and Architect from archietcts selection.
   5. Remove cement film from exposed surfaces before packaging for shipment.

B. Shapes: Provide shapes indicated on drawings.
   1. Variation from Any Dimension, Including Bow, Camber, and Twist: Maximum of plus/minus 1/8 inch (3 mm) or length divided by 360, whichever is greater, but not more than 1/4 inch (6 mm).
   2. Unless otherwise indicated on drawings, provide:
      a. Wash or slope of 1:12 on exterior horizontal surfaces.
      b. Drips on projecting components, wherever possible.
      c. Raised fillets at back of sills and at ends to be built in.

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

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine construction to receive cast stone components. Notify Architect if construction is not acceptable.

B. Do not begin installation until unacceptable conditions have been corrected.

3.02 INSTALLATION

A. Install cast stone components in conjunction with masonry, complying with requirements of Section 042000.

B. Mechanically anchor cast stone units indicated; set remainder in mortar.

C. Setting:
   1. Drench cast stone components with clear, running water immediately before installation.
   2. Set units in a full bed of mortar unless otherwise indicated.
   3. Fill vertical joints with mortar.
   4. Fill dowel holes and anchor slots completely with mortar or non-shrink grout.

D. Joints: Make all joints 3/8 inch (9.5 mm), except as otherwise detailed.
   1. Rake mortar joints 3/4 inch (19 mm) for pointing.
   2. Provide sealant & backer rod in all joints per manufacturer's requirements. Refer to section 07 9005.
   3. Remove excess mortar from face of stone before pointing joints.
   4. Point joints with mortar in layers 3/8 inch (9.5 mm) thick and tool to a slight concave profile.
   5. Leave the following joints open for sealant:
      a. Head joints in top courses, including copings, parapets, cornices, sills, and steps.
      b. Joints in projecting units.
      c. Joints between rigidly anchored units, including soffits, panels, and column covers.
      d. Joints below lugged sills and stair treads.
      e. Joints below ledge and relieving angles.
      f. Joints labeled "expansion joint".

E. Sealant Joints: Install sealants as specified in Section 079005.

F. Installation Tolerances:
   1. Variation from Plumb: Not more than 1/8 inch in 10 feet (3 mm in 3 m) or 1/4 inch in 20 feet (6 mm in 6 m) or more.
   2. Variation from Level: Not more than 1/8 inch in 10 feet (3 mm in 3 m) or 1/4 inch in 20 feet (6 mm in 6 m), or 3/8 inch (9 mm) maximum.
   3. Variation in Joint Width: Not more than 1/8 inch in 36 inches (3 mm in 900 mm) or 1/4 of nominal joint width, whichever is less.
   4. Variation in Plane Between Adjacent Surfaces (Lipping): Not more than 1/16 inch (1.5 mm) difference between planes of adjacent units or adjacent surfaces indicated to be flush with units.

G. Repairs: Repair chips and other surface damage noticeable when viewed in direct daylight at 10 feet (3 m).
   1. Repair with matching touchup material provided by the manufacturer and in accordance with manufacturer's instructions.

3.03 CLEANING

A. Clean completed exposed cast stone after mortar is thoroughly set and cured.
   1. Wet surfaces with water before applying cleaner.
   2. Apply cleaner to cast stone in accordance with manufacturer's instructions.
   3. Remove cleaner promptly by rinsing thoroughly with clear water.
   4. Do not use acidic cleaners.

3.04 PROTECTION

A. Protect completed work from damage.

B. Clean, repair, or restore damaged or mortar-splashed work to condition of new work.

C. Protect from soil stains during construction.

END OF SECTION

SECTION 051200 - STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Structural steel.
2. Shrinkage-resistant grout.

B. Related Requirements:

1. Section 051213 "Architecturally Exposed Structural Steel Framing" for additional requirements for architecturally exposed structural steel.
2. Section 053100 "Steel Decking" for field installation of shear stud connectors through deck.

1.2 DEFINITIONS

A. Structural Steel: Elements of the structural frame indicated on Drawings and as described in ANSI/AISC 303.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data:

1. Structural-steel materials.
2. High-strength, bolt-nut-washer assemblies.
3. Anchor rods.
4. Threaded rods.
5. Forged-steel hardware.
6. Shop primer.
7. Galvanized-steel primer.
8. Etching cleaner.
9. Galvanized repair paint.
10. Shrinkage-resistant grout.

B. Sustainable Design Submittals:

C. Shop Drawings: Show fabrication of structural-steel components.

D. Delegated Design Submittal: For structural-steel connections indicated on Drawings to comply with design loads, include analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Mill test reports for structural-steel materials, including chemical and physical properties.

C. Source quality-control reports.

D. Field quality-control reports.

1.6 QUALITY ASSURANCE

A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category BU or is accredited by the IAS Fabricator Inspection Program for Structural Steel (Acceptance Criteria 172).

B. Installer Qualifications: A qualified Installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector, Category ACSE.

C. Welding Qualifications: Qualify procedures and personnel in accordance with AWS D1.1/D1.1M.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Comply with applicable provisions of the following specifications and documents:

1. ANSI/AISC 303.
2. ANSI/AISC 360.
3. RCSC's "Specification for Structural Joints Using High-Strength Bolts."

B. Connection Design Information:

1. Design connections and final configuration of member reinforcement at connections in accordance with ANSI/AISC 303 by fabricator's qualified professional engineer.

a. Use Load and Resistance Factor Design; data are given at factored-load level.

C. Moment Connections: [Type PR, partially] [Type FR, fully] restrained.

D. Construction: Moment frame

2.2 STRUCTURAL-STEEL MATERIALS

A. W-Shapes: As indicated on construction drawings.

B. Channels, Angles: As indicated on construction drawings.

C. Plate and Bar: As indicated on construction drawings.

D. Cold-Formed Hollow Structural Sections: As indicated on construction drawings.

E. Steel Pipe: As indicated on construction drawings.

F. Welding Electrodes: Comply with AWS requirements.

2.3 BOLTS AND CONNECTORS

A. High-Strength A325 Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A325, Type 1, heavy-hex steel structural bolts; all with plain finish.

1. Direct-Tension Indicators: ASTM F959/F959M, Type 325-1, compressible-washer type with plain finish.

B. High-Strength A490 Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A490), Type 1, heavy-hex steel structural bolts

1. Direct-Tension Indicators: ASTM F959/F959M, Type 490-1, compressible-washer type with plain finish.

2.4 RODS

A. Headed Anchor Rods: ASTM F1554, Grade 36, straight.

1. Finish: Plain

B. Threaded Rods: ASTM A36/A36M

1. Finish: Plain

2.5 PRIMER

A. Steel Primer:

1. Comply with Section 099113 "Exterior Painting," Section 099123 "Interior Painting," and Section 099600 "High-Performance Coatings."

2.6 SHRINKAGE-RESISTANT GROUT

A. Metallic, Shrinkage-Resistant Grout: ASTM C1107/C1107M, factory-packaged, metallic aggregate grout, mixed with water to consistency suitable for application and a 30-minute working time.

B. Nonmetallic, Shrinkage-Resistant Grout: ASTM C1107/C1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.7 FABRICATION

A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate in accordance with ANSI/AISC 303 and to ANSI/AISC 360.

2.8 SHOP CONNECTIONS

A. High-Strength Bolts: Shop install high-strength bolts in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts" for type of bolt and type of joint specified.

B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

2.9 GALVANIZING

A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel in accordance with ASTM A123/A123M.

1. Fill vent and drain holes that are exposed in the finished Work unless they function as weep holes, by plugging with zinc solder and filing off smooth.

2.10 SHOP PRIMING

A. Shop prime steel surfaces, except the following:

1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
2. Surfaces to be field welded.
3. Surfaces of high-strength bolted, slip-critical connections.
4. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
5. Galvanized surfaces unless indicated to be painted.
6. Surfaces enclosed in interior construction.

B. Surface Preparation of Steel: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces in accordance with the following specifications and standards:

1. SSPC-SP 2.

2. SSPC-SP 3.

C. Surface Preparation of Galvanized Steel: Prepare galvanized-steel surfaces for shop priming by thoroughly cleaning steel of grease, dirt, oil, flux, and other foreign matter, and treating with etching cleaner or in accordance with SSPC-SP 16.

D. Priming: Immediately after surface preparation, apply primer in accordance with manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

2.11 SOURCE QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform shop tests and inspections.

1. Allow testing agency access to places where structural-steel work is being fabricated or produced to perform tests and inspections.
2. Bolted Connections: Inspect and test shop-bolted connections in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts."
3. Welded Connections: Visually inspect shop-welded connections in accordance with AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:

   a. Liquid Penetrant Inspection: ASTM E165/E165M.
   b. Magnetic Particle Inspection: ASTM E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
   c. Ultrasonic Inspection: ASTM E164.
   d. Radiographic Inspection: ASTM E94/E94M.
4. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify, with certified steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and in accordance with ANSI/AISC 303 and ANSI/AISC 360.

B. Baseplates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.

1. Set plates for structural members on wedges, shims, or setting nuts as required.
2. Weld plate washers to top of baseplate.
3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
4. Promptly pack shrinkage-resistant grout solidly between bearing surfaces and plates, so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for grouting.

C. Maintain erection tolerances of structural steel within ANSI/AISC 303.

3.3 FIELD CONNECTIONS

A. High-Strength Bolts: Install high-strength bolts in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts" for bolt and joint type specified.

B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

1. Comply with ANSI/AISC 303 and ANSI/AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.

3.4 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a special inspector to perform the following special inspections:

1. Verify structural-steel materials and inspect steel frame joint details.
2. Verify weld materials and inspect welds.
3. Verify connection materials and inspect high-strength bolted connections.

B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

1. Bolted Connections: Inspect and test bolted connections in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts."
2. Welded Connections: Visually inspect field welds in accordance with AWS D1.1/D1.1M.

END OF SECTION 051200

SECTION 052100 - STEEL JOIST FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. K-series steel joists.
2. Steel joist accessories.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of joist, accessory, and product.

B. Shop Drawings:

1. Include layout, designation, number, type, location, and spacing of joists.
2. Include joining and anchorage details; bracing, bridging, and joist accessories; splice and connection locations and details; and attachments to other construction.

1.3 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Manufacturer certificates.

C. Paint compatibility certificates.

D. Mill Certificates: For each type of bolt.

E. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: A manufacturer certified by SJI to manufacture joists complying with applicable standard specifications and load tables in SJI's "Specifications."

1. Manufacturer's responsibilities include providing professional engineering services for designing special joists to comply with performance requirements.

B. Welding Qualifications: Qualify field-welding procedures and personnel in accordance with AWS D1.1/D1.1M, "Structural Welding Code - Steel."

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PART 2 - PRODUCTS

2.1 STEEL JOISTS

A. K-Series Steel Joist: Manufactured steel joists of type indicated in accordance with "Standard Specification for Open Web Steel Joists, K-Series" in SJI's "Specifications," with steel-angle top- and bottom-chord members, underslung ends, and parallel top chord.

2.2 PRIMERS

A. Primer:

1. SSPC-Paint 15, or manufacturer's standard shop primer complying with performance requirements in SSPC-Paint 15.

2.3 STEEL JOIST ACCESSORIES

A. Bridging:

1. Provide bridging anchors and number of rows of horizontal or diagonal bridging of material, size, and type required by SJI's "Specifications" for type of joist, chord size, spacing, and span. Furnish additional erection bridging if required for stability.
2. Schematically indicated. Detail and fabricate in accordance with SJI's "Specifications." Furnish additional erection bridging if required for stability.
3. Fabricate as indicated on Drawings and in accordance with SJI's "Specifications. Furnish additional erection bridging if required for stability.

B. Furnish ceiling extensions, either extended bottom-chord elements or a separate extension unit of enough strength to support ceiling construction.

1. Extend ends to within 1/2 inch of finished wall surface unless otherwise indicated on Drawings.

C. Furnish miscellaneous accessories including splice plates and bolts required by joist manufacturer to complete joist assembly.

2.4 CLEANING AND SHOP PAINTING

A. Clean and remove loose scale, heavy rust, and other foreign materials from fabricated joists and accessories.

B. Apply one coat of shop primer to joists and joist accessories.

C. Shop priming of joists and joist accessories is specified in [ection 099113 "Exterior Painting" and Section 099123 "Interior Painting."

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PART 3 - EXECUTION

3.1 INSTALLATION

A. Do not install joists until supporting construction is in place and secured.

B. Install joists and accessories plumb, square, and true to line; securely fasten to supporting construction in accordance with SJI's "Specifications," joist manufacturer's written instructions, and requirements in this Section.

1. Before installation, splice joists delivered to Project site in more than one piece.
2. Space, adjust, and align joists accurately in location before permanently fastening.
3. Install temporary bracing and erection bridging, connections, and anchors to ensure that joists are stabilized during construction.

C. Field weld joists to supporting steel bearing plates and framework. Coordinate welding sequence and procedure with placement of joists. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.

D. Bolt joists to supporting steel framework using carbon-steel bolts.

E. Install and connect bridging concurrently with joist erection, before construction loads are applied. Anchor ends of bridging lines at top and bottom chords if terminating at walls or beams.

3.2 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Visually inspect field welds in accordance with AWS D1.1/D1.1M.

C. Visually inspect bolted connections.

D. Prepare test and inspection reports.

END OF SECTION 052100

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SECTION 053100 - STEEL DECKING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Roof deck.

1.2 ACTION SUBMITTALS

A. Product Data:

1. Roof deck.

B. Shop Drawings:

1. Include layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.

1.3 INFORMATIONAL SUBMITTALS

A. Certificates:

1. Welding certificates.
2. Product Certificates: For each type of steel deck.

B. Test and Evaluation Reports:

1. Product Test Reports: For tests performed by a qualified testing agency, indicating that power-actuated mechanical fasteners comply with requirements.
2. Research Reports: For steel deck, from ICC-ES showing compliance with the building code.

C. Field Quality-Control Submittals:

1. Field quality-control reports.

D. Qualification Statements: For welding personnel and testing agency.

1.4 QUALITY ASSURANCE

A. Qualifications:

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1. Welding Qualifications: Qualify procedures and personnel in accordance with SDI QA/QC and the following welding code:

   a. AWS D1.3/D1.3M.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store products in accordance with SDI MOC3. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. AISI Specifications: Comply with calculated structural characteristics of steel deck in accordance with AISI S100.

B. Fire-Resistance Ratings: Comply with ASTM E119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

   1. Indicate design designations from UL's "Fire Resistance Directory" or from listings of another qualified testing agency.

2.2 ROOF DECK

A. Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with SDI RD and with the following:

   1. Galvanized-Steel Sheet: ASTM A653/A653M, Structural Steel (SS), Grade as indicated, zinc coating.

   2. Deck Profile: As indicated
   3. Profile Depth: As indicated
   4. Design Uncoated-Steel Thickness: As indicated
   5. Span Condition: As indicated
   6. Side Laps: As indicated.

2.3 ACCESSORIES

A. Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.

B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.

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C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, minimum diameter indicated on drawings.

D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.

E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi, not less than 0.0359-inch design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.

F. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck unless otherwise indicated.

G. Weld Washers: Uncoated steel sheet, shaped to fit deck rib, 0.0598 inch thick, with factory-punched hole of 3/8-inch diameter.

H. Flat Sump Plates: Single-piece steel sheet, 0.0747 inch thick, of same material and finish as deck. For drains, cut holes in the field.

I. Galvanizing Repair Paint: ASTM A780/A780M.

J. Repair Paint: Manufacturer's standard rust-inhibitive primer of same color as primer.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Install deck panels and accessories in accordance with SDI C, SDI NC, and SDI RD, as applicable; manufacturer's written instructions; and requirements in this Section.

B. Install temporary shoring before placing deck panels if required to meet deflection limitations.

C. Locate deck bundles to prevent overloading of supporting members.

D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.

E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.

F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.

G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.

H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.

I. Mechanical fasteners may be used as indicated on the drawings. Locate mechanical fasteners and install in accordance with deck manufacturer's written instructions.

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3.2 INSTALLATION OF ROOF DECK

A. Fasten roof-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated or arc seam welds with an equal perimeter that is not less than 1-1/2 inches long, and as follows:

1. Weld Diameter: As indicated on the drawings nominal.
2. Weld Spacing: Weld edge and interior ribs of deck units with a minimum of two welds per deck unit at each support. Space welds as indicated.

B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of one-half of the span or 18 inches and as follows:

1. Mechanically fasten with self-drilling, No. 10 diameter or larger, carbon-steel screws.
2. Mechanically clinch or button punch.
3. Fasten with a minimum of 1-1/2-inch-long welds.

C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints as follows:

1. End Joints: Lapped 2 inches minimum.

D. Roof Sump Pans and Sump Plates: Install over openings provided in roof deck and mechanically fasten flanges to top of deck. Space mechanical fasteners not more than 12 inches apart with at least one fastener at each corner.

1. Install reinforcing channels or zees in ribs to span between supports and [weld] [or] [mechanically fasten].

E. Miscellaneous Roof-Deck Accessories: Install ridge and valley plates, finish strips, end closures, and reinforcing channels in accordance with deck manufacturer's written instructions. Weld or mechanically fasten to substrate to provide a complete deck installation.

1. Weld cover plates at changes in direction of roof-deck panels unless otherwise indicated.

F. Flexible Closure Strips: Install flexible closure strips over partitions, walls, and where indicated. Install with adhesive in accordance with manufacturer's written instructions to ensure complete closure.

3.3 REPAIR

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint in accordance with ASTM A780/A780M and manufacturer's written instructions.

B. Repair Painting:

1. Wire brush and clean rust spots, welds, and abraded areas on both surfaces of prime-painted deck immediately after installation, and apply repair paint.

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2. Apply repair paint, of same color as adjacent shop-primed deck, to bottom surfaces of deck exposed to view.
3. Wire brushing, cleaning, and repair painting of bottom deck surfaces are included in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."
4. Wire brushing, cleaning, and repair painting of rust spots, welds, and abraded areas of both deck surfaces are included in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Tests and Inspections:

1. Special inspections and qualification of welding special inspectors for cold-formed steel floor and roof deck in accordance with quality-assurance inspection requirements of SDI QA/QC.

   a. Field welds will be subject to inspection.

2. Steel decking will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

END OF SECTION 053100

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SECTION 054000
COLD-FORMED METAL FRAMING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Formed steel stud exterior wall and interior wall framing.

B. Formed steel joist, purlin, and rafter, and sub-framing girts framing and bridging as indicated on drawings.

1.02 RELATED REQUIREMENTS

A. Section 042001 - Masonry Veneer: Veneer masonry supported by wall stud metal framing.

B. Section 053100 - Steel Decking.

C. Section 061000 - Rough Carpentry: Wood blocking and miscellaneous framing.

D. Section 061000 - Rough Carpentry: Wall sheathing.

E. Section 072100 - Thermal Insulation: Insulation within framing members.

F. Section 072500 - Weather Barriers:

1.03 REFERENCE STANDARDS

A. AISI S100-12 - North American Specification for the Design of Cold-Formed Steel Structural Members; 2012.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.

C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

D. ASTM C955 - Standard Specification for Cold-Formed Steel Structural Framing Members; 2024.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate with work of other sections that is to be installed in or adjacent to the metal framing system, including but not limited to structural anchors, cladding anchors, utilities, insulation, and firestopping.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on standard framing members; describe materials and finish, product criteria, limitations.

C. Shop Drawings: Indicate component details, framed openings, bearing, anchorage, loading, welds, and type and location of fasteners, and accessories or items required of related work.
   1. Indicate stud and ceiling joist layout.
   2. Describe method for securing studs to tracks and for bolted framing connections.
   3. Provide design engineer's signed stamp on shop drawings by professional structural engineer registered in the State of Alabama.
   4. Provide calculations for loadings and stresses of specially fabricated framing, stamped and signed by a Professional Structural Engineer registered in the State of Alabama.
   5. Provide details and capacities for factory-made framing connectors.

D. Designer's Qualification Statement.

1.06 QUALITY ASSURANCE

A. Fabricator Qualifications: Fabricator with minimum 5 years of experience designing and fabricating systems equivalent to those required for this project and licensed by an acceptable manufacturer.

B. Installer Qualifications: Experienced installer approved by system fabricator.

C. Welders: Qualify welding processes and welding operators approved by metal stud manufacturer.

1.07 MOCK-UP

A. Provide mock-up of exterior framed wall, including components specified elsewhere, such as insulation, sheathing, window frame, door frame, exterior wall finish, and interior wall finish.

B. Location: As directed.

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

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Metal Framing, Connectors, and Accessories:
   1. ClarkDietrich; _____: www.clarkdietrich.com/#sle.
   2. Marino; ____: www.marinoware.com/#sle.
   3. The Steel Network, Inc; _____: www.SteelNetwork.com/#sle.
   4. Substitutions: See Section 01 6000 - Product Requirements.

2.02 FRAMING SYSTEM

A. Provide primary and secondary framing members, bridging, bracing, plates, gussets, clips, fittings, reinforcement, and fastenings as required to provide a complete framing system.

B. Design Requirements: Provide completed framing system having the following characteristics:
   1. Design: Calculate structural characteristics of cold-formed steel framing members according to AISI S100-12.
   2. Design Loads: As indicated on the drawings.

C. Deliver to site in largest practical sections.

2.03 FRAMING MATERIALS

A. Studs and Track: ASTM C955; structural studs formed to channel shape with punched web; U-shaped track in matching nominal width and compatible height.

B. Sub-framing Girts: Fabricated from ASTM A653/A653M steel sheet, with G90/Z275 hot dipped galvanzied coating.
   1. "Z" or "C"-shaped, percision-roll-formed, in different gages to meet specified loading conditions.
   2. Gage and Dpeth: As required to meet specified performance level, as recommended by metal panel manufacturer and as shown on drawings. Provide size and gage for attachment of metal wall panels, coordinate with all trades for placement of fastening requirements per applicable codes.
   3. Fastners: Self-tapping screws with weathertight resilient washers and other acceptable fastners approved by Architect.

C. Framing Connectors: Factory-made, formed steel sheet.
   1. Material: ASTM A653/A653M SS Grade 33 and 40 (minimum), with G90/Z275 galvanized coating for base metal thickness less than 10 gage (0.118 inch) (3 mm), and factory punched holes and slots.
   2. Structural Performance: Maintain load and movement capacity required by applicable code, when evaluated in accordance with AISI North American Specification for the Design of Cold Formed Steel Structural Members.
   3. Fixed Connections: Provide non-movement connections for tie-down to foundation, floor-to-floor tie-down, roof-to-wall tie-down, joist hangers, gusset plates, and stiffeners.

2.04 ACCESSORIES

A. Bracing, Furring, Bridging: Formed sheet steel, match stud thickness unless noted on drawings; finish to match framing components.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.

B. Verify field measurements and adjust installation as required.

3.02 INSTALLATION OF STUDS

A. Install components in accordance with manufacturers' instructions and ASTM C1007 requirements.

B. Align floor and ceiling tracks; locate to wall layout. Secure in place with fasteners at maximum 24 inches (600 mm) on center, unless otherwise noted on drawings. Coordinate installation of sealant with floor and ceiling tracks.

C. Construct corners using minimum of three studs. Install double studs at wall openings, door and window jambs, unless otherwise noted on drawings.

D. Install load bearing studs full length in one piece. Splicing of studs is not permitted.

E. Install load bearing studs, brace, and reinforce to develop full strength and achieve design requirements.

F. Install intermediate studs above and below openings to align with wall stud spacing.

G. Attach cross studs to studs for attachment of fixtures anchored to walls.

H. Install framing between studs for attachment of mechanical and electrical items, and to prevent stud rotation.

I. Touch-up field welds and damaged galvanized surfaces with primer.

3.03 INSTALLATION OF JOISTS, PURLINS, AND RAFTERS

A. Install framing components in accordance with manufacturer's instructions.

B. Make provisions for erection stresses. Provide temporary alignment and bracing, and permanent bridging and bracing as indicated or as recommended by manufacturer

END OF SECTION

SECTION 055000
METAL FABRICATIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Shop fabricated steel items.

B. Steel Railings.

C. Downspout Boots

1.02 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Placement of metal fabrications in concrete.

B. Section 042000 - Unit Masonry: Placement of metal fabrications in masonry.

C. Section 051200 - Structural Steel Framing: Structural steel column anchor bolts.

D. Section 052100 - Steel Joist Framing: Structural joist bearing plates, including anchorage.

E. Section 053100 - Steel Decking: Bearing plates for metal deck bearing, including anchorage.

F. Section 055100 - Metal Stairs.

G. Section 099113 - Exterior Painting: Paint finish.

H. Section 099123 - Interior Painting: Paint finish.

1.03 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

B. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2012.

C. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2024.

D. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.

E. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2013.

F. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2021.

G. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2013.

H. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 2014.

I. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

J. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2023.

K. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2020.

L. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2025.

M. SSPC-SP 2 - Hand Tool Cleaning; 1982 (Ed. 2004).

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.
   1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.

C. Welders' Certificates: Submit certification for welders employed on the project, verifying AWS qualification within the previous 12 months.

1.05 QUALITY ASSURANCE

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

B. Welding: Qualify procedures and personnel according to the following:
   1. AWS D1.1, "Structural Welding Code--Steel."

1.06 PROJECT CONDITIONS

A. Field Measurements: Where metal fabrications are indicated to fit walls and other construction, verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
   1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating metal fabrications without field measurements. Coordinate construction to ensure that actual dimensions correspond to established dimensions. Allow for trimming and fitting.

1.07 COORDINATION

A. Coordinate installation of anchorages for metal fabrications. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

PART 2 PRODUCTS

2.01 MATERIALS - STEEL

A. Steel Sections: ASTM A 36/A 36M.

B. Steel Tubing: ASTM A501/A501M hot-formed structural tubing.

C. Plates: ASTM A283/A283M.

D. Pipe: ASTM A 53/A 53M Grade B Schedule 40, black finish.

E. Slotted Channel Framing: ASTM A653/A653M, Grade 33.

F. Slotted Channel Fittings: ASTM A1011/A1011M.

G. Fasteners:
   1. General: Provide Type 304 or 316 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 5, where built into exterior walls. Select fasteners for type, grade, and class required.
   2. Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with hex nuts, ASTM A 563 (ASTM A 563M); and, where indicated, flat washers.
   3. Anchor Bolts: ASTM F 1554, Grade 36.
   4. Machine Screws: ASME B18.6.3 (ASME B18.6.7M).
   5. Lag Bolts: ASME B18.2.1 (ASME B18.2.3.8M).
   6. Plain Washers: Round, carbon steel, ASME B18.22.1 (ASME B18.22M).
   7. Lock Washers: Helical, spring type, carbon steel, ASME B18.21.1 (ASME B18.21.2M).
   8. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to six times the load imposed when

installed in unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.

a. Material: Carbon-steel components zinc-plated to comply with ASTM B 633, Class Fe/Zn 5.
b. Subparagraph above and below are examples only. Above protects against corrosion in an indoor atmosphere. Revise to suit other conditions after verifying availability of thicker coatings.
c. Material: Alloy Group 1 or 2 stainless-steel bolts complying with ASTM F 593 (ASTM F 738M) and nuts complying with ASTM F 594 (ASTM F 836M).

9. Toggle Bolts: FS FF-B-588, tumble-wing type, class and style as needed.

H. Cast-in-Place Anchors in Concrete: Anchors of type indicated below, fabricated from corrosion-resistant materials capable of sustaining, without failure, the load imposed within a safety factor of 4, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.

1. Threaded or wedge type; galvanized ferrous castings, either ASTM A 47 (ASTM A 47M) malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, hot-dip galvanized per ASTM A 153/A 153M.

I. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

2.02 FABRICATION

A. Fit and shop assemble items in largest practical sections, for delivery to site.

B. Fabricate items with joints tightly fitted and secured.

C. Continuously seal joined members by continuous welds.

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

E. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.

F. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.03 FABRICATED ITEMS

A. Bumper Posts and Guard Rails: As detailed; prime paint finish.

B. Ledge Angles, Shelf Angles, Channels, and Plates Not Attached to Structural Framing: For support of metal decking; prime paint finish.

C. Lintels: As detailed; prime paint finish.

2.04 STEEL RAILING COMPONENTS

A. Safety Railing: Equal to CAI Safety Systems, Fixed Top Floor Mounted, Removable Guardrails and 60" Split Self-Closing Safety Gate.

1. Meets and exceeds OSHA regulations for fall protection. Tested and independently certified to be in accordance with OSHA fall protection for guardrail regulations.
2. Finish: Manufacturer's standard factory applied powder coat finish.
3. Color: To be selected by Architect from manufacturer's standard range.

2.05 GROUT

A. Nonshrink, Metallic Grout: Factory-packaged, ferrous-aggregate grout complying with ASTM C 1107, specifically recommended by manufacturer for heavy-duty loading applications.

B. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.06 FINISHES - STEEL

A. Prime paint steel items.

B. Prepare surfaces to be primed in accordance with SSPC-SP2.

C. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

D. Prime Painting: One coat.

E. Galvanizing of Structural Steel Members: Galvanize after fabrication to ASTM A123/A123M requirements.

F. Galvanizing of Non-structural Items: Galvanize after fabrication to ASTM A123/A123M requirements.

2.07 FABRICATION TOLERANCES

A. Squareness: 1/8 inch (3 mm) maximum difference in diagonal measurements.

B. Maximum Offset Between Faces: 1/16 inch (1.5 mm).

C. Maximum Misalignment of Adjacent Members: 1/16 inch (1.5 mm).

D. Maximum Bow: 1/8 inch (3 mm) in 48 inches (1.2 m).

E. Maximum Deviation From Plane: 1/16 inch (1.5 mm) in 48 inches (1.2 m).

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.

B. Supply setting templates to the appropriate entities for steel items required to be cast into concrete or embedded in masonry.

3.03 INSTALLATION

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

B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

C. Perform field welding in accordance with AWS D1.1/D1.1M.

D. Obtain approval prior to site cutting or making adjustments not scheduled.

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

F. Install premanufactured items per manufacturer's written recommendations with Architect's written approval.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch (6 mm) per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch (6 mm).

C. Maximum Out-of-Position: 1/4 inch (6 mm).

END OF SECTION

SECTION 061000
ROUGH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Concealed blocking for miscellaneous items.

B. Wall and Roof Sheathing.

C. Shear wall panels

D. Roof-mounted curbs.

E. Preservative treated wood materials.

F. Miscellaneous framing and sheathing.

G. Communications and electrical room mounting boards.

H. Concealed wood blocking, nailers, and supports.

1.02 RELATED REQUIREMENTS

A. Section 016116 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 072726 - Fluid Applied Membrane Air Barriers

C. Section 076200 - Sheet Metal Flashing and Trim:

1.03 REFERENCE STANDARDS

A. ANSI A208.1 - American National Standard for Particleboard; 2022.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.

C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

D. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2025.

E. ASTM D2898 - Standard Practice for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing; 2010 (Reapproved 2024).

F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

G. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2024a.

H. AWPA U1 - Use Category System: User Specification for Treated Wood; 2025.

I. PS 1 - Structural Plywood; 2023.

J. PS 20 - American Softwood Lumber Standard; 2025.

K. SPIB (GR) - Standard Grading Rules; 2021.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide technical data on wood preservative materials and application instructions.

C. Samples: For rough carpentry members that will be exposed to view, submit two samples, 12by12 inch (.by. mm) in size illustrating wood grain, color, and general appearance.

D. Manufacturer's Certificate: Certify that wood products supplied for rough carpentry meet or exceed specified requirements.

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

1.05 DELIVERY, STORAGE, AND HANDLING

A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.

1.06 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

2.02 DIMENSION LUMBER FOR CONCEALED APPLICATIONS

A. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
   1. Boards: Standard or No. 3.

2.03 NON-STRUCTURAL LUMBER

A. 1 by 2 though 1 by 8 Board Lumber
   1. Moisture Content: S-dry (19 percent maximum).
   2. Sufacing: S1S2E
   3. Species: Southern Yellow, Presssure treated, kiln-dry after treatment
   4. Grade: No. 2
   5. Application: At locations shown on drawings.
   6. Finish: Stain, see Section 09 9113 Exterior Painting

2.04 CONSTRUCTION PANELS

A. Communications and Electrical Room Fire-Retardant Mounting Boards: PS 1 A-D plywood, or medium density fiberboard; 3/4 inch (19 mm) thick; flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84.

2.05 ACCESSORIES

A. Fasteners and Anchors:
   1. Metal and Finish: Hot-dipped galvanized steel complying with ASTM A153/A153M for high humidity and preservative-treated wood locations, unfinished steel elsewhere.

B. Die-Stamped Connectors: Hot dipped galvanized steel, sized to suit framing conditions.

2.06 FACTORY WOOD TREATMENT

A. Treated Lumber and Plywood: Comply with requirements of AWPA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.
   1. Preservative-Treated Wood: Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWPA standards.

B. Preservative Treatment:
   1. Manufacturers:
      a. Lonza Group; ____: www.wolmanizedwood.com/#sle.
      b. Viance, LLC; ____: www.treatedwood.com.
      c. Osmose, Inc: www.osmose.com.
   2. Preservative Pressure Treatment of Lumber Above Grade: AWPA U1, Use Category UC3B, Commodity Specification A using waterborne preservative.
      a. Kiln dry lumber after treatment to maximum moisture content of 19 percent.
      b. Treat lumber in contact with roofing, flashing, or waterproofing.
      c. Treat lumber in contact with masonry or concrete.

PART 3 EXECUTION

3.01 PREPARATION

A. Where wood framing bears on cementitious foundations, install full width sill flashing continuous over top of foundation, lap ends of flashing minimum of 4 inches (100 mm) and seal.

B. Coordinate installation of rough carpentry members specified in other sections.

3.02 INSTALLATION - GENERAL

A. Select material sizes to minimize waste.

B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.

C. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

3.03 BLOCKING, NAILERS, AND SUPPORTS

A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.

B. In framed assemblies that have concealed spaces, provide solid wood fireblocking as required by applicable local code, to close concealed draft openings between floors and between top story and roof/attic space; other material acceptable to code authorities may be used in lieu of solid wood blocking.

C. In metal stud walls, provide continuous blocking around door and window openings for anchorage of frames, securely attached to stud framing.

D. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.

E. Where ceiling-mounting is indicated, provide blocking and supplementary supports above ceiling, unless other method of support is explicitly indicated.

F. Specifically, provide the following non-structural concealed framing and blocking:
   1. Cabinets and shelf supports.
   2. Wall brackets.
   3. Handrails.
   4. Grab bars.
   5. Towel and bath accessories.
   6. Wall-mounted door stops.
   7. Chalkboards and marker boards.
   8. Wall paneling and trim.
   9. Joints of rigid wall coverings that occur between studs.
   10. Interior Wall Plaques
   11. Mirror attachment clips.
   12. Acoustical Wall Panels.
   13. Audio/Visual Equipment
   14. Electrical Equipment/Fixtures/Panels
   15. Mechanical
   16. Plumbing Equipment/Fixtures
   17. Vertical and Horizontal Wall Guards

3.04 ROOF-RELATED CARPENTRY

A. Coordinate installation of roofing carpentry with deck construction, framing of roof openings, and roofing assembly installation.

B. Provide wood curb at all roof openings except where specifically indicated otherwise. Form corners by alternating lapping side members.

3.05 INSTALLATION OF CONSTRUCTION PANELS

A. Communications and Electrical Room Mounting Boards: Secure with screws to studs with edges over firm bearing; space fasteners at maximum 24 inches (610 mm) on center on all edges and into studs in field of board.
   1. At fire-rated walls, install board over wall board indicated as part of the fire-rated assembly.
   2. Where boards are indicated as full floor-to-ceiling height, install with long edge of board parallel to studs.
   3. Install adjacent boards without gaps.
   4. Size and Location: As indicated on drawings.

3.06 TOLERANCES

A. Framing Members: 1/4 inch (6 mm) from true position, maximum.

B. Variation from Plane (Other than Floors): 1/4 inch in 10 feet (2 mm/m) maximum, and 1/4 inch in 30 feet (7 mm in 10 m) maximum.

3.07 CLEANING

A. Waste Disposal: Comply with the requirements of Section 017419 - Construction Waste Management and Disposal.
   1. Comply with applicable regulations.
   2. Do not burn scrap on project site.
   3. Do not burn scraps that have been pressure treated.
   4. Do not send materials treated with pentachlorophenol, CCA, or ACA to co-generation facilities or “waste-to-energy” facilities.

B. Do not leave any wood, shavings, sawdust, etc. on the ground or buried in fill.

C. Prevent sawdust and wood shavings from entering the storm drainage system.

END OF SECTION

SECTION 062000
FINISH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Finish carpentry items.

B. Specially fabricated bookshelving for transparent finish.

C. Wood moldings.

1.02 RELATED REQUIREMENTS

A. Section 061000 - Rough Carpentry: Support framing, grounds, and concealed blocking.

B. Section 099123 - Interior Painting: Painting of finish carpentry items.

1.03 REFERENCE STANDARDS

A. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).

B. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards; 2021, with Errata.

C. AWPA U1 - Use Category System: User Specification for Treated Wood; 2025.

D. PS 1 - Structural Plywood; 2023.

E. PS 20 - American Softwood Lumber Standard; 2025.

F. WDMA I.S. 4 - Industry Specification for Preservative Treatment for Millwork; 2024.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the work with plumbing rough-in, electrical rough-in, and installation of associated and adjacent components.

B. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Samples: Submit two samples of finish wood, 6 by 6 inch (__ mm) in size illustrating wood grain and specified finish.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver factory-fabricated units to project site in original packages, containers or bundles bearing brand name and identification.

B. Protect from moisture damage.

C. Handle materials and products to prevent damage to edges, ends, or surfaces.

PART 2 PRODUCTS

2.01 FINISH CARPENTRY ITEMS

A. Interior Woodwork Items:
   1. Wood Moulding Profiles:
      a. Profiles Designated by "MM" refer to Marshall Lumber Company's standard Molding Profiles. Montgomery AL. Equals are acceptable upon written approval by Architect.

2.02 BOOKSHELVING

A. Quality Grade: Unless otherwise indicated provide products of quality specified by AWI/AWMC/WI (AWS) for Custom Grade.

B. Wood Veneer Faced Cabinet:
   1. Exposed Surfaces: HPVA Grade A, White Oak, plain sliced, pleasing-matched.
   2. Semi-Exposed Surface: HPVA Grade B, White Oak, plain sliced, pleasing-matched.

3. Concealed Surfaces: HPVA Grade C, and face species, plain sliced, random-matched.

C. Face Frame: Grade FAS Clear, White Oak, maximum moisture content of 6 percent, with vertical wood grain.

D. Adjustable Shelving Loading: 50 lbs. per sq. ft.
1. Deflection: L/144

E. Hardwood Edgebanding: Use solid hardwood edgebanding matching species, color, grain, and grade for exposed portions of cabinetry.

2.03 FASTENINGS

A. Fasteners: Of size and type to suit application; chrome finish in concealed locations and chrome finish in exposed locations.

2.04 WOOD TREATMENT

A. Factory-Treated Lumber: Comply with requirements of AWPA U1 - Use Category System for pressure impregnated wood treatments determined by use categories, expected service conditions, and specific applications.

B. Redry wood after pressure treatment to maximum ____ percent moisture content.

2.05 FABRICATION

A. Shop assemble work for delivery to site, permitting passage through building openings.

B. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify adequacy of backing and support framing.

B. Verify mechanical, electrical, and building items affecting work of this section are placed and ready to receive this work.

3.02 INSTALLATION

A. Install custom fabrications in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade indicated.

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

C. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch (0.79 mm). Do not use additional overlay trim to conceal larger gaps.

3.03 PREPARATION FOR SITE FINISHING

A. Set exposed fasteners. Apply wood filler in exposed fastener indentations. Sand work smooth.

B. Before installation, prime paint surfaces of items or assemblies to be in contact with cementitious materials.

C. Site Finishing: See Section 09 9000 - Painting and Coating

3.04 TOLERANCES

A. Maximum Variation from True Position: 1/16 inch (1.6 mm).

B. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch (0.79 mm).

END OF SECTION

SECTION 070100
SPECIAL PROJECT ROOFING WARRANTY

PROJECT ROOFING CONTRACTOR'S ROOFING WARRANTY

NAME OF PROJECT: _____

PROJECT LOCATION:

OWNER: _____

ROOFING CONTRACTOR: _____

ADDRESS OF ROOFING CONTRACTOR: _____

Date of Acceptance :_____ Date of Expiration:_____

A. The Roofing Contractor does hereby certify that the roofing work included in this contract was installed in strict accordance with all requirements of the plans and specifications and in accordance with approved roofing manufacturers recommendations.

B. The Roofing Contractor does hereby guarantee the roofing and associated work including but not limited to parapet walls, all flashing and counter flashing both composition and metal; roof decking and/or sheathing; all material used as a roof substrate or insulation over which roof is applied; / or any other work on the surface of the roof; metal work; edge flashing and roof expansion joints to be absolutely water tight and free from all leaks, due to faulty or defective materials and workmanship for a period of five (5) years, starting on the date of substantial completion of the project. This guarantee does not extend to any deficiency which was caused by the failure of work which the contractor or his asigns did not damage or did not accomplish or was not charged to accomplish.

C. Subject to the terms and conditions listed below, the Roofing Contractor also guarantee that during the Guarantee Period he will, at his own cost and expense, make or cause to be made such repairs to, or replacements of said work, in accordance with the roofing manufacturers recommendations as are necessary to correct faulty and defective work and/or materials which may develop in the work including, but not limited to: Blisters, delamination, exposed felts, ridges, wrinkles, splits, warped insulation and/or loose flashing etc. in a manner pursuant to the total anticipated life of the roofing system and the best standards applicable to the particular roof type in value and in accordance with construction documents as are necessary to maintain said work in watertight conditions, and further, to respond on or within three (3) calendar days upon proper notification of leaks or defects by the Owner.

1. Specifically excluded from this Guarantee are damages to the work, other parts of the building and building contents caused by: (1) lightning, windstorm with wind speeds above specified IBC code requirements, hailstorm and other unusual phenomena of the elements: and (2) fire. When the work has been damaged by any of the foregoing causes, the Guarantee shall be null and void until such damage has been repaired by the Roofing Contractor and until the cost and expense thereof has been paid by the Owner or by the responsible party so designated.
2. During the Guarantee Period, if the Owner allows alteration of the work by anyone other the Roofing Contractor including cutting, patching and maintenance in connection with penetrations, and positioning of anything on the roof, this Guarantee shall become null and void upon the date of said alterations, only for that specific area of the roof. If the Owner engages the Roofing Contractor through the General Contractor to perform said alterations, the Guarantee shall not become null and void, unless the Roofing Contractor through the General Contractor, prior to proceeding with said work, shall have notified the Owner in writing, showing reasonable cause for claim that said alterations would likely damage or deteriorate the work, thereby reasonably justifying a termination of this Guarantee.

3. Nothing contained in this warranty modifies, nullifies, or changes any other specified Roofing Warranties.
4. Future building additions will not void this Guarantee, except for that portion of the future addition that might affect the work under this contract at the point of connection of the roof areas, and any damage caused by such addition. If this contract is for roofing of an addition to an existing building, then this guarantee covers the work involved at the point of connection with the existing roof.
5. During the Guarantee Period, if the original use of the roof is changed and it becomes used for, but was not originally specified for, a promenade, work deck, spray cooled surface, flooded basin, or other use of service more severe than originally specified, this Guarantee shall become null and void upon the date of said change.
6. The Owner shall promptly notify the Roofing Contractor through the General Contractor of observed, known or suspected leaks, defects or deterioration, and shall afford reasonable opportunity for the Roofing Contractor and General Contractor to inspect the work, and to examine the evidence of such leaks, defects or deterioration.

IN WITNESS THEREOF, this instrument has been duly executed this_____ day of the year_____.

_____ _____

Roofing Contractor's Authorized Signature

_____ _____

Typed Name and Title Typed Name and Title

_____

Notary Public

END OF SECTION

SECTION 070200
WATERPROOFING CONTRACTOR'S GUARANTEE

NAME OF PROJECT: _____

PROJECT LOCATION: _____

OWNER:

_____

WATERPROOFING CONTRACTOR:

_____

ADDRESS OF WATERPROOFING CONTRACTOR: _____

DATE OF ACCEPTANCE:

_____

DATE OF EXPIRATION: _____

A. The Waterproofing Contractor does hereby certify that the waterproofing work included under specification sections 07 1300 - Sheet Waterproofing, 07 2650 - Integrally Bonded Underslab Vapor Protection was installed in strict accordance with all requirements of the plans and specifications and in accordance with approved waterproofing manufacturer's recommendations.

B. The Waterproofing Contractor does hereby guarantee the waterproofing and associated work including but not limited to all vertical and horizontal waterproofing to be absolutely watertight and free from all leaks, due to faulty or defective materials and workmanship for a period of five (5) years, starting on the date of substantial completion of the project. This guarantee does not include liability for damage to interior contents by the failure of work which the waterproofing contractor did not damage or did not accomplish or was not charged to accomplish.

C. Subject to the terms and conditions listed below, the Waterproofing Contractor also guarantees that during the Guarantee Period he will, at his own cost and expense, make or cause to be made such repairs to, or replacements of said work, in accordance with the waterproofing manufacturers recommendations as are necessary to correct faulty and defective work and/or materials which may develop in the work in a manner pursuant to the total anticipated life of the waterproofing systems and the best standards applicable to the particular waterproofing type in value and in accordance with watertight conditions, and further, to respond on or within seven (7) calendar days upon proper notification or leaks or defects by the Owner or Architect.

1. During the Guarantee Period, if the Owner allows alteration of the work by anyone other than the Waterproofing Contractor including cutting, patching and maintenance in connection with penetrations of anything effecting the waterproofing, this Guarantee shall become null and void upon the date of said alterations.
2. Nothing contained in this warranty modifies, nullifies, or changes any other specified Waterproofing Warranties.
3. Future building additions will not void this Guarantee, except for that portion of the future addition that might affect the work under this contract at the point of connection of the waterproof areas, and any damage caused by such addition.
4. The Owner shall promptly notify the Waterproofing Contractor of observed, known or suspected leaks, defects or deterioration, and shall afford reasonable opportunity for the Waterproofing Contractor to inspect the work, and to examine the evidence of such leaks, defects or deterioration.

IN WITNESS THEREOF, this instrument has been duly executed this_____ day of the year_____.

_____ _____

Waterproofing Contractor's Authorized Signature

_____ _____

Typed Name and Title Typed Name and Title

Notary Public _____

END OF SECTION

SECTION 071300
SHEET WATERPROOFING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sheet membrane waterproofing system

1.02 RELATED REQUIREMENTS

A. The Contractor shall verify and be responsible for ensuring capatability of all waterproofing and weatherbarrier components inlcuding, but not limited to the related sections below. All components shall be furnished by the same manufacturer unless approved in writng.

B. Section 07 2500 - Weather Barriers.

C. Section 07 2650 - Underslab Vapor Protection.

D. Section 07 6500 - Wall Flashing.

E. Section 079200 - Joint Sealants: Sealing moving joints in waterproofed surfaces that are not required to be treated in this section.

1.03 REFERENCE STANDARDS

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data for membrane.

C. Certificate: Certify that products meet or exceed specified requirements.

D. Manufacturer's Installation Instructions: Indicate special procedures.

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

1.05 QUALITY ASSURANCE

A. Membrane Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

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

1.06 FIELD CONDITIONS

A. Maintain ambient temperatures above 40 degrees F (5 degrees C) for 24 hours before and during application and until liquid or mastic accessories have cured.

1.07 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Provide five year manufacturer warranty for waterproofing failing to resist penetration of water

PART 2 PRODUCTS

2.01 MATERIALS

A. Sheet Membrane Waterproofing System: Equal to Bituthene 3000 Membrane by Grace Construction Products; a self-adhesive, cold-applied composite sheet consisting of a thickness of 1.4 mm (0.056 in.) of rubberized asphalt and 0.1 mm (0.004 in.) of cross-laminated, high density polyethylene film. Provide rubberized asphalt membrane covered with a release sheet which is removed during installation. No special adhesive or heat shall be required to form laps.

2.02 PHYSICAL PROPERTIES FOR BITUTHENE 3000:

Property	Test Method	Typical Value
Color		Dark gray-black

Thickness	ASTM D 3767 Method A	1.5 mm (0.060 in.) nominal
Flexibility, 180, Bend over 25 mm (1 in.), mandrel at -43 C(-45 F)	ASTM D 1970	Unaffected
Tensile Strength, Membrane Die C Modified	ASTM D 412	2240 kN/m2 (325 lb/in.2) minimum
Tensile Strength, Film	ASTM D 882	34 500 kN/m2 (5 000 lb/in.2) minimum
Elongation, Ultimate Failure of Rubberized Asphalt	ASTM D 412	300% minimum
Crack Cycling -32?C (-25?F), 100 Cycles	ASTM C 836	Unaffected
Lap Adhesion at Minimum Application Temperature	ASTM D 1876	700 N/m (4 lb/in.) - Bituthene 3000 880 N/m (5 lb/in.) - Low Temp
Peel Strength	ASTM D 903	1576 N/m (9 lb/in.)
Puncture Resistance, Membrane	ASTM E 154	222 N (50 lb) minimum
Resistance to Hydrostatic Head	ASTM D 5385	60 m (200 ft) of water
Exposure to Fungi in Soil, 16 weeks	GSA-PBS 07115	Unaffected
Permeance	ASTM E 96 Method B	2.9 ng/m2sPa (0.05 perms) maximum
Water Absorption	ASTM D 570	0.1% maximum

2.03 ACCESSORIES

A. Provide all products to include but limited to (primers,tape, liquid membranes as required for a complete systems for manufacturers 5 year warranty.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions are acceptable prior to starting this work.

B. Verify items that penetrate surfaces to receive waterproofing are securely installed.

3.02 PREPARATION

A. Protect adjacent surfaces from damage not designated to receive waterproofing.

B. Clean and prepare surfaces to receive waterproofing in accordance with manufacturer's instructions; vacuum substrate clean.

C. Do not apply waterproofing to surfaces unacceptable to membrane manufacturer.

D. Surfaces for Adhesive Bonding: Apply surface conditioner at a rate recommended by manufacturer, and protect conditioner from rain or frost until dry.

3.03 INSTALLATION - MEMBRANE

A. Install membrane waterproofing in strict accordance with manufacturer's instructions and warranty requirements.

B. Roll out membrane, and minimize wrinkles and bubbles.

C. Self-Adhering Membrane: Remove release paper layer, and roll out onto substrate with a mechanical roller to provide full contact bond.

D. Overlap edges and ends, minimum 3 inches (76 mm), seal permanently waterproof by method recommended by manufacturer, and apply uniform bead of sealant to joint edge.

E. Reinforce membrane with multiple thickness of membrane material over joints, whether joints are static or dynamic.

F. Weather lap joints on sloped substrate in direction of drainage, and seal joints and seams.

G. Flexible Flashings: Seal items watertight that penetrate through waterproofing membrane with flexible flashings.

H. Seal membrane and flashings to adjoining surfaces. Install counterflashing over all exposed edges.

3.04 PROTECTION

A. Per Manufacturers recommendations

B. Do not permit traffic over unprotected or uncovered membrane.

END OF SECTION

SECTION 072100
THERMAL INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Board insulation cavity wall construction and where indicated on drawings.

B. Batt insulation in exterior wall and as shown construction.

C. Sound batt insulation for filling interior metal stud walls from floor to structure above.

1.02 RELATED REQUIREMENTS

A. Section 016116 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 054000 - Cold-Formed Metal Framing: Board insulation as wall sheathing.

C. Section 061000 - Rough Carpentry: Supporting construction for batt insulation.

D. Section 07 2500 - Weather Barriers

E. Section 07 4113 - Metal Roof Panels

F. Section 09 2116 - Gypsum Board Assemblies:

1.03 REFERENCE STANDARDS

A. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2024.

B. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2023.

C. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation; 2014 (Reapproved 2019).

D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

E. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2024a.

F. ASTM E136 - Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750 Degrees C; 2024c.

G. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials; National Fire Protection Association; 2006.

H. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible Components; 2025.

I. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 3001 - Submittals

B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.

C. Manufacturer's Installation Instructions: Include information on special environmental conditions required for installation and installation techniques.

1.05 FIELD CONDITIONS

A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

PART 2 PRODUCTS

2.01 APPLICATIONS

A. Insulation Inside Exterior Masonry Cavity Walls: Extruded polystyrene board.

B. Insulation in Interior Metal Framed Walls: Batt insulation with no vapor retarder.

C. Refer to Wall Type Plan.

2.02 FOAM BOARD INSULATION MATERIALS

A. Extruded Polystyrene Board Insulation: ASTM C 578, Type IV; Minimum 25psi extruded polystyrene board with either natural skin or cut cell surfaces; with the following characteristics:
   1. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
   2. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
   3. Board Size as required to coordinate with sepcified masonry anchor spacings.
   4. Board Thickness as required to provide minimum R Value of 7.5 (continuous). 1 1/2" board thickness.
   5. Board Edges: Square.
   6. Manufacturers:
      a. Owens Corning Corporation; FOAMULAR Extruded Polystyrene (XPS) Insulation: www.ocbuildingspec.com/#sle.

B. Polyisocyanurate (ISO) Board Insulation with Facers Both Sides: Rigid cellular foam,complying with ASTM C1289.
   1. Classifications:
      a. Type II:
         1) Class 1 - Faced with glass fiber reinforced cellulosic felt facers on both major surfaces of core foam.
         2) Compressive Strength: Classes 1-2-3, Grade 1 - 16 psi (110 kPa), minimum.
         3) Thermal Resistance, R-value (RSI-value): At 1-1/2 inch (38.1 mm) thick; Class1, Grades 1-2-3 - 8.4 (1.48) at 75 degrees F (24 degrees C).
   2. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
   3. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
   4. Board Thickness: 2.2 inch (____ mm).
   5. Manufacturers:
      a. Atlas Roofing Corporation; ACFoam-II Polyiso Roof Insulation: www.atlasroofing.com/#sle.
   6. 6. Substitutions: See Section 01 6000 - Product Requirements.

2.03 BATT INSULATION MATERIALS

A. Glass Fiber Batt Insulation: Flexible preformed batt or blanket, complying with ASTM C 665; Type 1, friction fit.
   1. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
   2. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.
   3. Combustibility: Non-combustible, when tested in accordance with ASTM E136, except for facing, if any.
   4. Formaldehyde Content: Zero.
   5. Thermal Resistance: R-value (RSI-value) of ____ (____). Exterior walls minimum R-19 .
   6. Facing: Unfaced.
   7. Provide in all interior metal stud walls continuous from floor to roof deck structure above unless specifically noted otherwise to provide insulated envelope for sound isolation.
   8. Provide in thicknesses as required to fill stud widths.
   9. Refer to 09 5100 for above ceiling insulation.
   10. Manufacturers:
      a. CertainTeed Corporation; _____: www.certainteed.com/#sle.
      b. Johns Manville; _____: www.jm.com/#sle.

2.04 ACCESSORIES

A. Wire Ties:
   1. Provide wire ties as required to hold sound batt insulation in place where gypsum wall board or other materials are not present on both sides of wall assembly.

2. Provide poultry wire netting as required to hold batt insulation in roof cavity where specified.

B. Insulation Fasteners: Impaling clip of galvanized steel with washer retainer and clips, to be adhered to surface to receive insulation, length to suit insulation thickness and substrate, capable of securely and rigidly fastening insulation in place.

C. Insulation Fasteners: Appropriate for purpose intended and approved by roofing manufacturer.
1. Length as required for thickness of insulation material and penetration of deck substrate.

D. Adhesive: Type recommended by insulation manufacturer for application.

PART 3 EXECUTION

3.01 EXAMINATION

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

B. Verify substrate surfaces are flat, free of materials or substances that may impede adhesive bond.

3.02 BOARD INSTALLATION AT CAVITY WALLS

A. Secure impale fasteners to substrate at required by the manufacturer.

B. Install boards to fit snugly between rain screen clips.

C. Install boards horizontally on walls.
1. Install in running bond pattern.
2. Butt edges and ends tightly to adjacent boards and to protrusions.

D. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

E. Coordinate work of this section with construction of air barrier seal specified in Section 07 2500.
1. Coordinate as required to ensure air barrier is installed continuously on top of sheathing prior to installation of masonry anchors, clips, and fasteners. After installation fasteners, re-install air barrier on top of anchors as required to seal penetrations in air barrier. After installation of air barrier on fasteners, install rigid insulation as required in this specification section. Coordinate with section 07 2500.

3.03 BATT INSTALLATION

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

B. Install in exterior wall spaces without gaps or voids. Do not compress insulation.

C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.

D. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.

3.04 PROTECTION

A. Do not permit installed insulation to be damaged prior to its concealment.

END OF SECTION

SECTION 072400
EXTERIOR INSULATION AND FINISH SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Composite wall cladding of rigid insulation and reinforced finish coating ("Class PB")

1.02 RELATED REQUIREMENTS

A. Section 054000 - Cold-Formed Metal Framing: Sheathing on metal studs.

B. Section 061000 - Rough Carpentry: Wood Sheathing on wood framing.

C. Section 076200 - Sheet Metal Flashing and Trim: Perimeter flashings.

D. Section 079005 - Joint Sealers: Perimeter and penetration sealants.

1.03 REFERENCE STANDARDS

A. ASTM B117 - Standard Practice for Operating Salt Spray (Fog) Apparatus; 2019.

B. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2023.

C. ASTM C1397 - Standard Practice for Application of Class PB Exterior Insulation and Finish Systems (EIFS) and EIFS with Drainage; 2025.

D. ASTM D226/D226M - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing; 2025.

E. ASTM D968 - Standard Test Methods for Abrasion Resistance of Organic Coatings by Falling Abrasive; 2025.

F. ASTM D2247 - Standard Practice for Testing Water Resistance of Coatings in 100 % Relative Humidity; 2025.

G. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2021.

H. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

I. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000 (Reapproved 2023).

J. ASTM E1677 - Standard Specification for Air Barrier (AB) Material or Assemblies for Low-Rise Framed Building Walls; 2023.

K. ASTM E2273 - Standard Test Method for Determining the Drainage Efficiency of Exterior Insulation and Finish Systems (EIFS) Clad Wall Assemblies; 2025.

L. ASTM E2486/E2486M - Standard Test Method for Impact Resistance of Class PB and PI Exterior Insulation and Finish Systems (EIFS); 2022.

M. ASTM G153 - Standard Practice for Operating Enclosed Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials; 2013 (Reapproved 2021).

N. ASTM G155 - Standard Practice for Operating Xenon Arc Lamp Apparatus for Exposure of Materials; 2021.

O. ICC-ES AC219 - Acceptance Criteria for Exterior Insulation and Finish Systems; 2009, with Editorial Revision (2022).

P. NFPA 259 - Standard Test Method for Potential Heat of Building Materials; 2023, with Errata.

Q. NFPA 268 - Standard Test Method for Determining Ignitability of Exterior Wall Assemblies Using a Radiant Heat Energy Source; 2022.

R. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible Components; 2025.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate wall joint patterns, joint details, and molding profiles.

C. Product Data: Provide data on system materials, product characteristics, performance criteria, and system limitations.

D. Verification Samples: Submit actual samples of selected coating on specified substrate, minimum 12 inches (300 mm) square Illustrating project colors and textures.

E. Manufacturer's Installation Instructions: Indicate preparation required, installation techniques, and jointing requirements.

F. Provide written acceptance of EIFS substrate as specified in Section 06 1000 Rough Carpentry under wall sheathing.

1.05 QUALITY ASSURANCE

A. Maintain copy of specified installation standard and manufacturer's installation instructions at project site during installation.

B. EIFS Manufacturer Qualifications: Provide EIFS products other than insulation from the same manufacturer with qualifications as follows:
   1. Member in good standing of EIMA (EIFS Industry Members Association).
   2. Manufacturer of EIFS products for not less than 5 years.

C. Insulation Manufacturer Qualifications: Approved by manufacturer of EIFS and approved and labeled under third party quality program as required by applicable building code.

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

1.06 MOCK-UP

A. Refer to Section 01 4000 - Quality Requirements. and Section 01 1000 - Summary.

B. Prepare mock up of wall section.

C. Prepare mock up of cornices, banding, facade detailing and mock up sample 6 ft. by 4 ft. Detailing provided by single source or by others.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver materials to project site in manufacturer's original, unopened containers with labels intact. Inspect materials and notify manufacturer of any discrepancies.

B. Storage: Store materials as directed by manufacturer's written instructions.
   1. Protect Portland cement based materials from moisture and humidity. Store under cover off the ground in a dry location.
   2. Protect insulation materials from exposure to sunlight.

1.08 FIELD CONDITIONS

A. Do not prepare materials or apply EIFS under conditions other than those described in the manufacturer's written instructions.

B. Do not prepare materials or apply EIFS during inclement weather unless areas of installation are protected. Protect installed EIFS areas from inclement weather until dry.

C. Do not install coatings or sealants when ambient temperature is below 40 degrees F (5 degrees C).

D. Do not leave installed insulation board exposed to sunlight for extended periods of time.

1.09 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Provide manufacturer's standard material warranty, covering a period of not less than 10 years.

C. Provide separate warranty from installer covering labor for repairs or replacement for a period of not less than 10 years.

D. Note in all warranties acceptance of substrate. Installation of EIFS indicates acceptance of substrates for all specified warranties.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Other Acceptable Manufacturers:
   1. Basis of Design: Dryvit Systems, Inc; Dryvit Outsulation Exterior Insulation and Finish System, Class PB; www.dryvit.com/#sle.
   2. Parex USA, Inc.: www.parex.com.
   3. BASF Wall Systems (Senergy, Finestone, Acrocrete, SonoWall): www.wallsystems.basf.com.
   4. Sto Corp: www.stocorp.com.
   5. Substitutions: See Section 016000 - Product Requirements.

2.02 EXTERIOR INSULATION AND FINISH SYSTEM

A. Exterior Insulation and Finish System: BARRIER type; reinforced finish coating on insulation board adhesive-applied direct to substrate; provide a complete system that has been tested to show compliance with the following characteristics; include all components of specified system and substrate in tested samples.

B. Allowable Wind Loading: At least 81 MPH, positive and negative, determined in accordance with ICC-ES AC219 or ICC-ES AC235 using factor of safety of 3.0.

C. Fire Characteristics:
   1. Flammability: Pass, when tested in accordance with NFPA 285.
   2. Ignitibility: No sustained flaming when tested in accordance with NFPA 268.
   3. Potential Heat of Foam Plastic Insulation Tested Independently of Assembly: No portion of the assembly having potential heat that exceeds that of the insulation sample tested for flammability (above), when tested in accordance with NFPA 259 with results expressed in Btu per square foot (mJ/sq m).

D. Water Penetration Resistance: No water penetration beyond the plane of the base coat/insulation board interface after 15 minutes, when tested in accordance with ASTM E331 at 6.24 psf (299 Pa) differential pressure with tracer dye in the water spray; include in tested sample at least two vertical joints and one horizontal joint of same type to be used in construction; disassemble sample if necessary to determine extent of water penetration.

E. Salt Spray Resistance: No cracking, checking, crazing, erosion, blistering, peeling, delamination, or corrosion of finish coating after 300 hours exposure in accordance with ASTM B117, using at least three samples matching intended assembly, at least 4 by 6 inches (100 by 150 mm) in size.

F. Freeze-Thaw Resistance: No cracking, checking, crazing, erosion, blistering, peeling, delamination, or corrosion of finish coating when viewed under 5x magnification after 10 cycles, when tested in accordance with ICC-ES AC 219 or 235. ASTM E 2485, ASTM C 67 Modified.

G. Weathering Resistance: No cracking, checking, crazing, erosion, blistering, peeling, delamination, or corrosion of finish coating when viewed under 5x magnification after 2000 hours of accelerated weathering conducted in accordance with ASTM G153 Cycle 1 or ASTM G155 Cycle 1, 5, or 9.

H. Water Degradation Resistance: No cracking, checking, crazing, erosion, blistering, peeling, delamination, or corrosion of finish coating after 14 days exposure, when tested in accordance with ASTM D2247.

I. Mildew Resistance: No growth supported on finish coating during 28 day exposure period, when tested in accordance with ASTM D3273.

J. Abrasion Resistance Of Finish: No cracking, checking or loss of film integrity when tested in accordance with ASTM D968 with 113.5 gallons (500 liters) of sand.

K. Impact Resistance: Construct system to provide the following impact resistance without exposure of broken reinforcing mesh, when tested in accordance with ASTM E2486/E2486M:
   1. Standard: 25 to 49 in-lb (2.83 to 5.54 J), for areas not indicated as requiring higher impact resistance.
   2. Panzer 15 or equal (50-89 in.-lb.) where noted in paragraph 2.03 C.

2.03 MATERIALS

A. Finish Coating Top Coat: Water-based, air curing, polymer-based finish with integral color and texture.
   1. Texture: Fine
   2. Color: Factory mixed, integrally colored finish coating as selected by Architect from manufacturer's full range. Proceed with color only after written acceptance of owner and by Architect of mock up sample (minimum size of 6 ft. by 4 ft). See paragraph 1.04.

B. Base Coat: Fiber-reinforced, compatable with all materials and as required for warranty requirements. Product shall be compatible with insulation board and reinforcing mesh.

C. Reinforcing Mesh: Balanced, open weave glass fiber fabric, treated for compatibility and improved bond with coating, weight, strength, and number of layers as required to meet required system impact rating. For surfaces below 8 feet above grade provide a secondary impact resistant mesh and base coats as required by manufacturer.

D. Insulation Board: Molded, expanded polystyrene board; ASTM C 578, Type I; with the following characteristics:
   1. Board Size: 24 by 48 inches (610 by 1220 mm).
   2. Board Size Tolerance: Plus/minus 1/16 inch (1.5 mm) from square and dimension.
   3. Board Thickness: As indicated on drawing. (Minimum thickness per manufacturers requirements)
   4. Thickness Tolerance: Plus/minus 1/16 inch (1.5 mm) maximum.
   5. Board Edges: Square.
   6. Thermal Resistance (R factor per 1 inch (25.4 mm)) at 75 degrees F (24 degrees C): 4.20 (0.74).
   7. Board Density: 1.15 lb/cu ft (18 kg/cu m).
   8. Compressive Resistance: 10 psi (69 kPa).
   9. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
   10. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.
   11. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/450, when tested in accordance with ASTM E84.
   12. Refer to drawings for additional requirements and special shapes.

2.04 ACCESSORY MATERIALS

A. Insulation Adhesive: Type required by EIFS manufacturer for project substrate and project warranties.

B. Trim: EIFS manufacturer's standard galvanized steel trim accessories, as required for a complete project and including starter track and drainage accessories.

C. Sealant Materials: Compatible with EIFS materials and as recommended by EIFS manufacturer.

D. Flashing Tape:
   1. 30-mil thick, self-sealing, self-healing composite membrane of polyester fabric and rubberized asphalt.
   2. Flashing Primer: Water-based primer for use prior to application flashing tape open all acceptable surfaces.
   3. Ensure compatibility with EIFS system.

PART 3 EXECUTION

3.01 GENERAL

A. Install in accordance with EIFS manufacturer's instructions and ASTM C1397.

B. Where different requirements appear in either document, comply with the most stringent.

C. Neither of these documents supercedes the provisions of the Contract Documents that define the contractual relationships between the parties or the scope of work.

3.02 EXAMINATION

A. Verify that substrate is sound and free of oil, dirt, other surface contaminants, efflorescence, loose materials, or protrusions that could interfere with EIFS installation and is of a type and construction that is acceptable to EIFS manufacturer. Do not begin work until substrate and adjacent materials are complete and thoroughly dry.

B. Verify that substrate surface is flat, with no deviation greater than 1/4 in (6 mm) when tested with a 10 ft (3 m) straightedge.

3.03 INSTALLATION - INSULATION

A. Install in accordance with manufacturer's instructions for specified substrates.

B. Install back wrap reinforcing mesh at all openings and terminations that are not to be protected with trim.

C. On wall surfaces, install boards horizontally.

D. Place boards in a method to maximize tight joints. Stagger vertical joints and interlock at corners. Butt edges and ends tight to adjacent board and to protrusions. Achieve a continuous flush insulation surface, with no gaps in excess of 1/16 inch (1.6 mm).

E. Fill gaps greater than with strips or shims cut from the same insulation material.

F. Rasp irregularities off surface of installed insulation board.

G. Adhesive Attachment: Use method required by manufacturer to achieve drainage efficiency specified; do not close up drainage channels when placing insulation board.

H. Install expansion joints as recommended by manufacturer.

I. Install sealant joints at terminations into intersecting materials in strict accordance with manufacturer's instruction.

J. At horizontal sloped areas, provide all necessary materials and processes required to meet specified warranty requirements and manufacturers instructions.

3.04 INSTALLATION - CLASS PB FINISH

A. Base Coat: Apply in thickness as necessary to fully embed reinforcing mesh, wrinkle free, including back-wrap at terminations of EIFS. Install reinforcing fabric as recommended by EIFS manufacturer.
   1. Lap reinforcing mesh edges and ends a minimum of 2-1/2 inches (64 mm).
   2. Allow base coat to dry a minimum of 24 hours before next coating application.

B. Apply finish coat after base coat has dried not less than 24 hours, embed finish aggregate, and finish to a uniform texture and color.

C. Seal control and expansion joints within the field of exterior finish and insulation system, using procedures recommended by sealant and finish system manufacturers.

D. Apply sealant at finish perimeter and expansion joints in accordance with Section 079005.

3.05 CLEANING

A. Clean EIFS surfaces and work areas of foreign materials resulting from EIFS operations.

3.06 PROTECTION

A. Protect completed work from damage and soiling by subsequent work.

END OF SECTION

SECTION 072726
FLUID-APPLIED MEMBRANE AIR BARRIERS

PART 1 — GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes the following:
   1. Materials and installation methods for fluid-applied, vapor permeable air barrier membrane system located in the non-accessible part of the wall.
   2. Materials and installation methods to bridge and seal air leakage pathways in roof and foundation junctions, window and door openings, control and expansion joints, masonry ties, piping and other penetrations through the wall assembly.
   3. The following specification sections with products by GCP Applied Technologies are the Basis of Design:
      a.
      b. Section 07 2726 - Fluid Applied Membrane Air Barriers.
      c. Section 07 6526 - Self-Adhering Sheet Flashing.
   4. A single source manufacturer of all sections and associated products is required for approval.
   5. Proof of products being equal to the Basis of Design and being compatible with all sections/products shall be submitted to the architect prior to the bid. Approved products must be listed in an addendum.
   6. Refer to Specification Section 01 6000 Product Requirements for additional requirements.

B. Related Sections include the following:
   1. Section 03 3000 – Cast-In-Place Concrete.
   2. Section 04 2000 – Unit Masonry.
   3. Section 05 4000 – Gypsum Sheathing.
   4. Section 07 1300 – Sheet Waterproofing.
   5. Section 07 1325 – Self-Adhering Sheet Waterproofing.
   6. Section 07 6200 – Sheet Metal Flashing and Trim.
   7. Section 07 9200 – Joint Sealants.

1.03 DEFINITIONS

A. Air Barrier Assembly: The collection of air barrier materials and auxiliary materials applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall.

1.04 PERFORMANCE REQUIREMENTS

A. General: Air barrier shall be capable of performing as a continuous vapor-permeable air barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration. Air barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.

B. The building envelope shall be designed and constructed with a continuous air barrier to control air leakage into, or out of the conditioned space. An air barrier shall also be provided for interior partitions between conditioned space and space designed to maintain temperature or humidity levels which differ from those in the conditioned space by more than 50% of the difference between the conditioned space and design ambient conditions. The air barrier shall have the following characteristics:
   1. It must be continuous, with all joints made airtight.

2. It shall have an air permeability not to exceed 0.004 cfm/sq. ft. under a pressure differential of 0.3 in. water (1.57 psf) (equal to 0.02 L/s. x sq. m. @ 75 Pa), when tested in accordance with ASTM E2178.
3. It shall have an air permeability not to exceed 0.04 cfm/sq. ft. under a pressure differential of 0.3 in. water (1.57 psf) (equal to 0.2 L/s. x sq. m. @ 75 Pa), when tested in accordance with ASTM E2357.
4. It shall be capable of withstanding positive and negative combined design wind, fan and stack pressures on the envelope without damage or displacement, and shall transfer the load to the structure. It shall not displace adjacent materials under full load.
5. It shall be durable or maintainable.
6. The air barrier shall be joined in an airtight and flexible manner to the air barrier material of adjacent systems, allowing for the relative movement of systems due to thermal and moisture variations and creep. Connection shall be made between:
   a. Foundation and walls.
   b. Walls and windows or doors.
   c. Different wall systems.
   d. Wall and roof.
   e. Walls, floor and roof across construction, control and expansion joints.
   f. Walls, floors and roof to utility, pipe and duct penetrations.
7. All penetrations of the air barrier and paths of air infiltration/exfiltration shall be made airtight.

1.05 REFERENCES

A. The following standards and publications are applicable to the extent referenced in the text. The most recent version of these standards is implied unless otherwise stated.

B. American Society for Testing and Materials (ASTM):
   1. ASTM C1193 Guide for Use of Joint Sealants.
   2. ASTM D412 Standard Test Methods for Rubber Properties in Tension.
   3. ASTM D570 Test Method for Water Absorption of Plastics.
   4. ASTM D1004 Test Method for Initial Tear Resistance of Plastic Film and Sheeting.
   5. ASTM D1876 Test Method for Peel Resistance of Adhesives.
   6. ASTM D1938 Test Method for Tear Propagation Resistance of Plastic Film and Sheeting.
   7. ASTM D1970 Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used. as Steep Roofing Underlayment for Ice Dam Protection.
   8. ASTM D4258 Practice for Surface Cleaning Concrete for Coating.
   9. ASTM D4263 Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method.
   10. ASTM D4541 Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers.
   11. ASTM E96 Test Methods for Water Vapor Transmission of Materials.
   12. ASTM E154 Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover.
   13. ASTM E1186 Practice for Air Leakage Site Detection in Building Envelopes and Air Retarder Systems.
   14. ASTM E2178 Standard Test Method for Air Permeance of Building Materials.
   15. ASTM E2357 Standard Test Method for Determining Air Leakage of Air Barrier Assemblies.
   16. NPFA 285 Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components.

1.06 SUBMITTALS

A. Product Data: Include manufacturer's written instructions for evaluating, preparing, and treating substrate; technical data; and tested physical and performance properties of air barrier.

B. Shop Drawings: Show locations and extent of air barrier. Include details for substrate joints and cracks, counterflashing strip, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.
   1. Include details of interfaces with other materials that form part of air barrier.
   2. Include details of mockups.

C. Samples: Submit representative samples of the following for approval:
   1. Fluid-Applied membrane.
   2. Self-Adhered Transition Membrane.
   3. Self-Adhered Through Wall Flashing.

D. Product Certificates: For air barriers, certifying compatibility of air barrier and accessory materials with Project materials that connect to or that come in contact with the barrier; signed by product manufacturer.

E. Qualification Data: For Applicator.

F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for air barriers, submit certified test report showing compliance with requirements specified for ASTM E2178.

G. Warranty: Submit a sample warranty identifying the terms and conditions stated in Article 1.10, applicable in state of the project.

1.07 QUALITY ASSURANCE

A. Manufacturer: Air barrier systems shall be manufactured and marketed by a firm with a minimum of Five years experience in the production and sales of waterproofing and air barriers. Manufacturers proposed for use, but not named in these specifications shall submit evidence of ability to meet all requirements specified, and include a list of projects of similar design and complexity completed within the past five years.

B. Source Limitations: Obtain primary air-barrier material and through wall flashing through one source from a single manufacturer. Should project require a vapor permeable and a vapor impermeable air barrier on same project, obtain vapor-permeable and vapor impermeable air barrier and through wall flashing from one source from a single manufacturer.

C. Applicator Qualifications: A firm experienced in applying air barrier materials similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.

D. Mockups: Before beginning installation of air barrier, provide air barrier work for exterior wall assembly mockups, incorporating backup wall construction, external cladding, window, door frame and sill, insulation, and flashing to demonstrate surface preparation, crack and joint treatment, and sealing of gaps, terminations, and penetrations of air barrier membrane.

E. Coordinate construction of mockup to permit inspection by Owner's testing agency of air barrier before external insulation and cladding is installed.

F. If Architect determines mockups do not comply with requirements, reconstruct mockups and apply air barrier until mockups are approved.

G. Pre-Installation Conference: A pre-installation conference shall be held prior to commencement of field operations to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work. Preinstallation conference shall include the Contractor, installer, Architect, and system manufacturer's field representative. Agenda for meeting shall include but not be limited to the following:
   1. Review of submittals.
   2. Review of surface preparation, minimum curing period and installation procedures.
   3. Review of special details and flashings.
   4. Sequence of construction, responsibilities and schedule for subsequent operations.
   5. Review of mock-up requirements.
   6. Review of inspection, testing, protection and repair procedures.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials and products in labeled packages. Store and handle in strict compliance with manufacturer's instructions, recommendations and material safety data sheets. Protect from damage from sunlight, weather, excessive temperatures and construction operations. Remove damaged material from the site and dispose of in accordance with applicable regulations.

B. Do not double-stack pallets of fluid applied membrane components on the job site. Provide cover on top and all sides, allowing for adequate ventilation.

C. Protect fluid-applied membrane components from freezing and extreme heat.

D. Sequence deliveries to avoid delays, but minimize on-site storage.

1.09 PROJECT CONDITIONS

A. Environmental Limitations: Apply air barrier within the range of ambient and substrate temperatures recommended by air barrier manufacturer. Protect substrates from environmental conditions that affect performance of air barrier. Do not apply air barrier to a wet substrate or during snow, rain, fog, or mist.

1.10 WARRANTIES

A. Submit manufacturer's warranty that air barrier and accessories are free of defects at time of delivery and are manufactured to meet manufacturer's published physical properties and material specifications.

B. Warranty Period: Ten years from date of completion of the air barrier membrane installation.

C. Project Waterproof Warranty: Provide ten (10) year warranty signed by Waterproofing Contractor and General Contractor.

PART 2 — PRODUCTS

2.01 FLUID-APPLIED, VAPOR PERMEABLE MEMBRANE AIR BARRIER

A. FLUID-APPLIED AIR BARRIER MEMBRANE: Basis of Design: Perm-A-Barrier® VPL, as manufactured by GCP Applied Technologies, 62 Whittemore Avenue, Cambridge, MA; a fluid-applied, vapor permeable, acrylic membrane that cures to form a resilient, monolithic, fully bonded elastomeric membrane when applied to construction surfaces. The membrane provides superior protection against the damaging effects of air and liquid water ingress on the building structures. Product shall meet the following requirements:

B. Membrane Air Permeance: ASTM E2178: Not to exceed 0.004 cfm/sq. ft. under a pressure differential of 0.3 in. water (1.57 psf) (equal to 0.02 L/s. x sq. m. @ 75 Pa).

C. Assembly Air Permeance: Provide a continuous air barrier assembly that has an air leakage not to exceed 0.04 cfm/sq. ft. of surface area under a pressure differential of 0.3 in. water (1.57 psf) (equal to 0.2 L/s. x sq. m. of surface area at 75 Pa) when tested in accordance with ASTM E2357.

D. Water Vapor Permeance: ASTM E96, Method B: Greater then 10 perms.

E. Pull Adhesion: ASTM D4541: Minimum 20 psi or substrate failure to glass faced wall board, minimum 100 psi to concrete/CMU.

F. Low Temperature Flexibility: ASTM D1970: Pass at minus 20 degrees Fahrenheit (at minus 29 degrees Celsius).

G. Water Resistance of In-Place Membrane: ASTM E331: Pass. No water penetration after 90 minutes @ 299 Pa (6.24 psf) tested over OSB and gypsum sheathing.

H. Nail Sealability: ASTM D1970: Pass UV Exposure Limit: Equal to or greater than 180 calendar days.

I. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.

J. IBC requires exterior walls on Type I-IV construction containing foam plastic insulation to meet NFPA 285 since the 2000 version. IBC 2012 also requires exterior walls that are greater than 40 feet and containing combustible Water Resistive Barrier to meet NFPA 285.

2.02 TRANSITION MEMBRANE

A. Perm-A-Barrier Detail Membrane manufactured by GCP Applied Technologies; a 0.9 mm (36 mils) of self-adhesive rubberized asphalt integrally bonded to 0.1 mm (4 mil) of cross-laminated, high-density polyethylene film to provide a min. 1.0 mm (40 mil) thick membrane. Membrane shall be interleaved with disposable silicone-coated release paper until installed, conforming with the following:
   1. Water Vapor Transmission: ASTM E96, Method B: 0.05 perms (2.9 ng/Pa s. sq. m.) maximum
   2. Air Permeance at 75 Pa (0.3 in. water) pressure difference: 0.0006 L/s. sq. m (0.00012 cfm/ sq. ft.) maximum
   3. Puncture Resistance: ASTM E154: 178 N (40 lbs.) minimum
   4. Lap Adhesion at minus 4 degrees Celsius (25 degrees Fahrenheit): ASTM D1876: 880 N/m (5.0 lbs./in.) of width
   5. Low Temperature Flexibility: ASTM D1970: Unaffected to minus 43 degrees Celsius (minus 45 degrees Fahrenheit)
   6. Tensile Strength: ASTM D412, Die C Modified: minimum 2.7 MPa (400 psi)
   7. Elongation, Ultimate Failure of Rubberized Asphalt: ASTM D412, Die C: minimum 200%

2.03 FLEXIBLE MEMBRANE WALL FLASHING

A. Perm-A-Barrier Wall Flashing manufactured by GCP Applied Technologies; a 0.8 mm (32 mils) of self-adhesive rubberized asphalt integrally bonded to 0.2 mm (8 mil) of cross-laminated, high-density polyethylene film to provide a min. 1.0 mm (40 mil) thick membrane. Membrane shall be interleaved with disposable silicone-coated release paper until installed, conforming with the following:

B. Water Vapor Transmission: ASTM E96, Method B: 0.05 perms (2.9 ng/ Pa s. sq. m.) maximum.

C. Water Absorption: ASTM D570: max. 0.1% by weight.

D. Puncture Resistance: ASTM E154: 356 N (80 lbs.) minimum.

E. Tear Resistance:
   1. Initiation ASTM D1004: min. 58 N (13.0 lbs.) M.D.
   2. Propagation ASTM D1938: min. 40 N (9.0 lbs.) M.D.

F. Lap Adhesion at minus 4 degrees Celsius (25 degrees Fahrenheit): ASTM D1876: 880 N/m (5.0 lbs./in.) of width.

G. Low Temperature Flexibility: ASTM D1970: Unaffected to minus 43 degrees Celsius (minus 45 degrees Fahrenheit).

H. Tensile Strength: ASTM D412, Die C Modified: minimum 5.5 MPa (800 psi).

2.04 PRIMERS

A. Primer for Self-Adhered Transition Membrane and Flexible Membrane Wall Flashing: Perm-A-Barrier WB Primer manufactured by GCP Applied Technologies; a water-based primer which imparts an aggressive, high tack finish on the treated substrate.
   1. Flash Point: No flash to boiling point.
   2. VOC Content: Not to exceed 10 g/L.
   3. Application Temperature: minus 4 degrees Celsius (25 degrees Fahrenheit) and above.
   4. Freezing point (as packaged): minus 7 degrees Celsius (21 degrees Fahrenheit).

B. Primer for Self-Adhered Transition Membrane and Flexible Membrane Wall Flashing:: Perm-A-Barrier Primer Plus manufactured by GCP Applied Technologies; a water-based primer which imparts an aggressive, high tack finish on the treated substrate. Product shall have the following minimum physical properties:
   1. Color: Milky White (wet), Clear (dry).
   2. Weight: 8.25 lbs./gal.
   3. Solids Content (by weight): 53-57%

4. Solvent Type: Water.
5. VOC Content: Not to excess 1 g/L.
6. Application Temperature: 4 degrees Celsius (40 degrees Fahrenheit) and above.

2.05 PENETRATIONS & TERMINATION SEALANT

A. Liquid Membrane for Details and Terminations and Substrate Patching: Bituthene Liquid Membrane manufactured by GCP Applied Technologies; a two-part, elastomeric, trowel grade material designed for use with fluid-applied membranes, self-adhered membranes and tapes. 10 g/L maximum VOC content.

B. Sealant for Details, Final Terminations and Sheathing Joint Treatment: S100 Sealant manufactured by GCP Applied Technologies: a one-part, neutral curing, ultra low modulus material designed for use with fluid-applied membranes, self-adhered membrane and tapes. 98 g/L maximum VOC content.

PART 3 — EXECUTION

3.01 EXAMINATION

A. Verify that substrates and conditions are ready to accept the Work of this section. Notify [architect] in writing of any discrepancies. Commencement of the Work or any parts thereof shall mean acceptance of the prepared substrates.

B. All surfaces must be sound, dry, clean and free of oil, grease, dirt, excess mortar or other contaminants detrimental to the adhesion of the membranes. Fill voids, gaps and spalled areas in substrate to provide an even plane. Strike masonry joints full-flush.

C. Curing compounds or release agents used in concrete construction must be resin based without oil, wax or pigments.

3.02 SURFACE PREPARATION

A. Refer to manufacturer’s literature for requirements for preparation of substrates. Surfaces shall be sound and free of voids, spalled areas, loose aggregate and sharp protrusions. Remove contaminants such as grease, oil and wax from exposed surfaces. Remove dust, dirt, loose stone and debris. Use repair materials and methods that are acceptable to manufacturer of the fluid-applied air barrier assembly.

B. Exterior sheathing panels: Ensure that the boards are sufficiently stabilized with corners and edges fastened with appropriate screws. Pre-treat all board joints with 50 – 75 mm (2-3 in.) wide, manufacturer's recommended mesh-style wallboard tape. Gaps greater than 6 mm (1/4 in.) should be filled with mastic or caulk, allowing sufficient time to fully cure before application of the mesh-style wallboard tape and fluid applied air barrier system.

C. Masonry Substrates: Apply air and vapor barrier over concrete block and brick with smooth trowel-cut mortar joints, struck full and flush. Fill all voids and holes, particularly in the mortar joints, with a lean mortar mix, non-shrinking grout or parge coat.

D. Related Materials: Treat construction joints and install flashing as recommended by manufacturer.

E. Clean, prepare, treat, and seal substrate according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for air barrier application.

F. Mask off adjoining surfaces not covered by air barrier to prevent spillage and overspray affecting other construction.

G. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.

H. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids in concrete with substrate patching membrane.

I. Remove excess mortar from masonry ties, shelf angles, and other obstructions.

J. At changes in substrate plane, apply sealant or Bituthene Liquid Membrane at sharp corners and edges to form a smooth transition from one plane to another.

K. Cover gaps in substrate plane and form a smooth transition from one substrate plane to another with stainless-steel sheet mechanically fastened to structural framing to provide continuous support for air barrier.

3.03 JOINT TREATMENT

A. Concrete and Masonry: Prepare, treat, rout, and fill joints and cracks in substrate according to ASTM C1193 and air barrier manufacturer's written instructions. Remove dust and dirt from joints and cracks complying with ASTM D4258 before coating surfaces.

B. Prime substrate as required.

C. Gypsum Sheathing: Fill joints with S100 Sealant per manufacturer's written instructions.

3.04 AIR BARRIER MEMBRANE INSTALLATION

A. Apply air barrier membrane to achieve a continuous air barrier according to air barrier manufacturer's written instructions.

B. Apply air barrier membrane within manufacturer's recommended application temperature ranges.

C. Apply a continuous unbroken air barrier to substrates according to the following minimum thickness. Apply membrane in full contact around protrusions such as masonry ties.

D. Vapor-Permeable Membrane Air Barrier: 70-mil (1.8-mm) wet film thickness, 40-mil (1.0-mm) dry film thickness.

E. Do not cover air barrier until it has been tested and inspected by Owner's testing agency.

F. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air barrier components.

3.05 TRANSITION MEMBRANE INSTALLATION

A. Connect and seal exterior wall air barrier membrane continuously to roofing membrane air barrier, concrete below-grade structures, floor-to floor construction, exterior glazing and window systems, glazed curtain-wall systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings, using accessory materials.

B. At end of each working day, seal top edge of strips and transition membrane to substrate with termination sealant.

C. Apply joint sealants forming part of air barrier assembly within sealant manufacturer's recommended application temperature ranges. Consult sealant manufacturer when sealant cannot be applied within these temperature ranges.

D. Wall Openings: Prime concealed perimeter frame surfaces of windows, curtain walls, storefronts, and doors. Apply transition membrane so that a minimum of 3 inches (75 mm) of coverage is achieved over both substrates.

E. Transition Membrane: Roll firmly to enhance adhesion.

F. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, and doors, and miscellaneous penetrations of air barrier membrane with foam sealant.

G. Repair punctures, voids, and deficient lapped seams in strips and transition membrane. Slit and flatten fish-mouths and blisters. Patch with transition membrane extending 6 inches (150 mm) beyond repaired areas in strip direction.

3.06 FIELD QUALITY CONTROL

A. Testing Agency: Owner may engage a qualified testing agency to perform tests and inspections and prepare test reports.

B. Inspections: Air barrier materials and installation are subject to inspection for compliance with requirements. Inspections may include the following:

C. Continuity of air barrier system has been achieved throughout the building envelope with no gaps or holes.

D. Continuous structural support of air barrier system has been provided.

E. Masonry and concrete surfaces are smooth, clean and free of cavities, protrusions, and mortar droppings.

F. Site conditions for application temperature and dryness of substrates have been maintained.

G. Maximum exposure time of materials to UV deterioration has not been exceeded.

H. Surfaces have been primed, if applicable.

I. Laps in strips and transition membrane have complied with minimum requirements and have been shingled in the correct direction (or mastic has been applied on exposed edges), with no fish-mouths.

J. Termination sealant has been applied on cut edges.

K. Strips and transition membrane have been firmly adhered to substrate.

L. Compatible materials have been used.

M. Transitions at changes in direction and structural support at gaps have been provided.

N. Connections between assemblies (membrane and sealants) have complied with requirements for cleanliness, preparation and priming of surfaces, structural support, integrity, and continuity of seal.

O. All penetrations have been sealed.

P. Tests: Testing to be performed will be determined by Owner's testing agency from among the following tests:

Q. Qualitative Testing: Air barrier assemblies will be tested for evidence of air leakage according to ASTM E1186.

R. Remove and replace deficient air barrier components and retest as specified above.

3.07 CLEANING AND PROTECTION

A. Protect air barrier system from damage during application and remainder of construction period, according to manufacturer's written instructions.

B. Protect air barrier from exposure to UV light and harmful weather exposure as required by manufacturer. Remove and replace main air barrier material exposed for more than 180 days.

C. Clean spills, stains, and soiling from construction that would be exposed in the completed work using cleaning agents and procedures recommended by manufacturer of affected construction.

D. Remove masking materials after installation.

END OF SECTION

SECTION 075423
THERMOPLASTIC-POLYOLEFIN ROOFING - VERSICO

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Adhered roof system with thermoplastic-polyolefin (TPO) roofing membrane.

B. Cover boards.

C. Insulation.

1.02 RELATED REQUIREMENTS

A. Section 053100 - Steel Decking.

B. Section 076200 - Sheet Metal Flashing and Trim: Counterflashings.

C. Section 077100 - Roof Specialties: Prefabricated roofing expansion joint flashing.

D. Section 077200 - Roof Accessories: Roof-mounted units; prefabricated curbs.

1.03 REFERENCE STANDARDS

A. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.

B. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2025.

C. ASTM C1325 - Standard Specification for Fiber-Mat Reinforced Cementitious Backer Units; 2022, with Editorial Revision (2023).

D. ASTM D6878/D6878M - Standard Specification for Thermoplastic Polyolefin-Based Sheet Roofing; 2021.

E. ASTM E1980 - Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces; 2024.

F. UL 790 - Standard for Standard Test Methods for Fire Tests of Roof Coverings; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week before starting work of this section.
   1. Review preparation and installation procedures, in addition to coordination and scheduling required with related work.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide manufacturer's written information listed below.
   1. Product data indicating membrane materials, flashing materials, insulation, surfacing, and fasteners.

C. Shop Drawings: Indicate joint or termination detail conditions, conditions of interface with other materials, and setting plan for tapered insulation.

D. Warranty Documentation.
   1. Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
   2. Submit installer's certification that installation complies with required warranty conditions for waterproofing membrane.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with at least twenty years of documented experience.

B. Installer Qualifications: Company specializing in performing work of type specified and with at least five years documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver products in manufacturer's original containers, dry, undamaged, with seals and labels intact.

B. Store products in weather protected environment, clear of ground and moisture.

C. Protect foam insulation from direct exposure to sunlight.

1.08 FIELD CONDITIONS

A. Do not apply roofing membrane when ambient temperature is below 40 degrees F (5 degrees C) or above ___ degrees F (___ degrees C).

B. Do not apply roofing membrane to damp or frozen deck surface or when precipitation is expected or occurring.

C. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed that same day.

D. Proceed with work so new roofing materials are not subject to construction traffic as work progresses.

E. Do not allow grease, oils, fats, or other contaminants to come into direct contact with roofing membrane.

1.09 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Material Warranty: Provide membrane manufacturer's warranty agreeing to replace material that shows manufacturing defects within 10 years after installation.

C. System Warranty: Provide manufacturer's system warranty agreeing to repair or replace roofing membrane that leaks or is damaged due to wind or other natural causes.
   1. System Warranty Term: 20 years.
   2. For repair and replacement include costs of both material and labor in warranty.

PART 2 PRODUCTS

2.01 MANUFACTURER

A. Versico Roofing Systems; _____: www.versico.com/#sle.

2.02 ROOFING APPLICATIONS

A. Thermoplastic-Polyolefin (TPO) Membrane Roofing: Single-ply membrane.

2.03 PERFORMANCE / DESIGN CRITERIA

A. Solar Reflectance Index (SRI): Minimum of 64 based on three-year aged value; if three-year aged data is not available, minimum of 82 initial value, calculated in accordance with ASTM E1980.
   1. Field applied coating may not be used to achieve specified SRI.

B. Roof Covering External Fire Resistance Classification: Class A when tested in accordance to UL 790.

C. Wind Uplift:
   1. Designed to withstand wind uplift forces calculated in accordance with ASCE 7.
   2. Design Wind Speed: In accordance with local building code and authorities having jurisdiction (AHJ).

D. Insulation Thermal Resistance (R-Value): Provide R-25, minimum, over entire roof deck.

2.04 ROOFING MEMBRANE MATERIALS

A. Single Source Responsibility: Provide and install products from single source.

B. Membrane: Thermoplastic-Polyolefin (TPO); ASTM D6878/D6878M, with internal fabric reinforcing.
   1. Thickness: 45 mils, 0.045 inch (1.1 mm), minimum.
   2. Sheet Width: Factory fabricated into largest sheets possible.
   3. Color: As selected by Architect from manufacturer's full color range.
   4. Products:
      a. Versico Roofing Systems; VersiWeld AC VersiFleece TPO.

C. Seaming Materials: As recommended by membrane manufacturer.

D. Flexible Flashing Material: Same material as roofing membrane.

E. Base Flashing: Provide waterproof, fully adhered base flashing system at penetrations, plane transitions, and terminations.

2.05 COVER BOARDS

A. Cover Board: Cement roof board, complying with ASTM C1325.
   1. Board Size: 48 by 96 inch (1,219 by 2,438 mm).
   2. Board Thickness: 1/2 inch (13 mm).

2.06 INSULATION

A. Polyisocyanurate (ISO) Board Insulation: Complying with ASTM C1289, Type II, Class 1 - Faced with organic felt facers (glass fiber reinforced cellulosic felt) on both major surfaces of core foam.
   1. Board Thickness: 2 inch (51 mm), nominal.

2.07 ACCESSORIES

A. Prefabricated Flashing Accessories:
   1. Miscellaneous Flashing: Non-reinforced TPO membrane; 60 mil (0.060 inch) (1.5 mm) thick, in manufacturer's standard lengths and widths.
   2. Corners and Seams:
      a. Inside/Outside Corner: 60 mil, 0.060 inch (1.5 mm) thick, pre-molded TPO, used for flashing inside or outside corners.
         1) Products:
            (a) Versico Roofing Systems; VersiWeld TPO Universal Corners.
   3. Penetrations: Same material as membrane, with manufacturer's standard cut-outs, rigid inserts, clamping rings, and flanges.
      a. Pipe Seals: Injection molded, pre-formed TPO flashings for pipes from 3/4 inch to 8 inch (19 mm to 203 mm) in diameter.
         1) Products:
            (a) Versico Roofing Systems; VersiWeld TPO Pipe Seals.
   4. Sealant Pockets: Same material as membrane, with manufacturer's standard accessories, in manufacturer's standard configuration.
      a. Molded Sealant Pockets: Interlocking, two-piece, injection molded TPO weldable pockets adjustable from 11-1/2 inch to 7-1/2 inch (279 mm to 191 mm) long, and used to waterproof pipe clusters or other odd shaped penetrations.
         1) Products:
            (a) Versico Roofing Systems; VersiWeld Molded Sealant Pockets.

B. Membrane Adhesive: As recommended by membrane manufacturer.

PART 3 EXECUTION

3.01 VERIFICATION OF CONDITIONS

A. Verify that surfaces and site conditions are ready to receive work.

B. Verify deck is supported and secure.

C. Verify deck is clean and smooth, flat, free of depressions, waves, or projections, properly sloped and suitable for installation of roof system.

D. Verify deck surfaces are dry and free of snow or ice.

E. Verify that roof openings, curbs, and penetrations through roof are solidly set, and cant strips, nailing strips, and reglets are in place.

3.02 SURFACE PREPARATION

A. Clean substrate thoroughly prior to roof application.

3.03 INSTALLATION - GENERAL

A. Install roofing system in accordance with manufacturer's instructions, as well as NRCA (RM) and NRCA (WM) applicable requirements.

B. Application of roofing membrane during unsuitable weather is not permitted.

C. Application of roofing membrane when ambient temperature is outside temperature range recommended by manufacturer is not permitted.

D. Application of roofing membrane to damp or frozen deck surface or when precipitation is expected or occurring is not permitted.

E. Exposing materials vulnerable to water or sun damage in quantities greater than can be weatherproofed the same day is not permitted.

F. Coordinate this work with installation of associated counterflashings being installed as specified in other sections as this work proceeds.

G. When substrate preparation is responsibility of another installer, notify Architect of unsatisfactory conditions, and do not proceed until corrections have been made.

3.04 INSULATION APPLICATION

A. Attachment of Insulation:
   1. Mechanically fasten insulation to deck in accordance with roofing manufacturer's instructions.

B. Installing wet, damaged, or warped insulation boards is not permitted.

C. Apply subsequent layers of insulation with joints staggered minimum 6 inch (152 mm) from joints of preceding layer.

D. Apply boards with edges in moderate contact without forcing, and with gap between boards no greater than 1/4 inch (6 mm) wide; cut insulation to fit neatly to perimeter blocking and around penetrations through roof.

E. Only apply quantity of insulation than can be completely waterproofed in same day.

3.05 MEMBRANE APPLICATION

A. Roll out membrane, free from wrinkles or tears; place sheet membrane into place without stretching.

B. Shingle joints on sloped substrates in direction of drainage.

C. At membrane intersections with vertical surfaces, provide the following:
   1. Fully adhere flexible flashing over membrane and up to nailing strips.

D. Daily Seal: Provide daily seal in accordance with manufacturer's installation instructions at end of each work day to prevent infiltration of water at incomplete flashings, terminations, and other unfinished membrane edges.

3.06 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements for general requirements for field quality control and inspection.

B. Attendance is required on-site of roofing and insulation material manufacturer's daily during installation of this work.

3.07 CLEANING

A. See Section 017000 - Execution and Closeout Requirements for additional requirements.

B. Remove wrappings, empty containers, paper, and other debris from roof daily, and dispose of debris in compliance with local, State, and Federal regulations.

C. Remove bituminous markings from finished surfaces.

D. In areas where finished surfaces are soiled by work of this section, consult manufacturer of surfaces for cleaning advice and comply with their documented instructions.

E. Repair or replace defaced or damaged finishes caused by work of this section.

3.08 PROTECTION

A. Protect installed roofing and flashings from construction operations.

B. Where traffic must continue over finished roof membrane, protect surfaces using durable materials.

END OF SECTION

SECTION 076200
SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fabricated sheet metal items, including flashings and counterflashings.

B. Jamb L-Shaped Flashing: Provide at all storefront and hollow metal exterior jambs, as per paragraph 2.01 A

C. Masonry Weep / Through-Wall Flashing: Provide at all through wall flashing conditions as per paragraph 2.01 B.

D. Two-Piece Stainless Steel Receiver / Cap Flashing: Provide at all locations as per paragraph 2.01 B.

1.02 RELATED REQUIREMENTS

A. Section 042000 - Unit Masonry: Metal flashings embedded in masonry.

B. Section 07 4113 - Metal Roof Panels

C. Section 07 4213 - Metal Panels

D. Section 077123 - Manufactured Gutters and Downspouts.

E. Section 079200 - Joint Sealants: Sealing non-lap joints between sheet metal fabrications and adjacent construction.

F. Section 08 4313 - Storefront

1.03 REFERENCE STANDARDS

A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.

B. CDA A4050 - Copper in Architecture - Handbook; current edition.

C. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

1.04 ADMINISTRATIVE REQUIREMENTS

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

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.

C. Samples: Submit two samples 6 by 6 inch (____by____ mm) in size illustrating metal finish color.

1.06 QUALITY ASSURANCE

A. Perform work in accordance with SMACNA (ASMM) and CDA A4050 requirements and standard details, except as otherwise indicated.

B. Maintain one copy of each document on site.

C. Fabricator and Installer Qualifications: Company specializing in sheet metal work with ____ years of documented experience.

D. The contractor shall be responsible for coordinating and holding a pre-installation conference. The required attendees shall be the Contractor, all related sub-contractors, the waterproofing subcontractor, project manager, and superintendent, and the waterproofing manufacturer's representative, the Owner, and Architect. Topics to be discussed include, but are not limited to delivery dates, specialty contractor skill sets and capabilities, work schedules, and approved submittals.

1.07 MOCK UP

A. Refer to 01 4000 Quality Requirements.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

B. Prevent contact with materials that could cause discoloration or staining.

1.09 PRE-ROOFING MEETING:

A. Organize and conduct a meeting at the construction site 2 weeks before scheduled start of roof system installation with roofing installer; installer of each component of related work, including deck or substrate construction, roof equipment, penetrations of roof deck, and other work integral with or adjacent to roofing; the architect; the Owner; the local code inspector, roofing manufacturer's representative; approved roofing consultant; owner's construction manager; and other parties involved with roofing system performance, including owner's insurance representative, independent testing agencies, and governing authorities.

1. Walk roof areas to review and discuss substrate preparation including repair of unacceptable surfaces, roof drainage, penetrations, equipment curbs, and work performed by other trades which requires coordination with roofing system.
2. Examine steel deck for proper flatness and slope, review structural capability for supporting roofing system and methods of fastening.
3. Review contract document requirements and submittals for roofing system, including roofing schedule, inspection and testing, and environmental conditions. Identify what are considered unacceptable weather conditions for roofing, and which governing regulations or insurance requirements will affect roofing system installation.
4. Document discussions in writing, including actions required, and distribute copy of reports to each meeting participant.

1.10 WARRANTIES:

A. Manufacturer's finish warranty:

1. Covering bare metal against rupture, structural failure and perforation due to normal atmospheric corrosion exposure.
2. Covering panel finish against cracking, checking, blistering, peeling, flaking, chipping, chalking and fading.
3. Duration: twenty (20) years

PART 2 PRODUCTS

2.01 SHEET MATERIALS

A. Pre-Finished Galvanized Steel: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 24 guage thick base metal (unless noted otherwise), shop pre-coated with PVDF coating.

1. PVDF (Polyvinylidene Fluoride) Coating: Superior Performance Organic Finish, AAMA 2605; multiple coat, thermally cured fluoropolymer finish system. Provide manufacturer's standard prime coat on underside.
2. Color: As selected in writing by Architect & Owner from manufacturer's full colors.

B. 26 gauge stainless steel flashing

C. Provide roofing manufacturers ES-1 wind rated metal coping with metal miters where required.

2.02 ACCESSORIES

A. Underlayment: Self Adhered Underlayment Equal to Grace Ultra

B. Primer: As recommended by manufacturer for application and specified finish.

2.03 FABRICATION

A. Form sections true to shape, accurate in size, square, and free from distortion or defects.

B. Fabricate cleats of same material as sheet, minimum 1 inches (____ mm) wide, interlocking with sheet. Provide continuous cleats where indicated on drawings and/or recommended by SMACNA.

C. Form pieces in longest possible lengths.

D. Hem exposed edges on underside 1/2 inch (13 mm); miter and seam corners.

E. Form material with flat lock seams, except where otherwise indicated; at moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.

F. Fabricate corners from one piece with minimum 18 inch (450 mm) long legs; seam for rigidity, seal with sealant.

G. Fabricate flashings to allow toe to extend 2 inches (50 mm) over roofing gravel. Return and brake edges.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.

B. Verify roofing termination and base flashings are in place, sealed, and secure.

3.02 PREPARATION

A. Install starter and edge strips, and cleats before starting installation.

B. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil (0.4 mm).

3.03 INSTALLATION

A. Secure flashings in place using concealed fasteners, and use exposed fasteners only where permitted.

B. Fit flashings tight in place; make corners square, surfaces true and straight in planes, and lines accurate to profiles.

C. Seal metal joints watertight.

3.04 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for field inspection requirements.

B. Inspection will involve surveillance of work during installation to ascertain compliance with specified requirements.

END OF SECTION

SECTION 076200
SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fabricated sheet metal items, including flashings and counterflashings.

B. Jamb L-Shaped Flashing: Provide at all storefront and hollow metal exterior jambs, as per paragraph 2.01 A

C. Masonry Weep / Through-Wall Flashing: Provide at all through wall flashing conditions as per paragraph 2.01 B.

D. Two-Piece Stainless Steel Receiver / Cap Flashing: Provide at all locations as per paragraph 2.01 B.

1.02 RELATED REQUIREMENTS

A. Section 042000 - Unit Masonry: Metal flashings embedded in masonry.

B. Section 07 4113 - Metal Roof Panels

C. Section 077100 - Roof Specialties: Manufactured copings.

D. Section 077123 - Manufactured Gutters and Downspouts.

E. Section 079200 - Joint Sealants: Sealing non-lap joints between sheet metal fabrications and adjacent construction.

F. Section 08 4313 - Storefront

1.03 REFERENCE STANDARDS

A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.

B. CDA A4050 - Copper in Architecture - Handbook; current edition.

C. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

1.04 ADMINISTRATIVE REQUIREMENTS

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

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.

C. Samples: Submit two samples 6 by 6 inch (____by____ mm) in size illustrating metal finish color.

1.06 QUALITY ASSURANCE

A. Perform work in accordance with SMACNA (ASMM) and CDA A4050 requirements and standard details, except as otherwise indicated.

B. Maintain one copy of each document on site.

C. Fabricator and Installer Qualifications: Company specializing in sheet metal work with ____ years of documented experience.

D. The contractor shall be responsible for coordinating and holding a pre-installation conference. The required attendees shall be the Contractor, all related sub-contractors, the waterproofing subcontractor, project manager, and superintendent, and the waterproofing manufacturer's representative, the Owner, and Architect. Topics to be discussed include, but are not limited to delivery dates, specialty contractor skill sets and capabilities, work schedules, and approved submittals.

1.07 MOCK UP

A. Refer to 01 4000 Quality Requirements.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

B. Prevent contact with materials that could cause discoloration or staining.

1.09 PRE-ROOFING MEETING:

A. Organize and conduct a meeting at the construction site 2 weeks before scheduled start of roof system installation with roofing installer; installer of each component of related work, including deck or substrate construction, roof equipment, penetrations of roof deck, and other work integral with or adjacent to roofing; the architect; the Owner; the local code inspector, roofing manufacturer's representative; approved roofing consultant; owner's construction manager; and other parties involved with roofing system performance, including owner's insurance representative, independent testing agencies, and governing authorities.
   1. Walk roof areas to review and discuss substrate preparation including repair of unacceptable surfaces, roof drainage, penetrations, equipment curbs, and work performed by other trades which requires coordination with roofing system.
   2. Examine steel deck for proper flatness and slope, review structural capability for supporting roofing system and methods of fastening.
   3. Review contract document requirements and submittals for roofing system, including roofing schedule, inspection and testing, and environmental conditions. Identify what are considered unacceptable weather conditions for roofing, and which governing regulations or insurance requirements will affect roofing system installation.
   4. Document discussions in writing, including actions required, and distribute copy of reports to each meeting participant.

1.10 WARRANTIES:

A. Manufacturer's finish warranty:
   1. Covering bare metal against rupture, structural failure and perforation due to normal atmospheric corrosion exposure.
   2. Covering panel finish against cracking, checking, blistering, peeling, flaking, chipping, chalking and fading.
   3. Duration: twenty (20) years

PART 2 PRODUCTS

2.01 SHEET MATERIALS

A. Pre-Finished Galvanized Steel: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 24 guage thick base metal (unless noted otherwise), shop pre-coated with PVDF coating.
   1. PVDF (Polyvinylidene Fluoride) Coating: Superior Performance Organic Finish, AAMA 2605; multiple coat, thermally cured fluoropolymer finish system. Provide manufacturer's standard prime coat on underside.
   2. Color: As selected in writing by Architect & Owner from manufacturer's full colors.

B. 26 gauge stainless steel flashing

C. Provide roofing manufacturers ES-1 wind rated metal coping with metal miters and with continuous cleat where required.

2.02 ACCESSORIES

A. Underlayment: Self Adhered Underlayment Equal to Grace Ultra

B. Primer: As recommended by manufacturer for application and specified finish.

2.03 FABRICATION

A. Form sections true to shape, accurate in size, square, and free from distortion or defects.

B. Fabricate cleats of same material as sheet, minimum 1 inches (____ mm) wide, interlocking with sheet. Provide continuous cleats where indicated on drawings and/or recommended by SMACNA.

C. Form pieces in longest possible lengths.

D. Hem exposed edges on underside 1/2 inch (13 mm); miter and seam corners.

E. Form material with flat lock seams, except where otherwise indicated; at moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.

F. Fabricate corners from one piece with minimum 18 inch (450 mm) long legs; seam for rigidity, seal with sealant.

G. Fabricate flashings to allow toe to extend 2 inches (50 mm) over roofing gravel. Return and brake edges.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.

B. Verify roofing termination and base flashings are in place, sealed, and secure.

3.02 PREPARATION

A. Install starter and edge strips, and cleats before starting installation.

B. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil (0.4 mm).

3.03 INSTALLATION

A. Secure flashings in place using concealed fasteners, and use exposed fasteners only where permitted.

B. Fit flashings tight in place; make corners square, surfaces true and straight in planes, and lines accurate to profiles.

C. Seal metal joints watertight.

3.04 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for field inspection requirements.

B. Inspection will involve surveillance of work during installation to ascertain compliance with specified requirements.

END OF SECTION

SECTION 076526
SELF-ADHERING SHEET FLASHING

PART 1 — GENERAL

1.01 RELATED DOCUMENTS

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

B. Section 042000 – Unit Masonry.

1.02 SUMMARY

A. Section provides for a flexible rubberized asphalt, self-sealing through-wall flashing and wall flashing accessories. Referred to on drawings as flexible wall flashing, flexible flashing, and through-wall flashing.

B. The following specification sections with products by GCP Applied Technologies are the Basis of Design:
   1. Section 07 1300 – Sheet Waterproofing.
   2. Section 07 2726 - Fluid Applied Membrane Air Barriers, Vapor Permeable.
   3. Section 07 6526 - Self-Adhering Sheet Flashing.

C. A single source manufacturer of all sections and associated products is required for approval.
   1. Proof of products being equal to the Basis of Design and being compatible with all sections/products shall be submitted to the architect prior to the bid. Approved products must be listed in an addendum.
   2. Refer to Specification Section 016000 Product Requirements for additional requirements.

1.03 REFERENCES

A. American Society for Testing and Materials
   1. ASTM E96 – Test Methods for Water Vapor Transmission of Materials.
   2. ASTM D570 – Test Method for Water Absorption of Plastics.
   3. ASTM E154 – Test Method for Water Vapor Retarders used in contact with Earth Under Concrete Slabs, on Walls or as Ground Cover.
   4. ASTM D1004 – Test Method for Initial Tear Resistance of Plastic Film and Sheeting.
   5. ASTM D1938 – Test Method for Tear Propagation Resistance of Plastic Film and Thin Sheeting by a Single-Tear Method.
   6. ASTM D1876 – Test Method for Peel Resistance of Adhesives.
   7. ASTM D1970 – Standard Specifications for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.
   8. D412 – Test Methods for Vulcanized Rubber & Thermoplastic Rubbers and Thermoplastic Elastomers – Tension.

1.04 SUBMITTALS

A. Product Data and Shop Drawings: Submit for each product; Spec-Data®/Data Sheets, details and installation procedures.

B. Test Reports: Indicating compliance with the performance requirements of this section.

C. Samples of flashing.

D. Manufacturer's Warranty: Applicable in the state of the project.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Comply with manufacturer's recommendations for storage and handling of each product.

1.06 WARRANTY

A. Standard Product Warranty:

1. Submit manufacturer's warranty that flashing and accessories are free of defects at time of delivery, and are manufactured to meet manufacturer's published physical properties and material specifications.
2. Warranty Period: Ten (10) years from date of completion of the substantial completion.
3. Installer to warrant that flashing and accessories have been installed in accordance with manufacturer's recommendations.
4. Project Waterproofing Warranty: Waterproofing Contractor and General Contractor ten (10) year listed at the end of this section.

1.07 QUALITY ASSURANCE

A. Manufacturer: Sheet membrane waterproofing system shall be manufactured and marketed by a firm with a minimum of five (5) years of experience in the production and sales of sheet membrane waterproofing. Manufacturers proposed for use but not named in these specifications shall submit evidence of ability to meet all requirements specified and include a list of projects of similar design and complexity completed within the past five (5) years.

B. Installer: A firm which has at least three (3) years of experience in work of the type required by this section and as certified by the manufacturer.

C. Materials: For each type of material required for the work of this section, provide primary materials which are the products of one manufacturer.

D. Pre-Installation Conference: An on-site pre-installation conference with manufacturers technical representative present shall be held prior to commencement of field operations to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work. Agenda for meeting shall include review of special details and flashing.

PART 2 — PRODUCTS

2.01 MATERIALS

A. **Flashing Description: 0.8 mm (32 mils) of self-adhesive rubberized asphalt integrally bonded to 0.2 mm (8 mils) of cross-laminated, high-density polyethylene film to provide a min. 1.0 mm (40 mil) thick membrane. Membrane shall be interleaved with disposable silicone-coated release paper until installed.**

B. Performance Requirements:
1. Water Vapor Transmission: ASTM E96, Method B – 2.9 ng/m2sPa (0.05 perms) maximum
2. Water Absorption: ASTM D570 – Max. 0.1% by weight
3. Puncture Resistance: ASTM E154 – 356 N (80 lbs)
4. Tear Resistance:
   a. Initiation – ASTM D1004 – min. 58 N (13.0 lbs) M.D.
   b. Propagation – ASTM D1938 – min. 40 N (9.0 lbs) M.D.
5. Lap Adhesion at -4ºC (25ºF): ASTM D1876 – 880 N/M (5.0 lbs/in.) of width
6. Low Temperature Flexibility – ASTM D1970 – Unaffected to -43ºC (-45ºF)
7. Tensile Strength: ASTM D412, Die C Modified – Min. 5.5 MPa (800 psi)
8. Elongation, Ultimate Failure of Rubberized Asphalt: ASTM D412, Die C – Min. 200%

C. Product: Perm-A-Barrier® Wall Flashing manufactured by GCP Advanced Technologies Construction Products.

D. Wall Flashing Accessories:
1. Primer:
   a. Description: Water-based primer which imparts an aggressive, high tack finish on the treated substrate.
      1) Flash Point: No flash to boiling point
      2) Solvent Type: Water
      3) VOC Content: Not to exceed 10 g/L
      4) Application Temperature: -4ºC (25ºF) and above

5) Freezing point (as packaged): -7ºC (21ºF)

b. Product: Perm-A-Barrier WB Primer manufactured by GCP Advanced Technologies Construction Products.

2. Termination Mastic:
   a. Description: Rubberized asphalt-based mastic with 200 g/L max. VOC Content.
   b. Product: Bituthene® Mastic manufactured by GCP Advanced Technologies Construction Products.
3. Optional Primer:
   a. Description: Water-based primer which imparts an aggressive, high tack finish on the treated substrate. 1 g/l max. VOC content.
   b. Product: Perm-A-Barrier Primer Plus by GCP Advanced Technologies Construction Products.
   c. Description: High tack low VOC solvent based primer. 200 g/l max. VOC content.
   d. Product: Bituthene Primer B2 LVC manufactured by GCP Advanced Technologies Construction Products.
4. Joint Sealant: Per manufacturer's recommendations.
5. Weep Vents and Mortar Nets: Refer to Section 04 2000 - Unit Masonry for materials and additional installation requirements.
6. Termination Bar
   a. Single Lip 26 gauge x 1-1/4 inches, Type 304 Stainless Steel Stainless Steel termination bar with ½" lip at 45° and pre-drilled holes spaced at 16" inches on center for attachment. Refer to drawings for additional information.
7. Drip Edge: Provide stainless steel drip edge at all locations where wall flashing terminates at the exterior face of brick, cast stone veneers and at locations shown on drawings.
   a. 26 gauge, Type 304 Stainless Steel
   b. Size and configuration as detailed on drawings.
   c. Install in accordance with manufacturer's written instructions and as detailed on drawings. Flashing shall not be exposed to ultraviolet light when properly installed.
   d. Include drip edge in project mock up. Also, mock up drip edge conditions at outside and inside corners for approval prior to proceeding.
8. Perm-A-Barrier Liquid Flashing (GCP or approved equal): Fluid applied flashing membrane and detailing accessory.
   a. Provide all system components.
   b. Provide as shown on drawings to manufacturer's specifications.
   c. Provide at all exterior openings and penetrations, including but not limited to, head, jambs and sill of all exterior doors, louvers and storefronts.

PART 3 — EXECUTION

3.01 EXAMINATION

A. Examine conditions, with installer present, for compliance with requirements for installation, tolerances and other specific conditions affecting performance of flashing. Remove all deleterious materials from surfaces to be flashed and as shown on drawings.

3.02 INSTALLATION

A. General: Install flashing to dry surfaces at air and surface temperatures of -4ºC (25ºF) and above in accordance with manufacturer's recommendations at locations indicated on Construction Documents.

B. Flexible Wall Flashing:
   1. Precut pieces of flashing to easily handled lengths for each location.
   2. Remove silicone-coated release paper and position flashing carefully before placing it against the surface.
   3. When properly positioned, place against surface by pressing firmly into place by hand roller. Fully adhere flashing to substrate to prevent water from migrating under flashing.
   4. Overlap adjacent pieces 50 mm (2 in.) and roll all seams with a steel hand roller.

5. Trim bottom edge 13 mm (1⁄2 in.) back from exposed face of the wall. Flashing shall not be permanently exposed to sunlight.
6. At heads, sills and all flashing terminations turn up ends a minimum of 50 mm (2 in.) and make careful folds to form an end dam, with the seams sealed.
7. Do not allow the rubberized asphalt surface of the flashing membrane to come in contact with polysulfide sealants, creosote, uncured coal tar products or EPDM.
8. Do not expose flashing membrane to sunlight for more than thirty days prior to enclosure.
9. Install Perma-A-Barrier Liquid Flashing per manufacturer's instructions at all head, jamb, and sill of exterior wall penetrations and as shown on the drawings.

C. Accessories:
1. When required by dirty or dusty site conditions or by surfaces having irregular or rough texture, apply Perm-A-Barrier Primer Plus by air spray, brush or roller or apply Perm-A-Barrier WB Primer by brush or roller at the rate recommended by manufacturer, prior to flashing installation. Allow the primer to dry completely before flashing application.
2. Apply a bead or trowel coat of mastic along flashing top edge, seams, cuts, and penetrations.
3. Apply primer by brush or heavy nap, natural-material roller at rate recommended by manufacturer prior to flashing installation. Allow primer to dry completely before flashing application.

3.03 PROJECT WATERPROOFING WARRANTY

NAME OF PROJECT: _____

PROJECT LOCATION: _____

OWNER: _____

DATE OF SUBSTANTIAL COMPLETION:_____

DATE OF EXPIRATION:_____

1. THE WATERPROOFING CONTRACTOR AND GENERAL CONTRACTOR DO HEREBY CERTIFY THAT THE SELF-ADHERING SHEET FLASHING AND LIQUID FLASWORK INCLUDED IN THIS CONTRACT WAS INSTALLED IN STRICT ACCORDANCE WITH ALL REQUIREMENTS OF THE PLANS AND SPECIFICATIONS 07 6526 ADHERING SHEET FLASHING AND IN ACCORDANCE WITH APPROVED WATERPROOFING MANUFACTURER'S RECOMMENDATIONS FOR ALL SPECIFIED WARRANTY REQUIREMENTS.

2. THE WATERPROOFING CONTRACTOR AND GENERAL CONTRACTOR HEREBY GUARANTEE THE WATERPROOFING AND ASSOCIATED WORK INCLUDING BUT NOT LIMITED TO ALL UNDERGROUND VERTICAL AND HORIZONTAL WATERPROOFING TO BE WATER TIGHT AND FREE FROM ALL LEAKS AND MOISTER INTRUSION, DUE TO FAULTY OR DEFECTIVE MATERIALS AND WORKMANSHIP FOR A PERIOD OF TEN (10) YEARS, STARTING ON THE DATE OF SUBSTANTIAL COMPLETION OF THE PROJECT.

3. SUBJECT TO THE TERMS AND GENERAL CONTRACTOR CONDITIONS LISTED BELOW, THE WATERPROOFING CONTRACTOR SHALL SO GUARANTEE THAT DURING THE GUARANTEE PERIOD HE WILL, AT HIS OWN COST AND EXPENSE, MAKE OR CAUSE TO BE MADE SUCH REPAIRS TO, OR REPLACEMENTS OF SAID WORK, IN ACCORDANCE WITH THE WATERPROOFING MANUFACTURERS RECOMMENDATIONS AS ARE NECESSARY TO CORRECT FAULTY AND DEFECTIVE WORK AND/OR MATERIALS WHICH MAY DEVELOP IN THE WORK INCLUDING. ANTICIPATED LIFE OF THE WATERPROOFING SYSTEMS AND THE BEST STANDARDS APPLICABLE TO THE PARTICULAR WATERPROOFING TYPE IN VALUE AND IN ACCORDANCE WITH CONSTRUCTION DOCUMENTS AS ARE NECESSARY TO MAINTAIN SAID WORK IN WATERTIGHT CONDITIONS, AND FURTHER, TO RESPOND ON OR WITHIN SEVEN (7) CALENDAR DAYS UPON PROPER NOTIFICATION OF LEAKS OR DEFECTS BY THE OWNER.

A. DURING THE GUARANTEE PERIOD, IF THE OWNER ALLOWS ALTERATION OF THE WORK BY ANYONE OTHER THAN THE WATERPROOFING CONTRACTOR OR GENERAL CONTRACTOR, INCLUDING CUTTING, PATCHING AND MAINTENANCE IN CONNECTION WITH PENETRATIONS, AND POSITIONING OF ANYTHING EFFECTING THE BELOW GRADE WATERPROOFING, THIS GUARANTEE SHALL BECOME NULL AND VOID UPON THE DATE OF SAID ALTERATIONS.

B. FUTURE BUILDING ADDITIONS WILL NOT VOID THIS GUARANTEE, EXCEPT FOR THAT PORTION OF THE FUTURE ADDITION THAT MIGHT AFFECT THE WORK UNDER THIS CONTRACT AT THE POINT OF CONNECTION OF THE WATERPROOFED AREAS, AND ANY DAMAGE CAUSED BY SUCH ADDITION.

C. THE OWNER SHALL PROMPTLY NOTIFY THE WATERPROOFING CONTRACTOR AND THE GENERAL CONTRACTOR OF OBSERVED, KNOWN OR SUSPECTED LEAKS, DEFECTS OR DETERIORATION, AND SHALL AFFORD REASONABLE OPPORTUNITY FOR THE WATERPROOFING CONTRACTOR TO INSPECT THE WORK, AND TO EXAMINE THE EVIDENCE OF SUCH LEAKS, DEFECTS OR DETERIORATION.

4. INCLUDED IN THE WARRANTY ARE ALL REQUIRED REPAIRS AND RECONSTITUTING OF PHYSICAL FACILITY TO THE PROJECT AS A RESULT OF DAMAGE TO THE FACILITY DUE TO FAILURE OF THE ABOVE NOTED SYSTEMS AT NO ADDITIONAL COST TO OWNER.

IN WITNESS THEREOF, THIS INSTRUMENT HAS BEEN DULY EXECUTED

THIS_____DAY OF_____(YEAR).

_____

WATERPROOFING CONTRACTOR'S AUTHORIZED SIGNATURE

_____

COMPANY NAME

_____

COMPANY ADDRESS

_____

GENERAL CONTRACTOR'S AUTHORIZED SIGNATURE

_____

COMPANY NAME

_____

COMPANY ADDRESS

_____

NOTARY PUBLIC

END OF SECTION

SECTION 077100
ROOF SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Manufactured roof specialties, including copings and fascias.

1.02 RELATED REQUIREMENTS

A. Section 077200 - Roof Accessories: Manufactured curbs.

1.03 REFERENCE STANDARDS

A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.

B. ANSI/SPRI/FM 4435/ES-1 - Test Standard for Edge Systems Used with Low Slope Roofing Systems; 2022.

C. NRCA (RM) - The NRCA Roofing Manual; 2025.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on shape of components, materials and finishes, anchor types and locations.

C. Shop Drawings: Indicate configuration and dimension of components, adjacent construction, required clearances and tolerances, and other affected work.

D. Samples: Submit two appropriately sized samples of coping.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Roof Edge Flashings and Copings:
   1. Architectural Products Co: www.archprod.com/#sle.
   2. ATAS International, Inc; Rapid-Lok Fascia: www.atas.com/#sle.
   3. Drexel Metals Inc: www.drexmet.com/#sle.
   4. Hickman Edge Systems: www.hickmanedgesystems.com/#sle.
   5. Metal-Era Inc: www.metalera.com/#sle.
   6. Metal Roofing Systems, Inc; Rapid Lock Coping: www.metalroofingsystems.biz/#sle.

2.02 COMPONENTS

A. Copings: Factory fabricated to sizes required; corners mitered; concealed fasteners.
   1. Configuration: Concealed continuous hold down cleat at both legs; internal splice piece at joints of same material, thickness, and finish as cap; concealed stainless steel fasteners.
   2. Pull-Off Resistance: Tested in accordance with ANSI/SPRI/FM 4435/ES-1 using test method RE-3 to positive and negative design wind pressure as defined by applicable local building code.
   3. Wall Width: As indicated on drawings.
   4. Outside Face Height: As indicated on drawings.
   5. Inside Face Height: As indicated on drawings.
   6. Material: Formed aluminum sheet, 0.040 inch (1.01 mm) thick, minimum.
   7. Finish: 70 percent polyvinylidene fluoride.

2.03 FINISHES

A. PVDF (Polyvinylidene Fluoride) Coating: Superior Performance Organic Finish, AAMA 2605; multiple coat, thermally cured fluoropolymer finish system; color as indicated.

2.04 ACCESSORIES

A. Adhesive for Anchoring to Roof Membrane: Compatible with roof membrane and approved by roof membrane manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that deck, curbs, roof membrane, base flashing, and other items affecting work of this Section are in place and positioned correctly.

3.02 INSTALLATION

A. Install components in accordance with manufacturer's instructions and NRCA (RM) applicable requirements.

END OF SECTION

SECTION 077100
ROOF SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Manufactured roof specialties, including copings.

1.02 RELATED REQUIREMENTS

A. Section 077200 - Roof Accessories: Manufactured curbs.

1.03 REFERENCE STANDARDS

A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.

B. ANSI/SPRI/FM 4435/ES-1 - Test Standard for Edge Systems Used with Low Slope Roofing Systems; 2022.

C. NRCA (RM) - The NRCA Roofing Manual; 2025.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on shape of components, materials and finishes, anchor types and locations.

C. Shop Drawings: Indicate configuration and dimension of components, adjacent construction, required clearances and tolerances, and other affected work.

D. Samples: Submit two appropriately sized samples of coping.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Roof Edge Flashings and Copings:
   1. Architectural Products Co: www.archprod.com/#sle.
   2. ATAS International, Inc; Rapid-Lok Fascia: www.atas.com/#sle.
   3. Drexel Metals Inc: www.drexmet.com/#sle.
   4. Hickman Edge Systems: www.hickmanedgesystems.com/#sle.
   5. Metal-Era Inc: www.metalera.com/#sle.
   6. Metal Roofing Systems, Inc; Rapid Lock Coping: www.metalroofingsystems.biz/#sle.

2.02 COMPONENTS

A. Copings: Factory fabricated to sizes required; corners mitered, soldered, and sealed watertight; concealed fasteners.
   1. Configuration: Concealed continuous hold down cleat at both legs; internal splice piece at joints of same material, thickness, and finish as cap; concealed stainless steel fasteners.
   2. Pull-Off Resistance: Tested in accordance with ANSI/SPRI/FM 4435/ES-1 using test method RE-3 to positive and negative design wind pressure as defined by applicable local building code.
   3. Wall Width: As indicated on drawings.
   4. Outside Face Height: As indicated on drawings.
   5. Inside Face Height: As indicated on drawings.
   6. Material: zinc-coated (galvanized) steel, nominal thickness as required to meet performance requir.
   7. Finish: 70 percent polyvinylidene fluoride.

2.03 FINISHES

A. PVDF (Polyvinylidene Fluoride) Coating: Superior Performance Organic Finish, AAMA 2605; multiple coat, thermally cured fluoropolymer finish system; color as indicated.

2.04 ACCESSORIES

A. Adhesive for Anchoring to Roof Membrane: Compatible with roof membrane and approved by roof membrane manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that deck, curbs, roof membrane, base flashing, and other items affecting work of this Section are in place and positioned correctly.

3.02 INSTALLATION

A. Install components in accordance with manufacturer's instructions and NRCA (RM) applicable requirements.

END OF SECTION

SECTION 077123
MANUFACTURED GUTTERS AND DOWNSPOUTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pre-finished aluminum gutters and downspouts.

B. Cast Iron Downspout Boots

1.02 RELATED REQUIREMENTS

A. Section 076100 - Sheet Metal Roofing.

B. Section 076200 - Sheet Metal Flashing and Trim.

C. Section 099113 - Exterior Painting: Field painting of cast Iron metal surfaces.

D. Section 13 3423 - Metal Building Sytems, for gutters,downspouts,and splash blocks for metal buildings.

1.03 REFERENCE STANDARDS

A. AAMA 611 - Specification for Anodized Architectural Aluminum; 2024.

B. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.

C. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric); 2014.

D. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Conform to SMACNA (ASMM) for sizing components for rainfall intensity determined by a storm occurrence of 1 in 5 years.

B. Conform to applicable code for size and method of rain water discharge.

C. Maintain one copy of each document on site.

1.05 SUBMITTALS

A. Shop Drawings: Indicate locations, configurations, jointing methods, fastening methods, locations, and installation details.

B. Product Data: Provide data on prefabricated components.

C. Samples: Submit two samples, 12 inch (____ mm) long illustrating component design, finish, color, and configuration. Provide cutom fully welded down spout drain attached to gutter sample.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Stack material to prevent twisting, bending, or abrasion, and to provide ventilation. Slope to drain.

B. Prevent contact with materials that could cause discoloration, staining, or damage.

1.07 WARRANTIES:

A. Provide Workmanship Warranty with no monetary limitation where the contractor agrees to repair or replace components in the roofing system, which cause a leak due to a failure in workmanship.
   1. Duration: Five (5) years from the date of completion.

B. Manufacturer's finish warranty:
   1. Covering bare metal against rupture, structural failure and perforation due to normal atmospheric corrosion exposure.
   2. Covering panel finish against cracking, checking, blistering, peeling, flaking, chipping, chalking and fading.
   3. Duration: twenty (20) years

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Gutters and Collectors:
   1. Cheney Flashing Company; ____: www.cheneyflashing.com/#sle.
   2. SAF Perimeter Systems, a division of Southern Aluminum Finishing Company, Inc; ____: BASIS-OF-DESIGN: www.saf.com/persys.
   3. W.P. Hickman Company; Wind Resistant Gutter: www.wph.com.

2.02 MATERIALS

A. Pre-finished aluminum coated to recieve PVDF system, 040 gage thick metal for Gutters.

B. Custom Fluoropolymer Coat System: On exterior finish provide Polyvinylidene fluoride (PVDF) multi - Coat Thermoplastic fluoropolymer coating system, including 70% PVDF color topcoat and minimum dry film thickness of .9 mil. Color and gloss as selected by architect. Equal to KYNAR

C. Protective Backing Paint: Asphaltic mastic, ASTM D4479 Type I.

D. Protective Backing Paint: Asphaltic mastic ASTM D 4479 Type I.

2.03 COMPONENTS

A. Gutters: Profile as indicated.

B. Equal to SAF Perimeter Systems: Snap-on decorative fascia.

C. Fully Custom Welded Internal (1/4" thick aluminum wall) Pipe Drain: Threaded for attachment to plumbing roof drain.

D. Anchors and Supports: Profiled to suit gutters and downspouts.
   1. Anchoring Devices: In accordance with SMACNA requirements.
   2. Gutter Supports: Brackets.

E. Fasteners: Same material and finish as gutters and downspouts , with soft neoprene washers.

2.04 ACCESSORIES

A. Downspout Boots: Cast iron; ASTM A48.
   1. Manufacturers:
      a. Downspout boots equal to J. R. Hoe & Sons; ASTM A-48 class 30 gray iron, N-Series, Rubber couplings, stainless steel anchors, mounting lugs, side cleanout, : www.downspoutboots.com/#sle. Provide manufacturer's recommended stainless steel circular screw clamps for rubber couplings.
   2. Provide sizes as required to coordinate with downspout size and storm drainage piping size & elevation. Refer to civil drawings for additional requirenments.
   3. Paint all downspout boots. Color as selected by architect.

B. Provide all support brackets and straps to match material, finish, and thickness - unless manufacturer requires thicker material for specific application.

2.05 FABRICATION

A. Form gutters in size & profiles indicated on the drawings.

B. Fabricate with required connection pieces.

C. Form sections square, true, and accurate in size, in maximum possible lengths, free of distortion or defects detrimental to appearance or performance. Allow for expansion at joints.

D. Hem exposed edges of metal.

E. Fabricate gutter accessories; seal watertight.

2.06 FINISHES

A. Custom Fluoropolymer Coat System: Provide Polyvinylidene fluoride (PVDF) multi - Coat Thermoplastic fluoropolymer coating system, including 70% PVDF color topcoat and minimum

dry film thickness of .9 mil. Color and gloss as selected by architect. Provide up to 55 colors for architect's selection.

B. Primer Coat: Finish concealed side of metal sheets with primer compatible with finish system,

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that surfaces are ready to receive work.

3.02 PREPARATION

A. Paint concealed metal surfaces and surfaces in contact with dissimilar metals with protective backing paint to a minimum dry film thickness of 15 mil (0.4 mm).

3.03 INSTALLATION

A. Install gutters and accessories in accordance with manufacturer's instructions.

B. Sheet Metal: Join lengths with formed seams sealed watertight. Flash and seal gutters to downspouts and accessories.

C. Slope gutters 1/4 inch per foot (____ mm/m) .

D. Coordinate with all associate trades, especially on drain pipe sizes and compatable threads for water tight fit to plumbing roof drains.

E. Coordinate adjacent materials to prevent dissimilar metal reactions.

F. Coordinate downspout with structural, other building elements, and plumbing.

END OF SECTION

SECTION 077200
ROOF ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Roof curbs.

1.02 RELATED REQUIREMENTS

A. Section 077100 - Roof Specialties: Other manufactured roof specialty items.

1.03 REFERENCE STANDARDS

A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used.
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.
   4. Maintenance requirements.

C. Warranty Documentation:
   1. Submit manufacturer warranty.
   2. Ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 DELIVERY, STORAGE, AND HANDLING

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

B. Store products under cover and elevated above grade.

1.06 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide 1-year manufacturer warranty for Roof Curbs. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 ROOF CURBS

A. Roof Curbs Manufacturers:
   1. GREENHECK; GPS canted roof curb; https://www.greenheck.com/products/air-movement/curbs-mounting-accessories/standard-curbs

B. Roof Curbs Mounting Assemblies: Factory fabricated hollow sheet metal construction, internally reinforced, and capable of supporting superimposed live and dead loads and designated equipment load with fully mitered and sealed corner joints welded or mechanically fastened, and integral counterflashing with top and edges formed to shed water.
   1. Applications: Roof curbs used for roof penetrations/openings as indicated on drawings.
   2. Roof Curb Mounting Substrate: Curb substrate consists of flat roof deck sheathing with insulation on top of metal decking..
   3. Sheet Metal Material:
      a. Galvanized Steel: Hot-dip zinc coated steel sheet complying with ASTM A653/A653M, SS Grade 33 (230); G60 (Z180) coating designation; 16 gauge, .0635 inch (1.61 mm) thick.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using methods recommended by manufacturer for achieving acceptable results for applicable substrate under project conditions.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions, in manner that maintains roofing system weather-tight integrity.

SECTION 079200
JOINT SEALANTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Nonsag gunnable joint sealants.

B. Joint backings and accessories.

1.02 RELATED REQUIREMENTS

A. Section 016116 - Volatile Organic Compound (VOC) Content Restrictions: Additional requirements for sealants and primers.

B. Section 092116 - Gypsum Board Assemblies: Sealing acoustical and sound-rated walls and ceilings.

C. Section 093000 - Tiling: Sealant between tile and plumbing fixtures and at junctions with other materials and changes in plane.

1.03 REFERENCE STANDARDS

A. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018 (Reapproved 2024).

B. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2025.

C. ASTM C1248 - Standard Test Method for Staining of Porous Substrate by Joint Sealants; 2022.

D. ASTM C1330 - Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants; 2023.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Submit manufacturer's technical datasheets for each product to be used; include the following:

1. Physical characteristics, including movement capability, VOC content, hardness, cure time, and color availability.
2. List of backing materials approved for use with the specific product.
3. Backing material recommended by sealant manufacturer.
4. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
5. Substrates the product should not be used on.
6. Installation instructions, including precautions, limitations, and recommended backing materials and tools.
7. Sample product warranty.

C. Executed warranty.

1.05 QUALITY ASSURANCE

A. Maintain one copy of each referenced document covering installation requirements on site.

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

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

1.06 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide 2-year manufacturer warranty for installed sealants and accessories that fail to achieve a watertight seal, exhibit loss of adhesion or cohesion, or do not cure. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Nonsag Sealants:
   1. Dow; _____: www.dow.com/#sle.
   2. Pecora Corporation; _____: www.pecora.com/#sle.
   3. Sika Corporation; _____: usa.sika.com/#sle.

2.02 JOINT SEALANT APPLICATIONS

A. Scope:
   1. Exterior Joints:
      a. Seal open joints except open joints indicated on drawings as not sealed.
      b. Seal the following joints:
         1) Wall expansion and control joints.
         2) Joints between doors, windows, and other frames or adjacent construction.
         3) Joints between different exposed materials.
   2. Interior Joints:
      a. Seal open joints except specific open joints indicated on drawings as not sealed.
      b. Seal the following joints:
         1) Joints between door frames and window frames and adjacent construction.
   3. Do Not Seal:
      a. Intentional weep holes in masonry.
      b. Joints where sealant installation is specified in other sections.
      c. Joints between suspended ceilings and walls.

2.03 JOINT SEALANTS - GENERAL

A. Sealants and Primers: Provide products with acceptable levels of volatile organic compound (VOC) content; see Section 016116.

B. Colors: As selected by architect from manfacturer's standard range.

2.04 NONSAG JOINT SEALANTS

A. Nonstaining Silicone Sealant: ASTM C920, Grade NS, Uses M, A, G, and O; not expected to withstand continuous water immersion or traffic.
   1. Movement Capability: Plus 100 percent and minus 50 percent, minimum.
   2. Nonstaining to Porous Stone: Nonstaining to light-colored natural stone when tested in accordance with ASTM C1248.
   3. Dirt Pick-Up: Reduced dirt pick-up compared to other silicone sealants.
   4. Products:
      a. Dow; DOWSIL 790 Silicone Building Sealant: www.dow.com/#sle.
      b. Dow; DOWSIL 795 Silicone Building Sealant: www.dow.com/#sle.

B. Mildew-Resistant Silicone Sealant: ASTM C920, Grade NS, Uses M and A; single component, mildew resistant; not expected to withstand continuous water immersion or traffic.
   1. Color: White.
   2. Products:
      a. Pecora Corporation; Pecora 898 NST (Non-Staining Technology): www.pecora.com/#sle.
      b. Sika Corporation; Sikasil N Plus US: usa.sika.com/#sle.
      c. Sika Corporation; Sikasil GP: usa.sika.com/#sle.

C. Polymer Sealant: ASTM C920; single component, cured sealant is paintable and mold/mildew resistant, low odor and VOC, and ultraviolet (UV) resistant.
   1. Color: White.
   2. Products:
      a. DAP Products Inc; DYNAFLEX 800 Sealant: www.dapspecline.com/#sle.

2.05 ACCESSORIES

A. Sealant Backing Materials, General: Materials placed in joint before applying sealants; assists sealant performance and service life by developing optimum sealant profile and preventing three-sided adhesion; type and size recommended by sealant manufacturer for compatibility with sealant, substrate, and application.

B. Sealant Backing Rod, Closed-Cell Type:
   1. Cylindrical flexible sealant backings complying with ASTM C1330 Type C.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that joints are ready to receive work.

B. Verify that backing materials are compatible with sealants.

C. Verify that backer rods are of the correct size.

3.02 PREPARATION

A. Remove loose materials and foreign matter that could impair adhesion of sealant.

B. Clean joints, and prime as necessary, in accordance with manufacturer's instructions.

C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.

D. Mask elements and surfaces adjacent to joints from damage and disfigurement due to sealant work; be aware that sealant drips and smears may not be completely removable.

3.03 INSTALLATION

A. Install this work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.

B. Provide joint sealant installations complying with ASTM C1193.

C. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer, except where specific dimensions are indicated.

D. Install bond breaker backing tape where backer rod cannot be used.

E. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.

F. Do not install sealant when ambient temperature is outside manufacturer's recommended temperature range, or will be outside that range during the entire curing period, unless manufacturer's approval is obtained and instructions are followed.

G. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.

3.04 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements for additional requirements.

B. Remove and replace failed portions of sealants using same materials and procedures as indicated for original installation.

END OF SECTION

SECTION 081113
HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Steel doors and frames.

B. Hollow metal frames.

C. Thermally insulated steel doors.

D. Accessories

1.02 RELATED REQUIREMENTS

A. Section 08 7100 - Door Hardware

B. Section 08 8000 - Glazing

C. Section 08 1416 - Flush Wood Doors

D. Section 09 9123 - Interior Painting

E. Section 09 9113 - Exterior Painting

1.03 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design 2010.

B. ANSI/ICC A117.1 - American National Standard for Accessible and Usable Buildings and Facilities; International Code Council; 2009.

C. ANSI/SDI A250.3 - Test Procedure and Acceptance Criteria for Factory Applied Finish Coatings for Steel Doors and Frames 2007 (R2011).

D. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors 2011.

E. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100) 2014.

F. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames 2011.

G. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2015.

H. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable 2015.

I. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength 2014.

J. ASTM C236 - Standard Test Method for Steady-State Thermal Performance of Building Assemblies by Means of a Guarded Hot Box; 1989 (Reapproved 1993).

K. ASTM C1363 - Standard Test Method for Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus; 2011.

L. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements 2009.

M. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference 2014.

N. ASTM E413 - Classification for Rating Sound Insulation 2010.

O. BHMA A156.115 - American National Standard for Hardware Preparation in Steel Doors and Steel Frames 2014.

P. FEMA P-361 - Safe Rooms for Tornadoes and Hurricanes: Guidance for Community and Residential Safe Rooms 2015.

Q. FLA (PAD) - Florida Building Code Online - Product Approval Directory database at www.floridabuilding.org.

R. ICC 500 - ICC/NSSA Standard for the Design and Construction of Storm Shelters; National Storm Shelter Association 2014.

S. ICC A117.1 - Accessible and Usable Buildings and Facilities 2009.

T. ITS (DIR) - Directory of Listed Products current edition.

U. Miami (APD) - Approved Products Directory; Miami-Dade County database at www.miamidade.gov/development/product-control.asp.

V. NAAMM HMMA 805 - Recommended Selection and Usage Guide for Hollow Metal Doors and Frames 2012.

W. NAAMM HMMA 830 - Hardware Selection for Hollow Metal Doors and Frames 2002.

X. NAAMM HMMA 831 - Hardware Locations for Hollow Metal Doors and Frames 2011.

Y. NAAMM HMMA 840 - Guide Specifications for Installation and Storage of Hollow Metal Doors and Frames 2007.

Z. NAAMM HMMA 860 - Guide Specifications for Hollow Metal Doors and Frames 2013.

AA. NAAMM HMMA 861 - Guide Specifications for Commercial Hollow Metal Doors and Frames 2006.

BB. NFPA 80 - Standard for Fire Doors and Other Opening Protectives 2016.

CC. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies 2012.

DD. UL (DIR) - Online Certifications Directory current listings at database.ul.com.

EE. UBC Std 7-2, Part II - Test Standard for Smoke- and Draft-control Assemblies; International Conference of Building Officials; 1997.

FF. UL (BMD) - Building Materials Directory; Underwriters Laboratories Inc.; current edition.

GG. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies Current Edition, Including All Revisions.

HH. UL 1784 - Standard for Air Leakage Tests of Door Assemblies Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Door Hardware supplier to furnish templates, template reference number and/or physical hardware to steel door and frame supplier.

C. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes; and one copy of referenced standards/guidelines.

D. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and any indicated finish requirements.

E. Installation Instructions: Manufacturer's published instructions, including any special installation instructions relating to this project.

F. VERIFICATION SAMPLES: Are required by request of Architect.

1.05 QUALITY ASSURANCE

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

B. Copies of Documents at Project Site: Maintain at the project site a copy of each referenced document that prescribes installation requirements.

C. Pre-submittal conference with supplier, installer, contractor for coordination of associated trades.

D. Verify field conditions and measurements of openings and wall thickness prior to fabrication.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Comply with NAAMM HMMA 840 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.

B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion and adverse effects on factory applied painted finish.

C. Stone hollow metal at project site. Place in stacks of five units with 1/4" space between each stacked door.

1.07 WARRANTY

A. Standard warranty to include installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Hollow Metal Doors and Frames:
   1. Mesker Door
   2. Ceco Door, an Assa Abloy Group company: www.assaabloydss.com/#sle.
   3. Steelcraft: www.steelcraft.com.
   4. Substitutions: See Section 01 6000 - Product Requirements.

2.02 DESIGN CRITERIA

A. Requirements for Hollow Metal Doors and Frames:
   1. Steel used for fabrication of doors and frames shall comply with one or more of the following requirements; Galvannealed steel conforming to ASTM A653/A653M, cold-rolled steel conforming to ASTM A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel conforming to ASTM A1011/A1011M, Commercial Steel (CS) Type B for each.
   2. Accessibility: Comply with ICC A117.1 and ADA Standards.
   3. Door Edge Profile: Manufacturers standard for application indicated.
   4. Glazed Lights: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings. Style: Manufacturers standard.
   5. Hardware Preparations, Selections and Locations: Comply with NAAMM HMMA 830 and NAAMM HMMA 831 or BHMA A156.115 and ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
   6. Finish: Factory primed, for field finishing.

B. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.

2.03 HOLLOW METAL DOORS

A. Exterior Doors: unless noted otherwise.
   1. Based on NAAMM HMMA Custom Guidelines:
      a. Comply with guidelines of NAAMM HMMA 860 for Hollow Metal Doors and Frames.
      b. Performance Level 3 - Extra Heavy Duty, in accordance with NAAMM HMMA 805.
      c. Physical Performance Level B, 500,000 cycles; in accordance with ANSI/SDI A250.4.
      d. Door Face Metal Thickness: 16 gage, 0.053 inch (1.3 mm), minimum.
      e. Zinc Coating: G90/Z275 galvanized coating; ASTM A653/A653M.
   2. Core Material: Polystyrene, 1 lbs/cu ft minimum density.

3. Door Thickness: 1-3/4 inch (44.5 mm), nominal.
4. Door Face Sheets: Flush.
5. Insulating Value: U-value of 0.166, when tested in accordance with ASTM C 518 .
6. Weatherstripping: Refer to Section 08 7100.
7. Door Finish: Factory primed and field finished.

B. Interior Doors : unless noted otherwise.
1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
a. Level 2 - Heavy-duty.
b. Physical Performance Level B, 500,000 cycles; in accordance with ANSI/SDI A250.4.
c. Model 1 - Full Flush.
d. Door Face Metal Thickness: 18 gage, 0.042 inch (1.0 mm), minimum.
2. Core Material: Manufacturers standard core material/construction and in compliance with requirements.
3. Door Thickness: 1-3/4 inch (44.5 mm), nominal.
4. Texture: Smooth faces.
5. Door Finish: Factory primed and field finished.

2.04 HOLLOW METAL FRAMES

A. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.

B. General:
1. Comply with the requirements of grade and gauge specified for corresponding door, except:
2. Finish: Same as for door.
3. Provide shop mitered and welded corners for all new frames in new wall openings.
4. For openings to remain, prep door frame as recommended by paint supplier, strip existing coating if necessary, sand existing finish smooth, and provide new two coat paint top coat as specified in section 09 9000.

C. Exterior Door Frames: Fully welded unless specifically noted otherwise.
1. Galvanizing: Components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A653/A653M, with A40/ZF120 coating.
2. Frame Metal Thickness: 16 gage, 0.053 inch (1.7 mm), minimum.
3. Frame Finish: Factory primed and field finished.
4. Weatherstripping: Separate, see Section 08 7100.

D. Interior Door Frames, Non-Fire Rated: Full profile/continuously welded type.
1. Frame Metal Thickness: 16 gage, 0.053 inch (1.3 mm), minimum.
2. Finish: Factory primed, for field finishing.
3. Provide fully welded frames at all new door openings in new wall assemblies.

E. Door Frames, Fire-Rated: Full profile/continuously welded type.
1. Fire Rating: Same as door, labeled.
2. Frame Metal Thickness: 16 gage, 0.053 inch (1.3 mm), minimum.
3. Frame Finish: Factory primed, for field finish.

F. Borrowed Lites Glazing Frames: Construction and face dimensions to match door frames, and as indicated on drawings.

G. Transom Bars: Fixed, of profile same as jamb and head.

2.05 ACCESSORIES

A. Glazing: As specified in Section 08 8000, factory installed.

B. Removable Stops: Formed sheet steel, shape as indicated on drawings, mitered or butted corners; prepared for countersink style tamper proof screws.

C. Astragals for Double Doors: Specified in Section 08 7100.

D. Silencers: Resilient rubber, fitted into drilled hole; 3 on strike side of single door, 3 on center mullion of pairs, and 2 on head of pairs without center mullions.

E. Temporary Frame Spreaders: Provide for factory- or shop-assembled frames.

F. Mullions.

2.06 FINISHES

A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.

B. Bituminous Coating: Asphalt emulsion or other high-build, water-resistant, resilient coating.

C. Finish: Refer to specification Section 09 9113, Exterior Painting and Section 09 9123 Interior Painting.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions, including but not limited to wall types, wall thicknesses, and openings before starting work.

B. Verify that opening sizes and tolerances are acceptable.

C. Verify that finished walls are in plane to ensure proper door alignment.

3.02 PREPARATION

A. Coat inside of frames to be installed in masonry or to be grouted, with bituminous coating, prior to installation.

B. Coat inside of other frames with bituminous coating to a thickness of 1/16 inch (1.6 mm).

3.03 INSTALLATION

A. Install doors and frames in accordance with manufacturer's instructions and related requirements of specified door and frame standards or custom guidelines indicated.

B. Install fire rated units in accordance with NFPA 80.

C. Provide and install frame anchors at all new doors. Minimum three anchors each jamb.

D. Coordinate frame anchor placement with wall construction.

E. Grout frames in masonry construction, using hand trowel methods; brace frames so that pressure of grout before setting will not deform frames.

F. Coordinate installation of hardware.

G. Coordinate installation of glazing.

H. Coordinate installation of electrical connections to electrical hardware items.

I. Touch up damaged factory finishes.

3.04 TOLERANCES

A. Clearances Between Door and Frame: Comply with related requirements of specified door and frame standards or custom guidelines indicated.

B. Maximum Diagonal Distortion: 1/16 in (1.5 mm) measured with straight edge, corner to corner.

3.05 ADJUSTING AND CLEANING

A. Adjust for smooth and balanced door movement.

B. Adjust sound control doors so that seals are fully engaged when door is closed.

C. Clean all doors and frames.

D. Test sound control doors for force to close, latch, and unlatch; adjust as necessary in compliance with requirements.

END OF SECTION

SECTION 081416
FLUSH WOOD DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Flush wood doors; flush configuration; non-rated.

1.02 RELATED REQUIREMENTS

A. Section 081113 - Hollow Metal Doors and Frames.

B. Section 087100 - Door Hardware.

1.03 REFERENCE STANDARDS

A. ASTM E413 - Classification for Rating Sound Insulation; 2022.

B. AWI (QCP) - Quality Certification Program; Current Edition.

C. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).

D. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards; 2021, with Errata.

E. UL (BMD) - Building Materials Directory; Underwriters Laboratories Inc.; current edition.

F. WDMA I.S. 1A - Interior Architectural Wood Flush Doors; 2021, with Errata (2022).

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Indicate door core materials and construction; veneer species, type and characteristics.

C. Shop Drawings: Show doors and frames, elevations, sizes, types, swings, undercuts, beveling, blocking for hardware, factory machining, factory finishing, cutouts for glazing and other details.

D. Samples: Submit two samples of door veneer, 6 by 6 inch (____ by ____ mm) in size illustrating wood grain, stain color, and sheen.

E. Manufacturer's Installation Instructions: Indicate special installation instructions.

F. Warranty, executed in Owner's name.

G. Accept doors on site in manufacturer's packaging. Inspect for damage.

H. Protect doors with resilient packaging sealed with heat shrunk plastic. Do not store in damp or wet areas; or in areas where sunlight might bleach veneer. Seal top and bottom edges with tinted sealer if stored more than one week. Break seal on site to permit ventilation.

1.05 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Interior Doors: Provide manufacturer's warranty for the life of the installation.

C. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Wood Veneer Faced Doors:
   1. Graham Wood Doors: www.grahamdoors.com.
   2. Eggers Industries; ____: www.eggersindustries.com/#sle.
   3. Marshfield DoorSystems, Inc; ____: www.marshfielddoors.com/#sle.
   4. Oshkosh; www.oshkoshdoor.com.
   5. Substitutions: See Section 016000 - Product Requirements.

2.02 DOORS AND PANELS

A. Doors: Refer to drawings for locations and additional requirements.
   1. Quality Standard: Custom Grade, Heavy Duty performance, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.
   2. Wood Veneer Faced Doors: 7-ply unless otherwise indicated.

B. Interior Doors: 1-3/4 inches (44 mm) thick unless otherwise indicated; flush construction.
   1. Provide solid core doors at all locations.

2.03 DOOR AND PANEL CORES

A. Non-Rated Solid Core and Doors: Type staved lumber core (SLC), plies and faces as indicated above.

2.04 DOOR FACINGS

A. Veneer Facing for Transparent Finish: Select White oak, veneer grade in accordance with quality standard indicated, plain sliced (flat cut), with book match between leaves of veneer, running match of spliced veneer leaves assembled on door or panel face.
   1. Vertical Edges: Same species as face veneer.
   2. "Pair Match" each pair of doors; "Set Match" pairs of doors within 10 feet (3 m) of each other when doors are closed.

B. Facing Adhesive: Type I - waterproof.

2.05 DOOR CONSTRUCTION

A. Fabricate doors in accordance with door quality standard specified.

B. Cores Constructed with stiles and rails:
   1. Provide solid blocks at lock edge and top of door for closer for hardware reinforcement.
   2. Provide solid blocking for other throughbolted hardware.

C. Factory machine doors for hardware other than surface-mounted hardware, in accordance with hardware requirements and dimensions.

D. Factory fit doors for frame opening dimensions identified on shop drawings, with edge clearances in accordance with specified quality standard.
   1. Exception: Doors to be field finished.

E. Provide edge clearances in accordance with the quality standard specified.

2.06 ACCESSORIES

A. Hollow Metal Door Frames: As specified in Section 081113.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

C. Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.

3.02 INSTALLATION

A. Install doors in accordance with manufacturer's instructions and specified quality standard.

B. Use machine tools to cut or drill for hardware.

C. Coordinate installation of doors with installation of frames and hardware.

3.03 TOLERANCES

A. Conform to specified quality standard for fit and clearance tolerances.

B. Conform to specified quality standard for telegraphing, warp, and squareness.

3.04 ADJUSTING

A. Adjust doors for smooth and balanced door movement.

B. Adjust closers for full closure.

END OF SECTION

SECTION 083400
– SPECIAL FUNCTION DOORS

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2016.

B. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

C. NFPA 105 - Standard for Smoke Door Assemblies and Other Opening Protectives; 2025.

D. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2022.

E. UL 1784 - Standard for Air Leakage Tests of Door Assemblies; Current Edition, Including All Revisions.

1.02 RELATED DOCUMENTS

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

1.03 SUMMARY

A. Section includes:
   1. Interior Aluminum-Framed Top-Hung Sliding Doors

B. Related Sections:
   1. Section 08 14 16 – Flush Wood Doors
   2. Section 08 13 16 – Aluminum Doors

1.04 REFERENCES

A. ANSI – American National Standards Institute
   1. ANSI 156.18 Materials and Finishes
   2. ANSI A117.1 Specifications for making buildings and facilities usable by physically handicapped people.

B. BHMA – Builders Hardware Manufacturers Association

C. DHI – Door and Hardware Institute

D. NFPA – National Fire Protection Association
   1. NFPA 80 – Fire Doors and Windows
   2. NFPA 101 – Life Safety code
   3. NFPA 105 – Smoke and Draft Control Door Assemblies
   4. NFPA 252 – Fire Tests of Doors Assemblies

E. AWS – Architectural Woodwork Standards

1.05 SUBMITTALS

A. Comply with Section 01 33 00 – Submittal Procedures

B. Product Data: Submit manufacturer’s product data, including installation instructions.

C. Shop Drawings: Submit manufacturer’s shop drawings, including plans, elevations, sections, and details, indicating dimensions, tolerances, materials, components, hardware, finish, options, and accessories. Shop Drawings to show required blocking by others.

D. Samples: Submit manufacturer’s samples of the following sliding door components:
   1. Door veneer or laminate sample.
   2. Aluminum Frame finish sample.

E. Manufacturer’s Certification: Submit manufacturer’s certification that materials comply with specified requirements and are suitable for intended application.

F. Warranty Documentation: Submit manufacturer’s standard warranty.

G. Test Reports: Submit acoustical reports or UL 1784 as applicable.

1.06 QUALITY ASSURANCE

A. Product Options: Drawings indicate size, profiles, and dimensional requirements of interior aluminum frames and doors.

B. Source: Obtain sliding aluminum framed doors and hardware from single source.

C. Manufacturer's Qualifications: Manufacturer regularly engaged for past 5 years in manufacture of sliding doors similar to that specified.

1.07 PERFORMANCE

A. Aluminum perimeter frames with integral acoustic seals at all door/frame interfaces
   1. Architect to verify frame thickness suitable for required application

B. Soft-closing mechanism at both sides of door integrated with top track. Soft Closers tested to a minimum of 150,000 cycles.

C. Concealed door guide.

D. Manufacturer to 3rd party acoustical performance test data

E. Manufacturer to submit 3rd party test data on air infiltration and/or smoke ratings as applicable

1.08 DELIVERY, STORAGE, AND HANDLING

A. Delivery and Acceptance Requirements: Deliver materials to site in manufacturer’s original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.

B. Notify manufacturer immediately of any shipping damage.

C. Storage and Handling Requirements:
   1. Store and handle materials in accordance with manufacturer’s instructions.
   2. Keep materials in manufacturer’s original, unopened containers and packaging until installation.
   3. Store materials in clean, dry area indoors.
   4. Protect materials and finish during storage, handling, and installation to prevent damage.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. AD SYSTEMS 2201 100th St. SW, Everett, WA 98204 | Website: http://specADsystems.com | Phone: 425-740-6011 | ADSystems.Estimating@allegion.com

2.02 INTERIOR SLIDING ALUMINUM-FRAMED DOORS AND PARTITIONS

A. Manufacturer:
   1. Scheduled Manufacturer: OfficeSlide™ High Performance Barn (Sliding) Door System by AD Systems.
   2. Acceptable Substitute: No Substitution.

B. Specified Wall Thickness 4-7/8”

C. Frame Profiles: Extruded aluminum frame “wrap” frame with integral vertical jamb (stile pocket).

D. Finish:
   1. Custom Stain Finish: See finish schedule.

E. Frame Profiles: Extruded aluminum frame “wrap” frame with integral vertical jamb (stile pocket).
   1. Profile Dimensions:
      a. Full Depth Mullion and Sill] (Option B in sample drawings)

F. Door Leaves: all Doors to be factory machined for hardware including pilot and function holes.
   1. 1-3/4" Flush Wood Door: Reference Spec Section 08 14 16 Wood Doors or other section as applicable.

G. Door Components:

1. Single Top Track: AD Systems extruded aluminum track by AD Systems
2. Valances: Extruded aluminum with integral end caps
3. Top Rollers: tandem nylon roller sized to match door weight.
4. Soft-Closers: Soft-closing dampener mechanism at both sides of door leaf
5. Demonstrate closers as tested to 150k cycles.
6. Pull Handles:
   a. AD Systems Standard Straight Pull: 12” long x 1” diameter. Finish: US32D Satin Stainless Steel.

H. Door Locks (Optional):

1. Deadbolt Lock.

Finish: US32D Standard, other finishes available

a. AD5450 Office—Keyed lock deadbolt with cylinder and ADA compliant thumbturn

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine wall openings to receive sliding doors for plumb, level, and square. Note: Finish door operation will be affected by out of tolerance framing.

B. Verify dimensions of wall openings.

C. Examine surfaces to receive top and bottom guide.

D. Notify Architect of conditions that would adversely affect installation or subsequent use of sliding doors.

E. Do not begin installation until unacceptable conditions are corrected.

F. Base of door side to be flush or minimal. Rubber Base acceptable.

3.02 INSTALLATION

A. Install sliding doors in accordance with manufacturer’s instructions at locations indicated on the Drawings.

B. Install sliding doors plumb, level, square, and in proper alignment.

C. Install sliding doors to close against walls without gaps.

D. Install sliding doors to open and close smoothly.

E. Anchor sliding doors securely in place to supports. Required: Fire treated 2 x 6 blocking required full length of track.

3.03 ADJUSTING

A. Adjust sliding doors for proper operation in accordance with manufacturer’s instructions.

B. Adjust sliding doors to operate smoothly without binding.

C. Repair minor damages to finish in accordance with manufacturer’s instructions and as approved by Architect.

3.04 CLEANING

A. Clean sliding doors promptly after installation in accordance with manufacturer’s instructions.

B. Do not use harsh cleaning materials or methods that could damage materials or finish.

3.05 PROTECTION

A. Protect installed sliding doors from damage during construction.

END OF SECTION

SECTION 084313
ALUMINUM-FRAMED STOREFRONTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Aluminum-framed storefront, with vision glass.

B. Aluminum doors and frames.

1.02 RELATED REQUIREMENTS

A. Section 072500 - Weather Barriers: Sealing framing to weather barrier installed on adjacent construction.

B. Section 079200 - Joint Sealants: Sealing joints between frames and adjacent construction.

C. Section 087100 - Door Hardware: Hardware items other than specified in this section.

D. Section 088000 - Glazing: Glass and glazing accessories.

1.03 REFERENCE STANDARDS

A. AAMA CW-10 - Care and Handling of Architectural Aluminum from Shop to Site; 2015.

B. AAMA 501.2 - Quality Assurance and Diagnostic Water Leakage Field Check of Installed Storefronts, Curtain Walls, and Sloped Glazing Systems; 2025.

C. AAMA 611 - Specification for Anodized Architectural Aluminum; 2024.

D. AAMA 612 - Voluntary Specification, Performance Requirements, and Test Procedures for Combined Coatings of Anodic Oxide and Transparent Organic Coatings on Architectural Aluminum; 2020, with Errata (2022).

E. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.

F. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.

G. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

H. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.

I. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2004 (Reapproved 2012).

J. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2014 (Reapproved 2021).

K. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000 (Reapproved 2023).

L. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000 (Reapproved 2009).

M. ASTM E1105 - Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference; 2015 (Reapproved 2023).

N. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); 2002 (Ed. 2004).

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate with installation of other components that comprise the exterior enclosure.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, door hardware, and internal drainage details.

C. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related work, expansion and contraction joint location and details, and field welding required.

D. Samples: Submit two samples 12 by 12 inches (____by____ mm) in size illustrating finished aluminum surface, glass, glazing materials.

E. Hardware Schedule: Complete itemization of each item of hardware to be provided for each door, cross-referenced to door identification numbers in Contract Documents.

F. Field Quality Control Submittals: Report of field testing for water penetration and air leakage.

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

H. Installation instructions of manufacturer's system.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.

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

C. The contractor shall be responsible for coordinating and holding a pre-instllation conference. The required attendees shall be the Contractor, all related sub-contractors, the waterproofing subcontractor, project manager, and superintendent, and the waterproofing manufacturer’s representative, the Owner, and Architect. Topics to be discussed include, but are not limited to delivery dates, specialty contractor skill sets and capabilities, work schedules, and approved submittals.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Handle products of this section in accordance with AAMA CW-10.

B. Protect finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond to aluminum when exposed to sunlight or weather.

1.08 FIELD CONDITIONS

A. Do not install sealants when ambient temperature is less than 40 degrees F (5 degrees C). Maintain this minimum temperature during and 48 hours after installation.

1.09 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 BASIS OF DESIGN

A. Center-Set Style, Thermally-Broken:
   1. Basis of Design: Equal to Kawneer 451t Series.
   2. Mullion Dimensions: 2 inches wide by 4-1/2 inches deep (50 mm wide by 114 mm deep).

2.02 BASIS OF DESIGN -- SWINGING DOORS

A. Wide Stile, Insulating Glazing, Thermally-Broken:
   1. Basis of Design: Kawneer Insulcald 560 Wide Stile with 10" bottom rail..

B. Substitutions: See Section 016000 - Product Requirements.

1. For any product not identified as "Basis of Design", submit information as specified for substitutions.

2.03 MANUFACTURERS

A. Aluminum-Framed Storefront and Doors:
   1. EFCO Corporation; Series 403T: www.efcocorp.com/sle.
   2. Kawneer North America; 451T: www.kawneer.com.
   3. Oldcastle BuildingEnvelope; Series 300 multiplane: https://www.obe.com/

2.04 ALUMINUM-FRAMED STOREFRONT

A. Aluminum-Framed Storefront: Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.
   1. Glazing Rabbet: For 1 inch (25 mm) insulating glazing.
   2. Finish: High performance organic coatings.
      a. Factory finish all surfaces that will be exposed in completed assemblies.
      b. Touch-up surfaces cut during fabrication so that no natural aluminum is visible in completed assemblies, including joint edges.
      c. Coat concealed metal surfaces that will be in contact with cementitious materials or dissimilar metals with bituminous paint.
   3. Finish Color: As selected by Architect from manufacturer's standard line.
   4. Fabrication: Joints and corners flush, hairline, and weatherproof, accurately fitted and secured; prepared to receive anchors and hardware; fasteners and attachments concealed from view; reinforced as required for imposed loads.
   5. Construction: Eliminate noises caused by wind and thermal movement, prevent vibration harmonics, and prevent "stack effect" in internal spaces.
   6. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.
   7. Expansion/Contraction: Provide for expansion and contraction within system components caused by cycling temperature range of 170 degrees F (95 degrees C) over a 12 hour period without causing detrimental effect to system components, anchorages, and other building elements.
   8. Movement: Allow for movement between storefront and adjacent construction, without damage to components or deterioration of seals.
   9. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.

B. Performance Requirements:
      a. Design Wind Loads: Comply with requirements of ASCE 7.
      b. Member Deflection: Limit member deflection to flexure limit of glass in any direction, with full recovery of glazing materials.
   2. Air Leakage Laboratory Test: Maximum of 0.06 cu ft/min sq ft (0.3 L/sec sq m) of wall area, when tested in accordance with ASTM E283 at 6.27 psf (300 Pa) pressure differential across assembly.
   3. Overall U-value Including Glazing: 0.44 Btu/(hr sq ft deg F) (W/(sq m K)), maximum.

2.05 COMPONENTS

A. Aluminum Framing Members: Tubular aluminum sections, drainage holes and internal weep drainage system.
   1. Glazing Stops: Flush.
   2. Cross-Section: As indicated on drawings.
   3. Structurally Reinforced Members: Extruded aluminum with internal reinforcement of structural steel member.

B. Glazing: As specified in Section 088000.

C. Swing Doors: Glazed aluminum - Thermally Broken

1. Thickness: 2-1/4 inches (50 mm).
2. Top Rail: 5 inches (____ mm) wide.
3. Vertical Stiles: 6 1/2 inches (____ mm) wide.
4. Bottom Rail: 10 inches (254 mm) wide.
5. Glazing Stops: Beveled. Color to be selected by Architect.
6. Finish: Same as storefront.
7. Equal to Kawneer Insulclad 560 Wide Stile Entrance.

2.06 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M).

B. Fasteners: Stainless steel.

C. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.

D. Glazing Accessories: As specified in Section 088000.

E. HP (High Performance) sill, with incorporated screw-applied end dams, ensuring positive engagement and tight joints between the sill flashing and end dam.

2.07 FINISHES

A. Color: As selected by Architect from manufacturer's standard range.

B. Touch-Up Materials: As recommended by coating manufacturer for field application.

2.08 HARDWARE

A. For each door, include weatherstripping and sill sweep strip.

B. Other Door Hardware: As specified in Section 08 7100 - Door Hardware.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify dimensions, tolerances, and method of attachment with other work.

B. Verify that wall openings and adjoining air and vapor seal materials are ready to receive work of this section.

3.02 INSTALLATION

A. Install wall system in accordance with manufacturer's instructions.

B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.

C. Provide alignment attachments and shims to permanently fasten system to building structure.

D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.

E. Provide thermal isolation where components penetrate or disrupt building insulation.

F. Install sill flashings. Turn up ends and edges; seal to adjacent work to form water tight dam.

G. Where fasteners penetrate sill flashings, make watertight by seating and sealing fastener heads to sill flashing.

H. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

I. Set thresholds in bed of sealant and secure.

J. Install hardware using templates provided.
   1. See Section 087100 for hardware installation requirements.

K. Install glass in accordance with Section 088000, using glazing method required to achieve performance criteria.

L. Install perimeter sealant in accordance with Section 07 9200.

M. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

3.03 TOLERANCES

A. Maximum Variation from Plumb: 0.06 inch per 3 feet (1.5 mm per m) non-cumulative or 0.06 inch per 10 feet (1.5 mm per 3 m), whichever is less.

B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch (0.8 mm).

3.04 FIELD QUALITY CONTROL

A. Water-Spray Test: Provide water spray quality test of installed storefront components in accordance with AAMA 501.2 during construction process and before installation of interior finishes.
   1. Perform a minimum of two tests in each designated area as indicated on drawings.
   2. Conduct tests in each area prior to 10 percent and 50 percent completion of this work.

B. Test 100 linear feet of exterior storefront systems installed with perimeter sealant cured. If test fails, retest the 100 linear feet plus additional linear feet as selected by the Architect/Waterproof Consultant. Additional testing shall be the glazing subcontractors responsibility.

3.05 ADJUSTING

A. Adjust operating hardware and sash for smooth operation.

3.06 CLEANING

A. Remove protective material from pre-finished aluminum surfaces.

3.07 PROTECTION

A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION

SECTION 085213
ULTIMATE CASEMENT/AWNING PUSH OUT COLLECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Ultimate Casement/Awning Push Out: Operators, Stationary and Picture units complete with hardware, glazing, weather strip, insect screen, removable screen, grilles-between-the-glass, simulated divided lite, jamb extension, and standard or specified anchors, trim and attachments

B. Ultimate Casement/Awning Push Out: Bow and Bay units: Operators, Stationary and Picture units complete with hardware, glazing, weather strip, insect screen, removable screen, grilles-between-the-glass, simulated divided lite, jamb extension, head/seat board and standard or specified anchors, trim and attachments

C. Ultimate Casement/Awning Narrow Frame Push Out: Operators, Stationary and Picture units complete with hardware, glazing, weather strip, insect screen, removable screen, grilles-between-the-glass, simulated divided lite, jamb extension, and standard or specified anchors, trim and attachments

1.02 REFERENCE STANDARDS

A. AAMA 502 - Voluntary Specification for Field Testing of Newly Installed Fenestration Products; 2021.

B. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.

C. AAMA/WDMA/CSA 101/I.S.2/A440 - North American Fenestration Standard/Specification for Windows, Doors, and Skylights; 2022, with Errata (2023).

D. ASTM C1036 - Standard Specification for Flat Glass; 2025.

E. ASTM E1105 - Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference; 2015 (Reapproved 2023).

F. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation; 2019.

G. ASTM F2090 - Standard Specification for Window Fall Prevention Devices with Emergency Escape (Egress) Release Mechanisms; 2021.

H. WDMA I.S. 4 - Industry Specification for Preservative Treatment for Millwork; 2024.

1.03 CONSTRUCTION SPECIFICATION INSTITUTE (CSI) MASTERFORMAT NUMBERS AND TITLES

A. Section 01 33 00 – Submittal Procedures; Shop Drawings, Product Data and Samples

B. Section 01 62 00 – Product Options

C. Section 01 65 00 – Product Delivery

D. Section 01 66 00 – Storage and Handling Requirements

E. Section 01 71 00 – Examination and Preparation

F. Section 01 73 00 - Execution

G. Section 01 74 00 – Cleaning and Waste Management

H. Section 01 76 00 – Protecting Installed Construction

I. Section 06 22 00 – Millwork: Wood trim other than furnished by window manufacturer

J. Section 07 92 00 – Joint Sealant: Sill sealant and perimeter caulking

K. Section 09 90 00 – Painting and Coatings: Paint and stain other than factory-applied finish

1.04 REFERENCES

A. American Society for Testing Materials (ASTM):
   1. E 283: Standard Test Method for Rate of Air Leakage through Exterior Windows, Curtain Walls and Doors
   2. E 330: Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls and Door by Uniform Static Air Pressure Difference
   3. E 547: Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls and Doors by Cyclic Static Air Pressure Differential
   4. E2112: Standard Practice for Installation of Exterior Windows, Doors, and Skylights
   5. E 2190: Specification for Sealed Insulated Glass Units
   6. C 1036: Standard Specification for Flat Glass
   7. F 2090-10: Standard Specifications for Windows Fall Prevention Devices with Emergency Escape (egress) Release Mechanisms

B. American Architectural Manufacturer's Association/Window and Door Manufacturer's Association (AAMA/WDMA/CSA):
   1. AAMA/WDMA/CSA 101/I.S.2/A440-08, NAFS – North American Fenestration Standard/Specification for Windows, Doors and Skylights
   2. AAMA/WDMA/CSA 101/I.S.2/A440-11, NAFS 2011 – Northern American Fenestration Standard/Specification for Windows, Doors and Skylights

C. WDMA I.S. 4: Industry Standard for Water Repellant Preservative Treatment for Millwork

D. Window and Door Manufacturer's Association (WDMA): 101/I.S.2 WDMA Hallmark Certification Program

E. Sealed Insulating Glass Manufacturer's Association/Insulating Glass Certification Council (SIGMA/IGCC)

F. American Architectural Manufacturer's Association (AAMA): 2605: Voluntary Specification for High Performance Organic Coatings on Architectural Extrusions and Panels

G. National Fenestration Rating Council (NFRC):
   1. 101: Procedure for Determining Fenestration Product Thermal Properties
   2. 200: Procedure for Determining Solar Heat Gain Coefficients at Normal Incidence

1.05 SUBMITTALS

A. Shop Drawings: Submit shop drawings under provision of CSI MasterFormat Section 01 33 00.

B. Product Data: Submit product data for certified options under provisions of CSI MasterFormat Section 01 33 00. Product performance rating information may be provided via quote, performance rating (NFRC Data), or certified performance grade summary (WDMA Hallmark data).

C. Samples:
   1. Submit corner section under provision of CSI MasterFormat Section 01 33 00.
   2. Specified performance and design requirements under provisions of CSI MasterFormat Section 01 33 00.

1.06 QUALITY ASSURANCE

A. Requirements: consult local code for IBC International Building Code and IRC International Residential Code adoption year and pertinent revisions for information on:
   1. Egress, emergency escape and rescue requirements
   2. Basement window requirements
   3. Windows fall prevention and/or window opening control device requirements

1.07 DELIVERY

A. Comply with provisions of CSI MasterFormat Section 01 65 00

B. Deliver in original packaging and protect from weather

1.08 STORAGE AND HANDLING

A. Prime and seal wood surfaces, including to be concealed by wall construction, if more than thirty (30) days will expire between delivery and installation

B. Store window units in an upright position in a clean and dry storage area above ground to protect from weather under provision of CSI MasterFormat Section 01660

1.09 WARRANTY

COMPLETE AND CURRENT WARRANTY INFORMATION IS AVAILABLE AT MARVIN.COM/WARRANTY. THE FOLLOWING SUMMARY IS SUBJECT TO THE TERMS, CONDITIONS, LIMITATIONS AND EXCLUSIONS SET FORTH IN THE MARVIN WINDOWS AND DOOR LIMITED WARRANTY AND PRODUCTS IN COASTAL ENVIRONMENTS LIMITED WARRANTY SUPPLEMENT:

A. Clear insulating glass with stainless steel spacers is warranted against seal failure caused by manufacturing defects and resulting in visible obstruction through the glass for twenty (20) years from the original date of purchase. Glass is warranted against stress cracks caused by manufacturing defects from ten (10) years from the original date of purchase.

B. Standard exterior aluminum cladding finish is warranted against manufacturing defects resulting in chalk, fade and loss of adhesion (peel) per the American Architectural Manufacturer's Association (AAMA) Specification 2605-11 Section 8.4 and 8.9 for twenty (20) years from the original date of purchase.

C. Factory-applied interior finish is warranted to be free from finish defects for a period of five (5) years from the original date of purchase.

D. Hardware and other non-glass components are warranted to be free from manufacturing defects for ten (10) years from the original date of purchase.

PART 2 PRODUCTS

3.01 MANUFACTURED UNITS

A. Description: Factory-assembled Ultimate Casement/Awning Push Out, operating exterior swing window on Casement and a top pivoting awning (stationary or picture units) as manufactured by Marvin, Warroad, Minnesota.

B. Description: Factory-assembled Ultimate Casement/Awning Narrow Frame Push Out, operating exterior swing window on Casement and a top pivoting awning (stationary or picture units) as manufactured by Marvin, Warroad, Minnesota.

C. Description: Factory-assembled Ultimate Casement Bow Assemblies as manufactured by Marvin, Warroad, Minnesota.
   1. Available in 3, 4, 5 and 6 wide assemblies
   2. 6 degree angle
   3. With and w/out head and seat board

D. Description: Factory assembled Ultimate Casement Bay Assemblies as manufactured by Marvin Windows and Doors, Warroad, Minnesota.
   1. Available 30 degree, 45 degree and 90 degree
   2. With and w/out head and seat board

3.02 FRAME DESCRIPTION

A. Interior: Non Finger-Jointed Pine or finger-jointed core with non finger-jointed Pine veneer; optional non finger-jointed Douglas Fir or finger-jointed core with non finger-jointed Douglas Fir veneer; optional non finger-jointed White Oak or finger-jointed with non finger-jointed Oak veneer; non finger-jointed Cherry or finger-jointed core with Cherry veneer; non finger-jointed Mahogany or finger-jointed core with non finger-jointed Mahogany veneer; non finger-jointed Vertical Grain Douglas Fir or finger-jointed with non finger-jointed Vertical Grain Douglas Fir veneer.
   1. Kiln-dried to moisture content no greater than twelve (12) percent at the time of fabrication

2. Water repellant preservative treated in accordance with WDMA I.S. 4.

B. Frame exterior aluminum clad with 0.055” (1.4mm) thick extruded aluminum

C. Frame thickness: 1 3/16” (30mm)

D. Frame depth for full frame units have an overall 5 21/32” jamb (144mm). 4 9/16” (116mm) jamb depth from the nailing fin plane to the interior face of the frame for new construction.

E. Frame depth for replacement frame and contemporary units have an overall 3 ¼” jamb (83mm) for replacement application and 2 3/16” (56mm) jamb depth from the nailing fin plane to the interior face of the frame for new construction.

F. Frame bevel: Standard is no bevel, options available are 8 degree and 14 degree bevel (replacement frame only)

3.03 SASH DESCRIPTION

A. Interior: Non Finger-Jointed Pine or finger-jointed core with non finger-jointed Pine veneer; optional non finger-jointed Douglas Fir or finger-jointed core with non finger-jointed Douglas Fir veneer; optional non finger-jointed White Oak or finger-jointed with non finger-jointed Oak veneer; non finger-jointed Cherry or finger-jointed core with Cherry veneer; non finger-jointed Mahogany or finger-jointed core with non finger-jointed Mahogany veneer; non finger-jointed Vertical Grain Douglas Fir or finger-jointed with non finger-jointed Vertical Grain Douglas Fir veneer.
   1. Kiln-dried to moisture content no greater than twelve (12) percent at the time of fabrication
   2. Water repellant preservative treated with accordance with WDMA I.S. 4

B. Sash exterior aluminum clad with 0.050” (1.3mm) thick extruded aluminum

C. Sash thickness: Sash thickness is 1 5/8” (41mm) and 1 7/8” (48mm). 1 7/8” (48mm) is not available for replacement frames.

D. Stiles and Rails: 2 1/16” (52mm)

E. Sash Option: Optional tall bottom rail: 3 9/16” (90mm)

F. Glazing Profiles:
   1. Interior Glazing Profile:
      a. Standard: Ogee
      b. Optional: Square
   2. Exterior Glazing Profile:
      a. Standard: Putty
      b. Optional: Square (applies to rectangle and polygon units. Option not offered on round top and full radius units.)

3.04 GLAZING

A. Select quality complying with ASTM C1036. Insulating glass SIGMA/IGCC certified to performance level CBA when tested in accordance with ASTM E2190.

B. Glazing method: Insulating glass

C. Glazing seal: Silicone bedding at interior and exterior

D. Insulating glass will be altitude adjusted with capillary tubes for higher elevations. Argon gas is not available for elevations that require capillary tubes.

E. Dual-pane thickness: 3/4" or 1”; Tri-pane thickness: 1”

F. Glass fill: Air with capillary tubes, Argon. Glass Type: Clear, Bronze, Gray, Reflective Bronze, Tempered, Obscure, Laminated, Low E2, Low E3, Low E1, Low E2/ERS, Low E3/ERS

G. Tripane glass (TG), Tripane Low E3/E1/ERS, Tripane E2/E1/ERS: Tripane Low E1 Argon, Tripane Low E2 Argon, Tripane Low E3 Argon.
   1. This glass type is dependent on sash thickness and availability. Consult ADM or OMS for availability.

3.05 FINISH

A. Exterior: Aluminum clad. Fluoropolymer modified acrylic topcoat over a primer. Meets AAMA 2605 requirements.
   1. Aluminum clad color options: Bahama Brown, Bronze, Cadet Gray, Cascade Blue, Cashmere, Clay, Coconut Cream, Ebony, Evergreen, Gunmetal, Hampton Sage, Pebble Gray, Sierra White, Stone White, Suede, Wineberry, Bright Silver (pearlescent), Copper (pearlescent), Liberty Bronze (pearlescent)
   2. Custom colors: Contact your Marvin representative

B. Interior Finish options:
   1. Prime: Factory-applied water-borne acrylic primer. Meets WDMA TM-11 requirements.
   2. Painted Interior Finish. Factory-applied water-borne acrylic enamel. Available on Pine product only. Available in White or Designer Black. Meets WDMA TM-14 requirements.
   3. Factory-applied water-borne acrylic enamel clear coat. Applied on two coats with light sanding between coats. Available on Pine, Mahogany, Mixed Grain Douglas Fir, Vertical Grain Douglas Fir, Cherry, White Oak. Meets WDMA TM-14 requirements.
   4. Factory-applied water-borne urethane stain. Stain applied over a wood (stain) conditioner. A water-borne acrylic enamel clear coat applied in two separate coats, with light sanding between coats, applied over the stain. Available on Pine, Mahogany, Mixed Grain Douglas Fir, Vertical Grain Douglas Fir, Cherry, White Oak. Colors available: Wheat, Honey, Hazelnut, Leather, Cabernet, and Espresso. Meets WDMA TM-14 requirements.

3.06 HARDWARE

A. Casement Push Out hardware:
   1. Multi-point sequential system with a single lock handle actuation. Sequential multi-point uses 2, 4, or 5 locking points depending on unit size. Handle is mounted on the interior face of the stile. Stainless steel option available.
   2. Handle: Handle and lock set for this product has a traditional style sand cast handle with an Oil Rubbed Bronze finish. Optional colors: Antique Brass, Brass, Satin Nickel.
   3. Detachable friction limiter device is used to hold sash in place and allow sash to open to multiple positions. Stainless steel option available
   4. Hinges: There is one hinge connecting the sill to the bottom rail and one hinge connecting the head jamb to the top rail on casement units. Hinges allow the user to slide the sash across the frame opening which causes the sash exterior to rotate towards the user for the easy wash mode. Units under 20 inches (508 mm) width OM do not have the easy wash hinges. Stainless steel option available.
   5. Option for custodial limit device. Detachable restrictor. Stainless steel option available.

B. Awning Push Out hardware:
   1. Lock is a multi-point sequential lock system actuated by using lock handle. Stainless steel option available
   2. Handle: Handle and lock set for this product had a traditional style sand cast handle with an Oil Rubbed Bronze living finish. Optional colors: Antique Brass, Brass, Satin Nickel
   3. There are two hinges that connect the stiles of the sash to the jambs of the frame. The hinges are four bar hinges and include a friction adjustment set screw. There are two hinges that connect the stiles of the sash to the jamb of the frame. Material is steel coated with zinc finish. Track is steel coated with zinc finish.
   4. Option for custodial limit device. Detachable restrictor. Stainless steel option available.

C. Optional Factory Installed Window Opening Control Device (WOCD): The standard operation of the WOCD limits the operation of the sash to an opening of less than 4” (102mm). The sash arm detaches from the lock housing by a two-step function actuation to allow the normal operation of the unit. The WOCD re-engages when the unit is fully closed. WOCD is Coastal-compliant. Hardware meets ASTM F2090-17.
   1. Minimum frame OSM 20” (508mm) x 19 1/8” (486mm);
   2. Maximum frame

a. 44” (1118mm) width
b. If the width is greater than 36” (914mm) or less than 44” (1118), then 92” (2337mm) maximum height
c. If the width is less than or equal to 36” (914), then 96 1/8” (2442mm).

3. The WOCD hardware is handed. The Lock Housing and Sash Arm are comprised of multiple stainless steel, injection molded components, and a single stainless steel spring. The Lock Housing fits within a pocket of the jamb. The Sash Arm will fit within a pocket between the jamb/sill cover and the locking hardware.

3.07 WEATHER STRIP

A. Weather strip at the frame is a hollow foamed material bent around 90 degree corner to allow for seamless corner joints
   1. Color: Beige

B. Sash weather strip bulb shaped glass filled material
   1. Color: White, beige or black

3.08 JAMB EXTENSION

A. Jamb extensions are available for various wall thickness factory-applied up to a 12 (305mm) wide.

B. Finish: Match interior frame finish

3.09 INSECT SCREEN

A. Wood hinged screen

B. Screen mesh: Standard: Marvin BrightViewTM. Optional Charcoal Aluminum Wire, Black Aluminum Wire, Bright Bronze Aluminum Wire.

3.10 SIMULATED DIVIDED LITES (SDL)

A. 5/8” (16mm) wide, 7/8” (22mm) wide, 1 1/8” (29mm) wide, 1 15/16” (49mm) wide, 2 13/32” (61mm) wide with or w/out internal spacer bar

B. Exterior muntins: 0.055” (1.4mm) thick extruded aluminum

C. Interior muntins: Pine, Douglas Fir, White Oak, Cherry, Mahogany, Vertical Grain Douglas Fir

D. Muntins adhere to glass with closed-cell copolymer acrylic foam tape

E. SDL Profiles:
   1. Interior SDL Profile:
      a. Standard: Ogee
      b. Optional: Square
   2. Exterior SDL Profile:
      a. Standard: Putty
      b. Optional: Square (applies to rectangle and polygon units. Option not offered on round top and full radius units.)

F. Patterns: Rectangular, diamond, custom lite cut

G. Finish – exterior matches exterior aluminum clad colors, interior matches interior wood species and color

3.11 GRILLES-BETWEEN-THE–GLASS (GBG)

A. 23/32” (18mm) contoured aluminum bar
   1. Exterior Colors: exterior matches exterior aluminum clad colors. The exterior GBG color is designed to best match the Marvin aluminum clad color when used with Low E glass. The use of different types of glazing may alter the exterior GBG color appearance
   2. Interior Colors: White, Bronze, Pebble Gray, Sierra, White, Ebony (only available with Ebony exterior)

B. Optional flat aluminum spacer bar. Contact your Marvin representative.

C. Pattern; Rectangular, Cottage, Custom lite layout

3.12 ACCESSORIES AND TRIM

A. Installation Accessories:
   1. Factory-installed vinyl nailing/drip cap
   2. Installation brackets: 6 3/8” (162mm), 9 3/8” (283mm), 15 3/8” (390mm)
   3. Masonry brackets: 6” (152mm), 10” (254mm)

B. Aluminum Extrusions:
   1. Profile: Brick mold casing, flat casing, various special casing, frame expander, jamb extender, mullion cover, mullion expander, subsill, subsill end cap and lineal cap
   2. Finish: Fluoropolymer modified acrylic topcoat applied over primer. Meets AAMA 2605 requirements.
   3. Available in all exterior aluminum clad colors

PART 3 EXECUTION

4.01 EXAMINATION

A. Verification of Condition: Before installation, verify openings are plumb, square and of proper dimensions as required in CSI MasterFormat Section 01 71 00. Report frame defects or unsuitable conditions to the General Contractor before proceeding.

B. Acceptance of Condition: The beginning of installation confirms acceptance of existing conditions.

4.02 INSTALLATION

A. Comply with CSI MasterFormat Section 01 73 00.

B. Assemble and install window/door unit(s) according to manufacturer’s instruction and reviewed shop drawing.

C. Install sealant and related backing materials at perimeter of unit or assembly in accordance with Section 07 92 00 Joint Sealants. Do not use expansive foam sealant.

D. Install accessory items as required.

E. Use finish nails to apply wood trim and mouldings.

4.03 FIELD QUALITY CONTROL

A. Remove visible labels and adhesive residue according to the manufacturer’s instructions.

B. Unless otherwise specified, air leakage resistance tests shall be conducted at a uniform static pressure of 75 Pa (~1.57 psf). The maximum allowable rate of air leakage shall not exceed 2.3 L/sm2 (~0.45 cfm/ft2).

C. Unless otherwise specified, water penetration resistance testing shall be conducted per AAMA 502 and ASTM E1105 at 2/3 of the fenestration products design pressure (DP) rating using “Procedure B” – cyclic static air pressure difference. Water penetration shall be defined in accordance with the test method(s) applied.

4.04 CLEANING

A. Remove visible labels and adhesive residue according to manufacturer’s instruction.

B. Leave windows and glass in a clean condition. Final cleaning as required in CSI MasterFormat Section 01 74 00.

4.05 PROTECTING INSTALLED CONSTRUCTION

A. Comply with CSI MasterFormat Section 07 76 00.

B. Protecting windows from damage by chemicals, solvents, paint or other construction operations that may cause damage.

END OF SECTION

SECTION 087100 - DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes commercial door hardware for the following:

1. Swinging doors.
2. Sliding doors.
3. Other doors to the extent indicated.

B. Door hardware includes, but is not necessarily limited to, the following:

1. Mechanical door hardware.
2. Electromechanical door hardware.
3. Cylinders specified for doors in other sections.

C. Related Sections:

1. Division 08 Section “Hollow Metal Doors and Frames”.
2. Division 08 Section “Flush Wood Doors”.
3. Division 08 Section “Aluminum-Framed Entrances and Storefronts”.
4. Division 08 Section “Fire-Rated Steel Framed Entrances”.

D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
2. ICC/IBC - International Building Code.
3. NFPA 70 - National Electrical Code.
4. NFPA 80 - Fire Doors and Windows.
5. NFPA 101 - Life Safety Code.
6. NFPA 105 - Installation of Smoke Door Assemblies.
7. State Building Codes, Local Amendments.

E. Standards: All hardware specified herein shall comply with the following industry standards as applicable. Any undated reference to a standard shall be interpreted as referring to the latest edition of that standard:

1. ANSI/BHMA Certified Product Standards - A156 Series.
2. UL10C - Positive Pressure Fire Tests of Door Assemblies.

3. ANSI/UL 294 - Access Control System Units.
4. UL 305 - Panic Hardware.
5. ANSI/UL 437- Key Locks.

1.3 SUBMITTALS

A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.

B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing, fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.
3. Content: Include the following information:

a. Type, style, function, size, label, hand, and finish of each door hardware item.
b. Manufacturer of each item.
c. Fastenings and other pertinent information.
d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
e. Explanation of abbreviations, symbols, and codes contained in schedule.
f. Mounting locations for door hardware.
g. Door and frame sizes and materials.
h. Warranty information for each product.

4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.

C. Shop Drawings: Details of electrified access control hardware indicating the following:

1. Wiring Diagrams: Upon receipt of approved schedules, submit detailed system wiring diagrams for power, signaling, monitoring, communication, and control of the access control system electrified hardware. Differentiate between manufacturer-installed and field-installed wiring. Include the following:

a. Elevation diagram of each unique access controlled opening showing location and interconnection of major system components with respect to their placement in the respective door openings.
b. Complete (risers, point-to-point) access control system block wiring diagrams.
c. Wiring instructions for each electronic component scheduled herein.

2. Electrical Coordination: Coordinate with related sections the voltages and wiring details required at electrically controlled and operated hardware openings.

D. Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.

E. Informational Submittals:

1. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.

1.4 CLOSEOUT SUBMITTALS

A. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Procedures.

B. Project Record Documents: Provide record documentation of as-built door hardware sets in digital format (.pdf, .docx, .xlsx, .csv) and as required in Division 01, Project Record Documents.

1.5 QUALITY ASSURANCE

A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.

B. Certified Products: Where specified, products must maintain a current listing in the Builders Hardware Manufacturers Association (BHMA) Certified Products Directory (CPD).

C. Installer Qualifications: A minimum 3 years documented experience installing both standard and electrified door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

D. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor by the

manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.

E. Source Limitations: Obtain each type and variety of door hardware specified in this section from a single source unless otherwise indicated.

1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.
2. Provide electromechanical door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated.

F. Each unit to bear third party permanent label indicating compliance with the referenced testing standards.

G. Keying Conference: Conduct conference to comply with requirements in Division 01 Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document:

1. Function of building, purpose of each area and degree of security required.
2. Plans for existing and future key system expansion.
3. Requirements for key control storage and software.
4. Installation of permanent keys, cylinder cores and software.
5. Address and requirements for delivery of keys.

H. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.

1. Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.
2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
3. Review sequence of operation narratives for each unique access controlled opening.
4. Review and finalize construction schedule and verify availability of materials.
5. Review the required inspecting, testing, commissioning, and demonstration procedures

I. At completion of installation, provide written documentation that components were applied according to manufacturer's instructions and recommendations and according to approved schedule.

1.6 DELIVERY, STORAGE AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.

B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.

C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.7 COORDINATION

A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.

B. Door and Frame Preparation: Doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

1.8 WARRANTY

A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:

1. Structural failures including excessive deflection, cracking, or breakage.
2. Faulty operation of the hardware.
3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
4. Electrical component defects and failures within the systems operation.

C. Warranty Period: Unless otherwise indicated, warranty shall be one year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Hardware shall not have any visible manufacturer names on exposed materials, except cylinders, when the door is in a closed position.

2.2 BUTT HINGES

A. Hinges: ANSI/BHMA A156.1 butt hinges with number of hinge knuckles and other options as specified in the Door Hardware Sets.

1. Quantity: Provide the following hinge quantity:

   a. Two Hinges: For doors with heights up to 60 inches.
   b. Three Hinges: For doors with heights 61 to 90 inches.
   c. Four Hinges: For doors with heights 91 to 120 inches.
   d. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.

2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:

   a. Widths up to 3’0”: 4-1/2” standard or heavy weight as specified.
   b. Sizes from 3’1” to 4’0”: 5” standard or heavy weight as specified.

3. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:

   a. Exterior Doors: Heavy weight, non-ferrous, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.
   b. Interior Doors: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.

4. Hinge Options: Comply with the following:

   a. Non-removable Pins: With the exception of electric through wire hinges, provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for all out-swinging lockable doors.

5. Manufacturers:

   a. McKinney (MK) - TA/T4A Series, 5-knuckle.

2.3 CONTINUOUS HINGES

A. Continuous Geared Hinges: ANSI/BHMA A156.26 Grade 1-600 continuous geared hinge. with minimum 0.120-inch thick extruded 6063-T6 aluminum alloy hinge leaves and a minimum overall width of 4 inches. Hinges are non-handed, reversible and fabricated to template screw locations. Factory trim hinges to suit door height and prepare for electrical cut-outs.

1. Manufacturers:.

    a. Pemko (PE).

2.4 POWER TRANSFER DEVICES

A. Concealed Quick Connect Electric Power Transfers: Provide concealed wiring pathway housing mortised into the door and frame for low voltage electrified door hardware. Furnish with Molex™ standardized plug connectors and sufficient number of concealed wires (up to 12) to accommodate the electrified functions specified in the Door Hardware Sets. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Wire nut connections are not acceptable.

1. Manufacturers:

    a. Pemko (PE) - EL-CEPT Series.
    b. Securitron (SU) - EL-CEPT Series.

B. Electric Door Wire Harnesses: Provide electric/data transfer wiring harnesses with standardized plug connectors to accommodate up to twelve (12) wires. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Provide sufficient number and type of concealed wires to accommodate electric function of specified hardware. Provide a connector for through-door electronic locking devices and from hinge to junction box above the opening. Wire nut connections are not acceptable. Determine the length required for each electrified hardware component for the door type, size and construction, minimum of two per electrified opening.

1. Provide one each of the following tools as part of the base bid contract:

    a. McKinney (MK) - Electrical Connecting Kit: QC-R001.
    b. McKinney (MK) - Connector Hand Tool: QC-R003.

2. Manufacturers:

    a. McKinney (MK) - QC-C Series.

2.5 DOOR OPERATING TRIM

A. Door Push Plates and Pulls: ANSI/BHMA A156.6 door pushes and pull units of type and design specified in the Hardware Sets. Coordinate and provide proper width and height as required where conflicting hardware dictates.

1. Push/Pull Plates: Minimum .050 inch thick, size as indicated in hardware sets, with beveled edges, secured with exposed screws unless otherwise indicated.
2. Door Pull and Push Bar Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door unless otherwise indicated.
3. Offset Pull Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door and offset of 90 degrees unless otherwise indicated.

4. Pulls shall be provided with a 10” clearance from the finished floor on the push side to accommodate wheelchair accessibility.
5. Fasteners: Provide manufacturer's designated fastener type as indicated in Hardware Sets. When through-bolt fasteners are in the same location as a push plate, countersink the fasteners flush with the door face allowing the push plate to sit flat against the door.
6. Manufacturers:

    a. Rockwood (RO).

2.6 CYLINDERS AND KEYING

A. General: Cylinder manufacturer to have minimum (10) years experience designing secured master key systems and have on record a published security keying system policy.

B. Cylinder Types: Original manufacturer cylinders able to supply the following cylinder formats and types:

1. Threaded mortise cylinders with rings and cams to suit hardware application.
2. Rim cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
3. Bored or cylindrical lock cylinders with tailpieces as required to suit locks.
4. Tubular deadlocks and other auxiliary locks.
5. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.
6. Keyway: Manufacturer’s Standard.

C. Keying System: Each type of lock and cylinders to be factory keyed.

1. Supplier shall conduct a "Keying Conference" to define and document keying system instructions and requirements.
2. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner.
3. New System: Key locks to a new key system as directed by the Owner.

D. Key Quantity: Provide the following minimum number of keys:

1. Change Keys per Cylinder: Two (2)
2. Master Keys (per Master Key Level/Group): Five (5).
3. Construction Keys (where required): Ten (10).

E. Construction Keying: Provide construction master keyed cylinders.

F. Key Registration List (Bitting List):

1. Provide keying transcript list to Owner's representative in the proper format for importing into key control software.
2. Provide transcript list in writing or electronic file as directed by the Owner.

2.7 KEY CONTROL

A. Key Control Cabinet: Provide a key control system including envelopes, labels, and tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet. Key control cabinet shall have expansion capacity of 150% of the number of locks required for the project.

1. Manufacturers:

a. Lund Equipment (LU).
b. MMF Industries (MM).
c. Telkee (TK).

2.8 MORTISE LOCKS AND LATCHING DEVICES

A. Mortise Locksets, Grade 1 (Heavy Duty): Provide ANSI/BHMA A156.13, Series 1000, Operational Grade 1 Certified Products Directory (CPD) listed mortise locksets. Listed manufacturers shall meet all functions and features as specified herein.

1. Manufacturers:

a. ASSA ABLOY ACCENTRA (YA) - 8800FL Series.
b. Corbin Russwin Hardware (RU) - ML2000 Series.
c. Sargent Manufacturing (SA) - 8200 Series.

2.9 CYLINDRICAL LOCKS AND LATCHING DEVICES

A. Cylindrical Locksets, Grade 2 (Standard Duty): ANSI/BHMA A156.2, Series 4000, Grade 2 Certified Products Directory (CPD) listed. Locks are to be non-handed and fully field reversible.

1. Provide locksets with functions and features as follows:

a. Meets ANSI/BHMA A156.41 for single motion egress.
b. Where required by code, provide knurling or abrasive coating on all levers leading to hazardous areas.
c. Meets UL and CUL Standard 10C Positive Pressure, Fire Test of Door Assemblies with levers that meet A117.1 Accessibility Code.
d. Meets Florida Building Code FL2998 and UL Certification Directory ZHEM.R21744 for latching hardware for hurricane requirements.
e. Five-year limited warranty for mechanical functions.

2. Manufacturers:

a. ASSA ABLOY ACCENTRA (YA) - 5300LN Series.
b. Corbin Russwin Hardware (RU) - CL3800 Series.
c. Sargent Manufacturing (SA) - 7 Line.LOCK AND LATCH STRIKES

B. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:

1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
3. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.
4. Double-lipped strikes: For locks at double acting doors. Furnish with retractable stop for rescue hardware applications.

C. Standards: Comply with the following:

1. Strikes for Mortise Locks and Latches: BHMA A156.13.
2. Strikes for Bored Locks and Latches: BHMA A156.2.
3. Strikes for Auxiliary Deadlocks: BHMA A156.36.
4. Dustproof Strikes: BHMA A156.16.

2.10 CONVENTIONAL EXIT DEVICES

A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:

1. Exit devices shall have a five-year warranty.
2. At doors not requiring a fire rating, provide devices complying with NFPA 101 and listed and labeled for "Panic Hardware" according to UL305. Provide proper fasteners as required by manufacturer including sex nuts and bolts at openings specified in the Hardware Sets.
3. Where exit devices are required on fire rated doors, provide devices complying with NFPA 80 and with UL labeling indicating "Fire Exit Hardware". Provide devices with the proper fasteners for installation as tested and listed by UL. Consult manufacturer’s catalog and template book for specific requirements.
4. Except on fire rated doors, provide exit devices with hex key dogging device to hold the pushbar and latch in a retracted position. Provide optional keyed cylinder dogging on devices where specified in Hardware Sets.
5. Devices must fit flat against the door face with no gap that permits unauthorized dogging of the push bar. The addition of filler strips is required in any case where the door light extends behind the device as in a full glass configuration.
6. Lever Operating Trim: Where exit devices require lever trim, furnish manufacturer's heavy duty escutcheon trim with threaded studs for thru-bolts.

    a. Lock Trim Design: As indicated in Hardware Sets, provide finishes and designs to match that of the specified locksets.
    b. Where function of exit device requires a cylinder, provide a cylinder (Rim or Mortise) as specified in Hardware Sets.

7. Vertical Rod Exit Devices: Where surface or concealed vertical rod exit devices are used at interior openings, provide as less bottom rod (LBR) unless otherwise indicated. Provide dust proof strikes where thermal pins are required to project into the floor.
8. Narrow Stile Applications: At doors constructed with narrow stiles, or as specified in Hardware Sets, provide devices designed for maximum 2” wide stiles.
9. Dummy Push Bar: Nonfunctioning push bar matching functional push bar.
10. Rail Sizing: Provide exit device rails factory sized for proper door width application.
11. Through Bolt Installation: For exit devices and trim as indicated in Door Hardware Sets.

B. Conventional Push Rail Exit Devices (Commercial Duty): ANSI/BHMA A156.3, Grade 1 Certified Products Directory (CPD) listed exit devices. Listed manufacturers shall meet all functions and features as specified herein. Listed manufacturers shall meet all functions and features as specified herein.

1. Provide locksets with functions and features as follows:

a. Where required by code, provide knurling or abrasive coating on all levers leading to hazardous areas.
b. Meets UL and CUL Standard 10C Positive Pressure, Fire Test of Door Assemblies with levers that meet A117.1 Accessibility Code.
c. Five-year limited warranty for mechanical features.

2. Manufacturers:

a. ASSA ABLOY ACCENTRA (YA) - 6000 Series.

C. Extruded Aluminum Removable Mullions: ANSI/BHMA A156.3 anodized, removable mullions with malleable-iron top and bottom retainers. Mullions to be provided standard with stabilizers and imbedded weatherstrip.

1. Manufacturers:

a. Same as exit device manufacturer.

2.11 SURFACE DOOR CLOSERS

A. All door closers specified herein shall meet or exceed the following criteria:

1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers.
2. Standards: Closers to comply with UL-10C for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.
3. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible to the Americans with Disabilities Act, provide units complying with ANSI ICC/A117.1.
4. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.

5. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.
6. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates as required for proper installation. Provide through-bolt and security type fasteners as specified in the hardware sets.

B. Door Closers, Surface Mounted (Unitrol): ANSI/BHMA A156.4, Grade 1 Certified Products Directory (CPD) listed surface mounted closers with door stop mechanism to absorb dead stop shock on arm and top hinge. Hold-open arms to have a spring loaded mechanism in addition to shock absorber assembly. Arms to be provided with rigid steel main arm and secondary arm lengths proportional to the door width.

1. Manufacturers:

a. ASSA ABLOY ACCENTRA (YA) - Unitrol Series.
b. Corbin Russwin Hardware (RU) - Unitrol Series.
c. Norton Rixson (NO) - Unitrol Series.

C. Door Closers, Surface Mounted (Commercial Duty): ANSI/BHMA 156.4, Grade 1 Certified Products Directory (CPD) listed surface mounted, institutional grade door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron or aluminum alloy body construction, with adjustable backcheck, closing sweep, and latch speed control valves. Provide non-handed units standard.

1. Manufacturers:

a. ASSA ABLOY ACCENTRA (YA) - 3500 Series.
b. Corbin Russwin Hardware (RU) - DC6000 Series.
c. Norton Rixson (NO) - 8500 Series.
d. Sargent Manufacturing (SA) - 1431 Series.

2.12 ARCHITECTURAL TRIM AND ACCESSORIES

A. Door Protective Trim:

1. General: Door protective trim units to be of type and design as specified below or in the Hardware Sets.
2. Size: Fabricate protection plates (kick, armor, or mop) not more than 2" less than door width (LDW) on stop side of single doors and 1” LDW on stop side of pairs of doors, and not more than 1" less than door width on pull side. Coordinate and provide proper width and height as required where conflicting hardware dictates. Height to be as specified in the Hardware Sets.
3. Where plates are applied to fire rated doors with the top of the plate more than 16” above the bottom of the door, provide plates complying with NFPA 80. Consult manufacturer’s catalog and template book for specific requirements for size and applications.
4. Protection Plates: ANSI/BHMA A156.6 protection plates (kick, armor, or mop), fabricated from the following:

a. Stainless Steel: 300 grade, 050-inch thick.

5. Options and fasteners: Provide manufacturer's designated fastener type as specified in the Hardware Sets. Provide countersunk screw holes.
6. Manufacturers:

a. Rockwood (RO).

2.13 DOOR STOPS AND HOLDERS

A. General: Door stops and holders to be of type and design as specified below or in the Hardware Sets.

B. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as indicated, unless floor or other types of door stops are specified in Hardware Sets. Do not mount floor stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.

1. Manufacturers:

a. Rockwood (RO).

2.14 ARCHITECTURAL SEALS

A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.

B. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.

1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.

C. Fire Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL-10C.

1. Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and NFPA 252, Standard Methods of Fire Tests of Door Assemblies.

D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated.

E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.

F. Manufacturers:

1. Pemko (PE).

2.15 ELECTRONIC ACCESSORIES

A. Door Position Switches: Door position magnetic reed contact switches specifically designed for use in commercial door applications. On recessed models the contact and magnetic housing snap-lock into a 1" diameter hole. Surface mounted models include wide gap distance design complete with armored flex cabling. Provide SPDT, N/O switches with optional Rare Earth Magnet installation on steel doors with flush top channels.

1. Manufacturers:

a. Securitron (SU) - DPS Series.

B. Intelligent Switching Power Supplies: Provide the least number of power supplies at the appropriate amperage level sufficient to exceed the required total draw for the specified electrified hardware and access control equipment.

1. Power supplies shall meet all functions and features as specified herein.

a. UL listed dual voltage 12 or 24 VDC field selectable continuous output.
b. Dedicated fast charger to prolong battery life with low battery cutoff to protect batteries from deep discharge.
c. Enhanced surge immunity for input/output protection
d. Separate, dedicated battery charging circuit to keep locks cooler.
e. Dual-color LED visual notification to prevent applying incorrect voltages to the power supply.
f. Instant auto-switch to battery on AC loss.
g. Expandable up to 16 outputs in the standard enclosure
h. Integrated fire alarm interface to allow main output shutdown or disconnect on a per output basis when using an R8 output module.
i. Network ready and remotely manage locks and connected devices when using an M8 managed output module on network models.
j. Lifetime replacement, no-fault, no questions asked warranty.

2. Manufacturers:

a. Securitron (SU) - AQL Series.

2.16 FABRICATION

A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

2.17 FINISHES

A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.

B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware

C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.

B. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.

B. Wood Doors: Comply with ANSI/DHI A115-W series.

3.3 INSTALLATION

A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.

1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.

B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:

1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
2. DHI TDH-007-20: Installation Guide for Doors and Hardware.
3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."

4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.

C. Retrofitting: Install door hardware to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

D. Push Plates and Door Pulls: When through-bolt fasteners are in the same location as a push plate, countersink the fasteners flush with the door face allowing the push plate to sit flat against the door.

E. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."

F. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

3.4 FIELD QUALITY CONTROL

A. Field Inspection (Punch Report): Reference Division 01 Sections “Closeout Procedures”. Produce project punch report for each installed door opening indicating compliance with approved submittals and verification hardware is properly installed, operating and adjusted. Include list of items to be completed and corrected, indicating the reasons or deficiencies causing the Work to be incomplete or rejected.

3.5 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

3.6 CLEANING AND PROTECTION

A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.

B. Clean adjacent surfaces soiled by door hardware installation.

C. Clean operating items as necessary to restore proper finish. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.7 DEMONSTRATION

A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

3.8 DOOR HARDWARE SETS

A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

1. Quantities listed are for each pair of doors, or for each single door.
2. The supplier is responsible for handing and sizing all products.
3. Where multiple options for a piece of hardware are given in a single line item, the supplier shall provide the appropriate application for the opening.

B. Manufacturer’s Abbreviations:

1. MK - McKinney
2. PE - Pemko
3. SU - Securitron
4. YA - ASSA ABLOY ACCENTRA
5. RO - Rockwood
6. OT - Other

Hardware Sets

Set: 1.0

Doors: 118A, 118B

Description: EXTERIOR ALUMINUM NIGHTLATCH EXIT PAIR w/ STOP ARM CLOSER, CARD READER

2	Continuous Hinge	BSPFM_SLF-HD1 PT x Length Required		PE
2	Electric Power Transfer	EL-CEPT	BSP	SU
1	Mullion	M300 x Length Required	628	YA
1	Rim Exit Device, Exit Only	6205 B MELR EO	BSP	YA
1	Rim Exit Device, Nightlatch	6205 B MELR 121NL	BSP	YA
3	Core/ Cylinder	as required	BSP	YA

2	*Straight Pull	RM7501-24 Mtg-Type 1HD	BSP	RO
2	Surface Closer	UNI3301	BSP	YA
2	Door Stop	403 (or) 441CU (As Required)	BSP	RO
1	Gasketing	Provided By Door/Frame Supplier		OT
1	Threshold	271BSP x Length Required x MSES25SS		PE
1	Card Reader	Provided By Security Supplier		OT
2	ElectroLynx Harness	QC-C**** x Length Required		MK
2	ElectroLynx Harness	QC-C1500P		MK
1	Power Supply	AQ Series		SU
1	Wiring Diagram	Elevation and Point to Point as Specified		OT

Notes: *Provide offset door pulls RM7511 if straight door pulls cannot be mounted in a way as to not interfere with the operation of the keyed cylinder and thumbturn cylinder.

-Balance of hardware by storefront supplier
-Coordinate all hardware with the aluminum storefront manufacturer/supplier.
-Provide necessary drop plates and fillers for proper installation of door closers.
-Provide blocking/spacer rings in thickness as required to fill gap, if any, between cylinder head and face of door.
-Verify finish of hardware.

Door is normally closed and locked. Presenting valid credentials to card reader retracts latch momentarily allowing authorized entry. During fire alarm or power failure door remains closed and locked. Manual key override available at all times. Free egress at all times.

Set: 2.0

Doors: 115

Description: EXTERIOR NIGHTLATCH EXIT w/ KNURLING

3	Hinge, Full Mortise, Hvy Wt	T4A3386 NRP	BSP	MK
1	Rim Exit Device, Nightlatch	6100ED TB627F Less Dogging KNO	BSP	YA
1	Core/ Cylinder	as required	BSP	YA
1	Surface Closer	UNI3301	BSP	YA
1	Kick Plate	K1050 10" high CSK BEV	BSP	RO
1	Door Stop	403 (or) 441CU (As Required)	BSP	RO
1	Gasketing	303BSPS (Head & Jambs)		PE
1	Sweep	315BSPN x Length Required		PE
1	Threshold	271BSP x Length Required x MSES25SS		PE

Set: 3.0

Doors: 104, 122

Description: EXTERIOR EXIT ONLY EXIT

3	Hinge, Full Mortise, Hvy Wt	T4A3386 NRP	BSP	MK
1	Rim Exit Device, Exit Only	6100ED EO Less Dogging	BSP	YA
1	Surface Closer	UNI3301	BSP	YA
1	Kick Plate	K1050 10" high CSK BEV	BSP	RO
1	Door Stop	403 (or) 441CU (As Required)	BSP	RO
1	Gasketing	303BSPS (Head & Jambs)		PE
1	Sweep	315BSPN x Length Required		PE
1	Threshold	271BSP x Length Required x MSES25SS		PE

Set: 4.0

Doors: 119

Description: EXTERIOR STOREROOM

3	Hinge, Full Mortise, Hvy Wt	T4A3386 NRP	BSP	MK
1	Storeroom Lock	TBCN 8840RL	BSP	YA
1	Core/ Cylinder	as required	BSP	YA
1	Surface Closer	UNI3301	BSP	YA
1	Kick Plate	K1050 10" high CSK BEV	BSP	RO
1	Door Stop	403 (or) 441CU (As Required)	BSP	RO
1	Gasketing	303BSPS (Head & Jambs)		PE
1	Sweep	315BSPN x Length Required		PE
1	Threshold	271BSP x Length Required x MSES25SS		PE

Set: 5.0

Doors: 109A, 109B, 110A, 110B

Description: PUSH PULL PAIR w/ STOP ARM/ HOLD OPEN CLOSER

6	Hinge, Full Mortise, Hvy Wt	T4A3786	BSP	MK
2	*Straight Pull w/ BTB	RM7501-24 Mtg-Type 5HD	BSP	RO
2	Surface Closer w/ Hold Open	3331T	BSP	YA
2	Kick Plate	K1050 10" high CSK BEV	BSP	RO
1	Astragal	S771BL		PE
1	Gasketing	S88BL (Head & Jambs)		PE

Set: 6.0

Doors: 106, 113, 120, 121
Description: STOREROOM w/ STOP ARM CLOSER

3	Hinge, Full Mortise	TA2714	BSP	MK
1	Storeroom or Closet Lock	TB 4605LN	BSP	YA
1	Core/ Cylinder	as required	BSP	YA
1	Surface Closer	UNI3301	BSP	YA
1	Kick Plate	K1050 10" high CSK BEV	BSP	RO
1	Gasketing	S88BL (Head & Jambs)		PE

Set: 7.0

Doors: 107, 108, 111, 112
Description: CLASSROOM

3	Hinge, Full Mortise	TA2714	BSP	MK
1	Classroom Lock	TB 4608LN	BSP	YA
1	Core/ Cylinder	as required	BSP	YA
1	Door Stop	403 (or) 441CU (As Required)	BSP	RO
3	Silencer	608-RKW		RO

Set: 8.0

Doors: 103, 116
Description: PRIVACY w/ CLOSER

3	Hinge, Full Mortise	TA2714	BSP	MK
1	Privacy Lock	TBCN 8802RL V21	BSP	YA
1	Surface Closer	3301 (Reg or P/A)	BSP	YA
1	Kick Plate	K1050 10" high CSK BEV	BSP	RO
1	Door Stop	403 (or) 441CU (As Required)	BSP	RO
1	Gasketing	S88BL (Head & Jambs)		PE
1	Coat Hook	RM801	BSP	RO

Set: 9.0

Doors: 105C, 105D, 105E, 114C, 114D, 114E
Description: PRIVACY

3	Hinge, Full Mortise	TA2714	BSP	MK
1	Privacy Lock	TBCN 8802RL V21	BSP	YA
1	Door Stop	403 (or) 441CU (As Required)	BSP	RO

1 Gasketing	S88BL (Head & Jambs)		PE
1 Coat Hook	RM801	BSP	RO

Set: 10.0

Doors: 105A, 105B, 114A, 114B
Description: PUSH PULL

3 Hinge, Full Mortise, Hvy Wt	T4A3386	BSP	MK
1 *Straight Pull w/ BTB	RM7501-24 Mtg-Type 5HD	BSP	RO
1 Surface Closer	3301 (Reg or P/A)	BSP	YA
1 Kick Plate	K1050 10" high CSK BEV	BSP	RO
1 Door Stop	403 (or) 441CU (As Required)	BSP	RO
1 Gasketing	S88BL (Head & Jambs)		PE

Set: 11.0

Doors: 102, 117
Description: AUTOMATIC SLIDER

1	All Hardware Provided By Door Supplier		OT

END OF SECTION 087100

SECTION 088000
GLAZING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Glass.

B. Glazing compounds and accessories.

1.02 RELATED REQUIREMENTS

A. Section 06 2000 - Finish Carpentry.

B. Section 07 9005 - Joint Sealers: Sealant and back-up material.

C. Section 08 1113 - Hollow Metal Doors and Frames: Glazed lites in doors.

D. Section 08 1416 - Flush Wood Doors: Glazed lites in doors.

E. Section 08 4313 - Aluminum-Framed Storefronts: Glazing furnished by storefront manufacturer.

F. Section 10 2800 - Toilet, Bath, and Laundry Accessories: Mirrors.

1.03 REFERENCE STANDARDS

A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials Current Edition.

B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings, Safety Performance Specifications and Methods of Test; 2010.

C. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers 2005 (Reapproved 2019).

D. ASTM C920 - Standard Specification for Elastomeric Joint Sealants 2018.

E. ASTM C1036 - Standard Specification for Flat Glass 2021.

F. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass 2018.

G. ASTM C1172 - Standard Specification for Laminated Architectural Flat Glass 2019.

H. ASTM C1193 - Standard Guide for Use of Joint Sealants 2016.

I. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2021a.

J. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings 2016.

K. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation 2010.

L. GANA (GM) - GANA Glazing Manual 2008.

M. GANA (SM) - GANA Sealant Manual 2008.

N. GANA (LGRM) - Laminated Glazing Reference Manual 2009.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data on Glass Types: Provide structural, physical and environmental characteristics, size limitations, special handling or installation requirements.

C. Product Data on Glazing Compounds: Provide chemical, functional, and environmental characteristics, limitations, special application requirements. Identify available colors.

D. Samples: Submit two samples 12 inch by 12 inch (by 12 mm) in size of glass units.

E. Manufacturer's Certificate: Certify that sealed insulated glass meets or exceeds specified requirements.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Extra Insulating Glass Units: One of each glass size and each glass type.

1.05 QUALITY ASSURANCE

A. Perform Work in accordance with GANA Glazing Manual and FGMA Sealant Manual for glazing installation methods.

B. Installer Qualifications: Company specializing in performing the work of this section with minimum three years documented experience.

1.06 FIELD CONDITIONS

A. Do not install glazing when ambient temperature is less than 50 degrees F (10 degrees C).

1.07 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Sealed Insulating Glass Units: Provide a five (5) year warranty to include coverage for seal failure, interpane dusting or misting, including replacement of failed units.

PART 2 PRODUCTS

2.01 INSULATING GLASS UNITS

A. Type IG-1 - Sealed Insulating Glass Units: +/-1" thick Vision glazing.
   1. Application: All exterior glazing unless otherwise indicated.
   2. Outboard Lite: Fully tempered float glass, 1/4 inch (6 mm) thick, minimum.
      a. Tint: Optic Gray or Clear or combination thereof as determined by Architect
      b. Coating: Low-E type, on #2 surface
      c. Coating Type: Solarban 70 or Cardinal Glass Low-E meeting below requirements
   3. Inboard Lite: Fully tempered float glass, 1/4 inch (6 mm).
      a. Tint: Clear.
   4. Total Thickness: 1 inch (25 mm).
   5. Total Visible Light Transmittance: 27.5 percent maximum.
   6. Total Solar Heat Gain Coeffficient: .23 nominal; (Glass Alone)
   7. Whole window or door Assembly maximum solar heat gain coefficient: .23
   8. Glazing Method: Gasket glazing.

B. Type IG-2 - Sealed Insulating Obscure Glass Units: +/-1" thick Vision glazing, double glazed.
   1. Application: All exterior restroom glazing unless otherwise indicated.
   2. Outboard Lite: Annealed float glass, 1/4 inch (6 mm) thick, minimum, tempered.
      a. Tint: Solar grey.
      b. Coating: Low-E type (passive type), on #2 surface.
      c. Coating: Equal to Solarban 70 XL.
   3. Inboard Lite: Annealed float glass, +/- 1/4 inch (6 mm). minimum, tempered.
      a. Tint: Obscure glazing - Translucent showing shadows but not forms.
   4. `Total Visible Light Transmittance: 34 percent, nominal.
   5. Total Solar Heat Gain Coeffficient: .20 percent, nominal.
   6. U-Value: .28
   7. Glazing method: Gasket glazing.

2.02 GLAZING UNITS

A. Type S-1 - Single Vision Glazing:
   1. Application: All interior glazing unless otherwise indicated.
   2. Type: Fully tempered float glass.
   3. Tint: Clear.
   4. Thickness: 1/4 inch (6 mm).
   5. Polish all exposed edges.

2.03 EXTERIOR GLAZING ASSEMBLIES

A. Performance Criteria: Select type and thickness of glass to withstand dead and live loads caused by positive and negative wind pressure acting normal to plane of glass.
   1. Use the procedure specified in ASTM E1300 to determine glass type and thickness.
   2. Limit glass deflection to 1/200 or flexure limit of glass, whichever is less, with full recovery of glazing materials.
   3. Glass thicknesses listed are minimum.

B. GLASS MATERIALS
   1. Float Glass Manufacturers:
      a. AGC Flat Glass North America, Inc: www.na.agc-flatglass.com.
      b. Guardian Industries Corp: www.sunguardglass.com/#sle.
      c. Pilkington North America Inc: www.pilkington.com/na.
      d. VITRO, Formally PPG
      e. Oldcastle Building Envelope
      f. Cardinal Glass Industries (www.cardinalcorp.com)
      g. Substitutions: Refer to Section 01 6000 - Product Requirements.
   2. Float Glass: Provide float glass based glazing unless noted otherwise.
      a. Annealed Type: ASTM C1036, Type I - Transparent Flat, Class 1 - Clear, Quality-Q3.
      b. Heat-Strengthened and Fully Tempered Types: ASTM C1048, Kind HS and Kind FT.
      c. Tinted Types: ASTM C1036, Class 2 - Tinted, color and performance characteristics as indicated.
      d. Thicknesses: As indicated; for exterior glazing comply with requirements indicated for wind load design regardless of thickness indicated.

2.04 SEALED INSULATING GLASS UNITS

A. Sealed Insulating Glass Units: Types as indicated.
   1. Durability: Certified by an independent testing agency to comply with ASTM E2190.
   2. Edge Spacers: Aluminum, bent and soldered corners.
   3. Edge Seal: Glass to elastomer.
   4. Purge interpane space with dry hermetic air.

2.05 GLAZING COMPOUNDS

A. Manufacturers:
   1. Bostik Inc: www.bostik-us.com/#sle.
   2. Pecora Corporation: www.pecora.com/#sle.
   3. BASF Construction Chemicals-Building Systems: www.buildingsystems.basf.com/#sle.
   4. Substitutions: Refer to Section 01 6000 - Product Requirements.

2.06 GLAZING ACCESSORIES

A. Setting Blocks: Neoprene, 80 to 90 Shore A durometer hardness; ASTM C864 Option I. Length of 0.1 inch for each square foot (25 mm for each square meter) of glazing or minimum 4 inch (100 mm) x width of glazing rabbet space minus 1/16 inch (1.5 mm) x height to suit glazing method and pane weight and area.

B. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness; ASTM C864 Option I. Minimum 3 inch (75 mm) long x one half the height of the glazing stop x thickness to suit application, self adhesive on one face.

C. Glazing Tape: Preformed butyl compound with integral resilient tube spacing device; 10 to 15 Shore A durometer hardness; coiled on release paper; black color.
   1. Manufacturers:
      a. Pecora Corporation: www.pecora.com.
      b. Tremco Global Sealants: www.tremcosealants.com.
      c. Dow Chemical: https://www.dow.com/en-us

d. Substitutions: Refer to Section 01 6000 - Product Requirements.

D. Glazing Splines: Resilient polyvinyl chloride extruded shape to suit glazing channel retaining slot; ASTM C864 Option I; Black color.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that openings for glazing are correctly sized and within tolerance.

B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and ready to receive glazing.

3.02 PREPARATION

A. Clean contact surfaces with solvent and wipe dry.

B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.

C. Prime surfaces scheduled to receive sealant.

D. Install sealants in accordance with ASTM C1193 and GANA Sealant Manual.

E. Install sealants in accordance with manufacturer's instructions.

3.03 INSTALLATION - EXTERIOR/INTERIOR DRY METHOD (GASKET GLAZING)

A. Place setting blocks at 1/4 points with edge block no more than 6 inch (152 mm) from corners.

B. Rest glazing on setting blocks and push against fixed stop with sufficient pressure on gasket to attain full contact.

C. Install removable stops without displacing glazing gasket; exert pressure for full continuous contact.

3.04 FIELD QUALITY CONTROL

A. Glass product manufacturers to provide field surveillance of the installation of their products.

B. Monitor and report installation procedures and unacceptable conditions.

3.05 CLEANING

A. Remove glazing materials from finish surfaces.

B. Remove labels after Work is complete.

C. Clean glass and adjacent surfaces.

3.06 PROTECTION

A. After installation, mark pane with an 'X' by using removable plastic tape or paste; do not mark heat absorbing or reflective glass units.

END OF SECTION

SECTION 090561
COMMON WORK RESULTS FOR FLOORING PREPARATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. **All products and procedures must meet the manufacturer's required criteria for installation.**

B. This section applies to floors identified in contract documents that are receiving the following types of floor coverings:
   1. Resilient Tile
   2. Carpet Tile.
   3. Tiling
   4. Terrazzo
   5. All other floor finishes as sepcified in individual sections.
   6. Exterior concrete sealers, see exterior painting.

C. Preparation of new concrete floor slabs for installation of floor coverings.

D. Testing of concrete floor slabs for moisture and alkalinity (pH).

E. Remediation of concrete floor slabs due to unsatisfactory moisture or alkalinity (pH) conditions.

F. Contractor shall perform all specified remediation of concrete floor slabs. If such remediation is indicated by testing agency's report and is due to a condition not under Contractor's control or could not have been predicted by examination prior to entering into the contract, a contract modification will be issued.

1.02 RELATED REQUIREMENTS

A. Section 014000 - Quality Requirements: Additional requirements relating to testing agencies and testing.

B. Section 033000 - Cast-in-Place Concrete: Concrete admixture for slabs to receive adhered flooring, to prevent moisture content-related flooring failures.

C. Section - 03 5400 Self Leveling Cast Underlayment

1.03 REFERENCE STANDARDS

A. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2022.

B. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride; 2023.

C. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes; 2019a.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate scheduling of cleaning and testing, so that preliminary cleaning has been completed for at least 24 hours prior to testing.

1.05 SUBMITTALS

A. Floor Covering and Adhesive Manufacturers' Product Literature: For each specific combination of substrate, floor covering, and adhesive to be used; showing:
   1. Moisture and alkalinity (pH) limits and test methods.
   2. Manufacturer's required bond/compatibility test procedure.

B. Testing Agency's Report:
   1. Description of areas tested; include floor plans and photographs if helpful.
   2. Summary of conditions encountered.
   3. Copies of specified test methods.
   4. Recommendations for remediation of unsatisfactory surfaces.

5. Submit report to Architect, owner, owner's representative
6. Submit report not more than two business days after conclusion of testing.

C. Adhesive Bond and Compatibility Test Report.

1.06 QUALITY ASSURANCE

A. Moisture and alkalinity (pH) testing shall be performed by an independent testing agency employed and paid by Contractor.

B. Testing Agency Qualifications: Independent testing agency experienced in the types of testing specified.
1. Submit evidence of experience consisting of at least 3 test reports of the type required, with project Owner's project contact information.

C. Contractor's Responsibility Relating to Independent Agency Testing:
1. Provide access for and cooperate with testing agency.
2. Confirm date of start of testing at least 10 days prior to actual start.
3. Allow at least 4 business days on site for testing agency activities.
4. Achieve and maintain specified ambient conditions.
5. Notify Owner when specified ambient conditions have been achieved and when testing will start.
6. Notify Architect when specified ambient conditions have been achieved and when testing will start.

1.07 FIELD CONDITIONS

A. Maintain ambient temperature in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 65 degrees F (18 degrees C) or more than 85 degrees F (30 degrees C).

B. Maintain relative humidity in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 40 percent and not more than 60 percent.

PART 2 EXECUTION

2.01 CONCRETE SLAB PREPARATION

A. PROPER SURFACE PREPARATION INCLUDES THE FOLLOWING:
1. Inspection of the existing concrete substrate
2. Removal of existing floor coatings
3. Decontamination of the concrete surface
4. Creation of surface profile
5. Repair of surface irregularities

B. INSPECTION OF THE EXISTING CONCRETE SUBSTRATE
1. Inspect the existing concrete substrate to determine its general condition, soundness, presence of contaminants, existing floor coating, presence of moisture vapor emissions and the best methods to use in preparation of the surface to meet the requirements of the project.

C. DECONTAMINATION OF THE CONCRETE SURFACE
1. Decontamination of the concrete surface requires the removal of oils, grease, wax, fatty acids and other contaminants, and may be accomplished by the use of detergent scrubbing with a heavy duty cleaner/degreaser, low pressure water cleaning (less than 5,000 psi), steam cleaning, or chemical cleaning. The success of these methods is dependent upon the depth of penetration of the contaminant; which is completely dependent upon the contaminant’s viscosity, the concrete’s permeability and the duration of exposure. Special care should be taken when preparing concrete at an "in use" facility for repair, replacement or an initial floor topping.
2. Test concrete substrate for moisture vapor emission using test methods recommended by manufacturer of flooring system being installed.

D. CREATION OF SURFACE PROFILE

1. A. Creation of surface profile can be accomplished by a number of methods each utilizing a selection of tools, equipment and materials to accomplish the intended purpose, (See METHODS OF SURFACE PREPARATION below). Selection is dependent upon the type of surface to be prepared and the type of system to be installed. In addition, floors, trenches each have their own particular requirements. The type and thickness of the selected flooring system also plays an important role in the selection process. Regardless of the method selected or tools employed, the contractor must provide a surface that will accept the application of flooring products and allow the mechanical bond of the flooring system securely to the concrete. The type of service the structure will be subjected to, will also help to define the degree of profile required. The surface profile is the measure of the average distance from the peaks of the surface to the valleys as seen through a cross sectional view of the surface of the concrete.
2. This dimension is defined pictorially and through physical samples in the ICRI Technical Guideline No 03732, and is expressed as a Concrete Surface Profile number (CSP 1-9).
3. Methods of Surface Preparation
   a. Depending upon conditions of the concrete one or more methods of surface preparation may be required. It is common for decontamination to precede mechanical preparation, and if necessary a second decontamination to follow.
   b. The preferred methods for creation of a surface profile, including the removal of dirt, dust, laitance and curing compounds, is steel shotblasting, abrasive (sand) blasting or scarifying. The steel shotblasting or vacuum blasting process is commonly referenced by equipment brand names, such as, Blastrac, Vacu-Blast, Shot-Blast, etc. Vertical and overhead surfaces, such as cove base, wall, and ceiling surfaces shall be prepared utilizing methods of grinding, scarifying, abrasive (sand) blasting, needle scaling, or vertical steel shotblasting. The following table provides a guide for the degree of surface profile required for the coating or overlay to be applied and the preparation methods used to generate each profile. Provide written instruction from manufacturer to architect regarding profile requirements and recommended method for achieving profile.

Application	**Profile**	**Preparation**
Sealers	0-3 mils	Detergent scrub Low-pressure Water Acid Etching (not recommended) Grinding
Thin Film	4-10 mils	Grinding Abrasive Blast Steel Shot Blast
High Build	10-40 mils	Abrasive Blast Steel Shot Blast Scarifying
Self-Leveling	50 mils-1/8 inch	Abrasive Blast Steel Shot Blast Scarifying Needle Scaling
Polymer Overlay	1/8-1/4 inch	Abrasive Blast Steel Shot Blast Scarifying Needle Scaling Scabbling Flame Blasting Milling/rotomilling

4. Other surface preparation methods are mentioned in ADDITONAL SURFACE PREPARATION REFERENCES.

E. REPAIR OF SURFACE IRREGULARITIES
1. Repair of surface irregularities including bugholes, spalls, cracks, deteriorated joints, slopes, areas near transition zones, such as around drains, floor boxes, doorways, etc. must be repaired prior to the placement of the flooring system and/or the system must be designed to off-set the thickness of the irregularities. For bugholes and other minor surface irregularities, fill using materials recommended by manufacturer of flooring

system. For treatment of cracks and joints refer to the section below entitled “Crack Isolation”.

F. CRACK ISOLATION
1. The performance of elastomeric products, requires a relatively uniform dry film thickness to resist drying shrinkage and thermal movement of the concrete, while maintaining a seamless bridge or seal over the concrete. Therefore it is critical that all mortar splatter, protrusions, ridges, penetrations, or sharp projections in the surface of the concrete, be ground smooth or otherwise made smooth, in addition to the normal surface preparation outlined above.
2. Prior to application of an elastomeric system, control/contraction joints, construction joints, and cracks should be sealed with the selected system flexible sealant as recommended by manufacturer of flooring system. This coating should extend a minimum of 6” on either side of the joint or crack. The entire surface area should then receive the specified crack isolation system. Isolation and/or expansion joints should be detailed in accordance with the floor system manufacturer’s recommendations.
3. General Polymer systems can be applied to a variety of substrates if the substrate is properly prepared. Preparation of surfaces other than concrete or steel, such as wood, concrete block, brick, quarry tile, glazed tile, cement terrazzo, vinyl composition tile, plastics and existing polymer systems, can be accomplished to receive bonded polymer sealers, coatings, or toppings. For questions regarding a substrate other than concrete or steel, or a condition not mentioned in this guideline, contact the product Technical Service Department prior to starting the project. For steel surfaces, refer to Guideline Instructions for Surface Preparation of Structural Steel, Form G-2.Repair of surface irregularities including bugholes, spalls, cracks, deteriorated joints, slopes, areas near transition zones, such as around drains, floor boxes, doorways, etc. must be repaired prior to the placement of the flooring system and/or the system must be designed to off-set the thickness of the irregularities.

G. ADDITIONAL SURFACE PREPARATION REFERENCES
1. Important and relevant information on surface preparation of concrete is available by referencing the following codes, standards, and guidelines.
   a. SSPC The Society for Protective Coatings, 40 24th Street, 6th Floor, Pittsburgh, Pa. 15222-4643, (412) 281-2331.
      1) SSPC-SP 13 Surface Preparation of Concrete
      2) SSPC-TU 2/NACE 6G197 Design, Installation, and Maintenance of Coating Systems for Concrete Used in Secondary Containment
   b. ICRI International Concrete Repair Institute, 38800 Country Club Drive Farmington Hills, MI 48331, (248) 848-3809
   c. Technical Guideline No.03732, “Selecting and Specifying Concrete Surface
      1) Preparation for Sealers, Coatings, and Polymer Overlays”. Includes visual standards to act as a guide in defining acceptable surface profiles for the application of industrial coatings and polymer floor toppings.
      2) Technical Guideline No.03730, “Guide for Surface Preparation for the Repair of Deteriorated Concrete Resulting from Reinforcing Steel Corrosion”.
   d. ASTM American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959, (610) 832-9585
      1) ASTM D 4258 “Practice for Surface Cleaning Concrete for Coating”
      2) ASTM D 4260 “Standard Practice for Acid Etching Concrete”
      3) ASTM D 4261 “Practice for Surface Cleaning Unit Masonry for Coating”
      4) ASTM D 4262 “Test Method for pH of Chemically Cleaned or Etched Concrete Surfaces”The performance of elastomeric products, requires a relatively uniform dry film thickness to resist drying shrinkage and thermal movement of the concrete, while maintaining a seamless bridge or seal over the concrete. Therefore it is critical that all mortar splatter, protrusions, ridges, penetrations, or

sharp projections in the surface of the concrete, be ground smooth or otherwise made smooth, in addition to the normal surface preparation outlined above.

2.02 CONCRETE SLAB PREPARATION

A. Perform following operations in the order indicated:
   1. Preliminary cleaning.
   2. Internal relative humidity tests; in same locations as moisture vapor emission tests, unless otherwise indicated.
   3. Alkalinity (pH) tests; in same locations as moisture vapor emission tests, unless otherwise indicated.
   4. Specified remediation, if required.
   5. Patching, smoothing, and leveling, as required.
   6. Other preparation specified.
   7. Adhesive bond and compatibility test.
   8. Protection.
   9. Underlayment per Section 03 5400

2.03 MOISTURE VAPOR EMISSION TESTING

A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.

B. Test in accordance with ASTM F1869 and as follows.

C. Plastic sheet test and mat bond test may not be substituted for the specified ASTM test method, as those methods do not quantify the moisture content sufficiently.

D. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if test values exceed 3 pounds per 1000 square feet (1.4 kg per 93 square meters) per 24 hours.

E. Report: Report the information required by the test method.

2.04 INTERNAL RELATIVE HUMIDITY TESTING

A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.

B. Test in accordance with ASTM F2170 Procedure A and as follows.

C. Testing with electrical impedance or resistance apparatus may not be substituted for the specified ASTM test method, as the values determined are not comparable to the ASTM test values and do not quantify the moisture content sufficiently.

D. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if any test value exceeds 75 percent relative humidity.

E. Report: Report the information required by the test method.

2.05 ALKALINITY TESTING

A. The following procedure is the equivalent of that described in ASTM F710, repeated here for the Contractor's convenience.

B. Use a wide range alkalinity (pH) test paper, its associated chart, and distilled or deionized water.

C. Place several drops of water on a clean surface of concrete, forming a puddle approximately 1 inch (25 mm) in diameter. Allow the puddle to set for approximately 60 seconds, then dip the alkalinity (pH) test paper into the water, remove it, and compare immediately to chart to determine alkalinity (pH) reading.

2.06 ADHESIVE BOND AND COMPATIBILITY TESTING

A. Comply with requirements and recommendations of floor covering manufacturer.

END OF SECTION

SECTION 092116
GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Performance criteria for gypsum board assemblies.

B. Gypsum wallboard.
   1. Interior gypsum wallboard.
   2. Exterior gypsum sheathing.
   3. Exterior gypsum board panel.

C. Metal stud wall framing.

D. Metal channel ceiling framing.

E. Acoustic insulation. Refer to Section 07 2100 Thermal Insulation

F. Cementitious Backer Board (Provide at all installations of hard wall tile on metal studs).

G. Joint treatment and accessories.

H. Drywall Grid System for Gypsum Board

I. Triple Fiber Reinforced Cement Board Gill

1.02 RELATED REQUIREMENTS

A. Section 016116 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 054000 - Cold-Formed Metal Framing: Exterior wind-load-bearing metal stud framing.

C. Section 061000 - Rough Carpentry: Wood blocking product and execution requirements.

D. Section 06 2000 - Finish Carpentry.

E. Section 06 8316 - Fiberglass Reinforced Paneling.

F. Section 072100 - Thermal Insulation: Sound Attenuation Batt Insulation.

G. Section 093000 - Tiling.

H. Section 09 9913 - Interior Painting.

1.03 REFERENCE STANDARDS

A. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2017 (Reapproved 2022).

B. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members; 2024.

C. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2020.

D. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2024.

E. ASTM C954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness; 2022.

F. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2022.

G. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2024.

H. GA-216 - Application and Finishing of Gypsum Panel Products; 2024.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate special details associated with fireproofing and acoustic seals.

C. Product Data: Provide data on metal framing, gypsum board, accessories, and joint finishing system.

D. Test Reports: For all stud framing products that do not comply with ASTM C645 or C754, provide independent laboratory reports showing maximum stud heights at required spacings and deflections.

1.05 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: For gypsum board assemblies with fire-resistance ratings, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.
   1. Fire-Resistance-Rated Assemblies: Indicated by design designations from UL's "Fire Resistance Directory", or GA-600, "Fire Resistance Design Manual."

B. Installer Qualifications: Company specializing in performing gypsum board application and finishing with a minimum 3 years of documented experience.

C. Copies of Documents at Site: Maintain at the project site a copy of each referenced document that prescribes execution requirements.

PART 2 PRODUCTS

2.01 GYPSUM BOARD ASSEMBLIES

A. Provide completed assemblies complying with ASTM C840 and GA-216.

B. **Refer to Drawing Wall type Legend** for wall types and required STC ratings.

2.02 CEMENTITIOUS BACKER BOARD:

A. Panel Size: Provide in maximum lengths and widths available that will minimize joints in each area and correspond with support system indicated.

B. Cementitious Backing Board: ASTM C 1325 and ASTM D 3273.
   1. Provide cementitious backing board at required locations where fire ratings are not required.
      a. Thickness: 5/8 inch.
      b. Location: All locations indicated to receive tile or similar finish, including as a base for wall tile in tub and shower areas and wall and ceiling panels in shower areas.
   2. Acceptable Products:
      a. PermaBase Cement Board by National Gypsum.

2.03 METAL FRAMING MATERIALS (FOR CEILINGS, WALLS, AND INTERIOR PARTITIONS, REFER TO DRAWINGS FOR WIDTH & HEIGHT)

A. Manufacturers - Metal Framing, Connectors, and Accessories:
   1. Clarkwestern Dietrich Building Systems LLC; Product ____: www.clarkdietrich.com/#sle.
   2. Dietrich Metal Framing: www.dietrichindustries.com.
   3. Marino: www.marinoware.com/#sle.
   4. Phillips Manufacturing Company: www.phillipsmfg.com.
   5. Substitutions: See Section 016000 - Product Requirements.

B. General: As follows:
   1. Steel Sheet Components: Complying with ASTM C 645 requirements for metal and with ASTM A 653/A 653M, G40 hot-dip galvanized zinc coating.

C. Steel Studs and Runners: ASTM C 645.
   1. Minimum Base Metal Thickness: 0.0209 (25 ga.) or as required to comply with height and loading requirements as per relevant Building Code. Coordinate with manufacture's Load Framing Tables.
   2. Depth: As indicated, see Partition Index or details**.**

D. Deep-Leg Deflection Track: ASTM C 645 top runner with minimum 2-inch- deep flanges**.**

E. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
   1. Minimum Base Metal Thickness: 0.0359 inch (20ga.).

F. Steel Channel Bridging: 0.0598-inch (16 ga.) bare steel thickness, with minimum 1/2-inch- wide flange.
   1. Depth: 1-1/2 inches with 7/16 inch legs, 475 lb/1000ft.
   2. Clip Angle: 1-1/2 by 1-1/2 inch 0.068-inch- thick, galvanized steel.

G. Hat-Shaped, Rigid Furring Channels: ASTM C 645.
   1. Minimum Base Metal Thickness: 0.0209 (25 ga.).
   2. Depth: As indicated.

H. Resilient Furring Channels: 1/2-inch- deep, steel sheet members designed to reduce sound transmission.

I. Cold-Rolled Furring Channels: 0.0598-inch (16 ga.) bare steel thickness, with minimum 1/2-inch- wide flange.
   1. Depth: As indicated.

J. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates, complying with the recommendations of gypsum board framing manufacture for application indicated.

K. Ceiling Hangers: Type and size as specified in ASTM C754 for spacing required.

2.04 BOARD MATERIALS

A. INTERIOR GYPSUM BOARD
   1. Panel Size: Provide in maximum lengths and widths available that will minimize joints in each area and correspond with support system indicated.
   2. Interior Gypsum Wallboard: ASTM C 1396, ASTM E 84, ASTM G 21 and ASTM D 3273 for mold resistance and control. Color coded for 5/8” type X.
      a. Provide Type X fire rated gypsum board, meeting minimum requirements of approved fire test.
         1) Thickness: 5/8 inch, Type X.
         2) Long Edges: Tapered.
         3) Location: All partitions, including rated and non-rated assemblies, except as noted for tile backing panels.
      b. Acceptable Products:
         1) ProRoc w/ Moisture and Mold Resistant with M2Tech -Type X by CertainTeed.
         2) Densglass Ext. Sheathing – Type X by Georgia-Pacific.
         3) Sheetrock Mold Tough – Firecode, Type X by USG.
      c. Where Type X fire rated gypsum boards are used in fire-rated assemblies as indicated on drawings, provide color panels in manufacturer’s color designation indicating use in rated assembly.

B. EXTERIOR GYPSUM SHEATHING
   1. Panel Size: Provide in maximum lengths and widths available that will minimize joints in each area and correspond with support system indicated.
   2. Exterior Gypsum Sheathing Board: ASTM C1177, with manufacturer's standard edges.
      a. Thickness: 5/8 inch, Type X.
      b. Location: All exterior vertical and horizontal applications exposed to weather. Color coded for 5/8” type X.
   3. Acceptable Products:
      a. Securock Glass-Mat Sheathing – Type X by USG.
      b. GlasRoc Sheathing by CertainTeed.
      c. Densglass Ext. Sheathing – Type X by Georgia-Pacific.

C. EXTERIOR GYPSUM CEILING AND SOFFIT BOARD: ASTM C931and ASTM C 1396, with tapered edges.

1. Provide Type X fire rated ceiling and soffit panels, meeting the minimum requirements of approved fire test.
   a. Thickness: 5/8 inch, Type X.
   b. Location: All exterior horizontal ceiling and soffit applications not directly exposed to weather.
2. Acceptable Products:
   a. Sheetrock Firecode Exterior Ceiling Board - Type X by USG.
   b. ProRoc Exterior Soffit Board -Type X by CertainTeed.
   c. ToughRock Fireguard Type X Soffit Board - by Georgia-Pacific.

2.05 ACCESSORIES

A. TRIM ACCESSORIES
1. Interior Trim: ASTM C 1047.
   a. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
   b. Shapes: Furnish special shapes as indicated or required.
      1) Cornerbead: Use at outside corners, unless otherwise indicated.
      2) LC-Bead: J-shaped; exposed long flange receives joint compound; use at exposed panel edges.
      3) L-Bead: L-shaped; exposed long leg receives joint compound; use where indicated.
2. Exterior Trim: ASTM C 1047.
   a. Material: Hot-dip galvanized steel sheet or rolled zinc.
   b. Shapes: Furnished special shapes as indicated or required.
      1) Cornerbead: Use at outside corners.
      2) LC-Bead: J-shaped; exposed long flange receives joint compound; use at exposed panel edges.
      3) Expansion (Control) Joint: One-piece, rolled zinc with V-shaped slot and removable strip covering slot opening.

B. JOINT TREATMENT MATERIALS
1. General: Comply with ASTM C 475 and the recommendations of both the manufacture of panel products and of joint treatment material for each application.
2. Joint Tape:
   a. Interior Gypsum Wallboard: Paper.
   b. Exterior Gypsum Soffit Board: As recommended by panel manufacturer.
   c. Glass Mat Gypsum Sheathing Board: 10-by-10 glass mesh tape or as recommended by manufacture.
   d. Tile Backing Panels: Polymer coated, open glass-fiber mesh or as recommended by panel manufacturer.
3. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is provided by gypsum wallboard manufacturer and is compatible with other compounds applied on previous or for successive coats by the same manufacturer.
   a. Prefilling: At open joints, and damaged surface areas, use setting-type taping compound.
   b. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use all-purpose compound.
   c. Fill Coat: For second coat, use all-purpose compound.
   d. Finish Coat: For third coat, use all-purpose compound.
4. Joint Compound for Exterior Applications:
   a. Exterior Gypsum Soffit Board: As recommended and prvided by manufacturer.
   b. Gypsum Sheathing Board: As recommended by manufacturer.
5. Joint Compound for Tile Backing Panels:
   a. Glass-Mat, Water-Resistant Backing Panel: As recommended by manufacturer.
   b. Cementitious Backer Units: As recommended by manufacturer.

C. MISCELLANEOUS MATERIALS
   1. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.
   2. Laminating Adhesive: Special adhesive or joint compound recommended for laminating gypsum panels.
   3. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
      a. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.
      b. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.
   4. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
      a. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.
   5. Thermal Insulation: Refer to Section 07 2100

D. Screws for Attachment to Steel Members Less Than 0.03 inch (0.7 mm) In Thickness, to Wood Members, and to Gypsum Board: ASTM C1002; self-piercing tapping type; cadmium-plated for exterior locations.

E. Screws for Attachment to Steel Members From 0.033 to 0.112 inch (0.8 to 2.8 mm) in Thickness: ASTM C954; steel drill screws for application of gypsum board to loadbearing steel studs.

F. Anchorage to Substrate: Tie wire, nails, screws, and other metal supports, of type and size to suit application; to rigidly secure materials in place.

PART 3 EXECUTION

3.01 EXAMINATION

A. Install gypsum drywall systems and framing is strict accordance with manufacturer’s approved installation instructions, approved fire rated assemblies and the requirements of this Section.

B. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors as applicable, and structural framing, for compliance with requirements and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPPARATION

A. Suspended Ceilings: Coordinate installation of ceiling suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive ceiling hangers at spacing required to support ceilings and that hangers will develop their full strength.
   1. Furnish concrete inserts and other devises indicated to other trades for installation in advance of time needed for coordination and construction.

B. Verify that project conditions are appropriate for work of this section to commence.

3.03 FRAMING INSTALLATION

A. Metal Framing: Install in accordance with ASTM C754 and manufacturer's instructions.

B. INSTALLING STEEL FRAMING FOR CEILINGS, WALLS AND PARTITONS
   1. Install tracks (runners) at floors, ceilings, and structural walls and columns where gypsum board assemblies abut other construction.
      a. Where studs are installed directly against exterior walls, install foam or rubberized membrane isolation strip between studs and wall.
   2. Installation Tolerance: Install each steel framing and furring member so fastening surfaces vary not more than 1/8 inch from the plane formed by the faces of adjacent framing.

3. Extend partition framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing over frames for doors and openings and frame around ducts penetrating partitions above ceiling to provide support for gypsum board.
    a. For fire-resistance-rated and STC-rated partitions that extend to the underside of floor/roof slabs and decks or other continuous solid-structure surfaces to obtain ratings, install framing around structural and other members extending below floor/roof slabs and decks, as needed to support gypsum board closures and to make partitions continuous from floor to underside of solid structure.
4. Install steel studs and furring spaced at 16 inches o.c. unless indicated otherwise.
5. Install steel studs so flanges point in the same direction and leading edge or end of each panel can be attached to open (unsupported) edges of stud flanges first.
6. Attach runners to structural elements at floor and ceiling framing for partitions that do not extend full height, with fasteners located 2 inches from ends and spaced 24 inches o.c.
7. Attach runners to suspended ceilings with toggle bolts or hollow wall anchors located 2 inches from ends and spaced 24 inches o.c. if aligned with grid or as available where runner overlaps/intersects grid.
8. Curved Partitions: Install as per manufactures recommendation or use prefabricated track.
9. Frame door openings to comply with GA-600 and with gypsum board manufacturer's applicable written recommendations, unless otherwise indicated. Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
    a. Install two studs at each jamb, unless otherwise indicated.
    b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint if required.
    c. Extend jamb studs through suspended ceilings and attach to underside of floor or roof structure above at partitions that are indicated not to attach to structure above.
10. Frame openings other than door openings the same as required for door openings, unless otherwise indicated. Install framing below sills of openings, and ductwork above ceiling, to match framing required above door heads.
11. Install thermal insulation continuous at exterior walls and soffits, with tight joints and with clips or miscellaneous framing to hold firmly in place.

C. Openings: Reinforce openings as required for weight of doors or operable panels, using not less than double studs at jambs.

D. Acoustic Furring: Install resilient channels at maximum 24 inches (600 mm) on center. Locate joints over framing members.

E. Blocking: Install cocealed wood blocking for support of:
    1. Wall mounted cabinets.
    2. Toilet partitions.
    3. Toilet accessories.
    4. Refer to Section 06 1000, Rough Carpentry, for additional requirements.

3.04 ACOUSTIC ACCESSORIES INSTALLATION

A. Refer to 07 2100 - Thermal Insulation.

B. Acoustic Sealant: Install in accordance with manufacturer's instructions.
    1. Place one bead continuously on substrate before installation of perimeter framing members.

3.05 BOARD INSTALLATION

A. Comply with ASTM C840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.

B. Single-Layer Non-Rated: Install gypsum board in most economical direction, with ends and edges occurring over firm bearing.

1. Exception: Tapered edges to receive joint treatment at right angles to framing.
2. On ceilings, apply gypsum panels before wall/partition board application to the greatest extent possible and at right angles to framing, unless otherwise indicated.
3. On partitions/walls, apply gypsum panels horizontally (perpendicular to framing), unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
   a. Stagger abutting end joints not less than one framing member in alternate courses of board.
   b. At stairwells and other high walls, install panels horizontally, unless otherwise indicated or required by fire-resistance-rated assembly.
4. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.

C. Multilayer Application on Ceilings: Apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints 1 framing member, 16 inches minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.

D. Multilayer Application on Partitions/Walls: Apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
   1. Z-Furring Members: Apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.

E. Single-Layer Fastening Methods: Apply gypsum panels to supports with steel drill screws.

F. Multilayer Fastening Methods: Fasten base layers and face layers separately to supports with screws.

G. Curved Partitions:
   1. Install panels horizontally and unbroken, to the extent possible, across curved surface plus 12-inch- long straight sections at ends of curves and tangent to them.
   2. Wet gypsum panels on surfaces that will become compressed where curve radius prevents using dry panels. Comply with gypsum board manufacturer's written recommendations for curve radii, wetting methods, stacking panels after wetting, and other preparations that precede installing wetted gypsum panels.
   3. On convex sides of partitions, begin installation at one end of curved surface and fasten gypsum panels to studs as they are wrapped around curve. On concave side, start fastening panels to stud at center of curve and work outward to panel ends. Fasten panels to framing with screws spaced 12 inches o.c.
   4. For double-layer construction, fasten base layer to studs with screws 16 inches o.c. Center gypsum board face layer over joints in base layer, and fasten to studs with screws spaced 12 inches o.c.
   5. Allow wetted gypsum panels to dry before applying joint treatment.

H.
   1.
   2. Fasten with corrosion-resistant screws.

I. Tile Backing Panels:
   1. Glass-Mat, Water-Resistant Backing Panel: Comply with manufacturer's written installation instructions and install at showers, tubs, where indicated and locations indicated to receive tile. Install with 1/4-inch gap where panels abut other construction or penetrations.
   2. Cementitious Backer Units: ANSI A108.11, at showers, tubs, where indicated and locations indicated to receive tile.

3. Areas Not Subject to Wetting: Install standard gypsum wallboard panels to produce a flat surface except at showers, tubs, and other locations indicated to receive water-resistant panels.

J. Install cementitious backer board as shown on drawings **and at all walls and ceilings to receive hard tile** in accordance with ANSI A108.11 and board manufacturer's instructions. Tape joints and corners, cover with skim coat of dry-set mortar to a feather edge.

3.06 APPLYING AND FINISHING PANELS, GENERAL

A. Gypsum Board Application and Finishing Standards: ASTM C 840 and GA-216.

B. Install sound attenuation blankets before installing gypsum panels, unless blankets are readily installed after panels have been installed on one side.

C. Install ceiling board panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in the central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

D. Install gypsum panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.

E. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

F. Attach gypsum panels to steel studs so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

G. Attach gypsum panels to framing provided at openings and cutouts.

H. Form control and expansion joints with space between edges of adjoining gypsum panels.

I. Cover both faces of steel stud partition framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
   1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft in area.
   2. Fit gypsum panels around ducts, pipes, and conduits.
   3. Where partitions intersect open concrete coffers, concrete joists, and other structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by coffers, joists, and other structural members; allow 1/4- to 3/8-inch-wide joints to install sealant.

J. Isolate perimeter of non-load-bearing gypsum board partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- wide spaces at these locations, and trim edges with U-bead edge trim where edges of gypsum panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

K. STC-Rated Assemblies: Seal construction at perimeters, behind control and expansion joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through gypsum board assemblies, including sealing partitions above acoustical ceilings.

L. Space fasteners in panels according to referenced board application and finishing standard and manufacturer's written recommendations.
   1. Space screws a maximum of 12 inches o.c. for vertical applications.
   2. Space fasteners in panels that are tile substrates a maximum of 8 inches o.c.

3.07 INSTALLATION OF TRIM AND ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

B. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect for visual effect.

C. Corner Beads: Install at external corners, using longest practical lengths.

D. Install edge trim where edge of gypsum panels would otherwise would be exposed. Provide edge trim type with face flange formed to receive joint compound.

3.08 JOINT TREATMENT

A. Paper Faced Gypsum Board: Use paper joint tape, bedded with ready-mixed vinyl-based joint compound and finished with ready-mixed vinyl-based joint compound.

B. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
   1. Level 5: Walls over ten feet high.
   2. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.
   3. Level 1: Fire rated wall areas above finished ceilings, whether or not accessible in the completed construction.

C. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
   1. Feather coats of joint compound so that camber is maximum 1/32 inch (0.8 mm).

3.09 CLEANING AND PROTECTION

A. Promptly remove any residual joint compound from adjacent surfaces.

B. Provide final protection and maintain conditions without until the time of Owner Occupancy.

3.10 TOLERANCES

A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet (3 mm in 3 m) in any direction.

END OF SECTION

SECTION 093000
TILING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Porcelain Tile for floor applications.

B. Ceramic Tile for wall applications.

C. Backer Boards as tile substrate, refer to Section 09 2116 Gypsum Board Assemblies.

D. Ceramic Metal Trim and trasition strips.

1.02 RELATED REQUIREMENTS

A. Section 079005 - Joint Sealers.

B. Section 092116 - Gypsum Board Assemblies: Installation of tile on cementitious backer board.

C. Section 01 6116 - Volatile Organic Compound (VOC) restrictions

D. Section 22 1540 - Plumbing Fixtures.

E. Section 09 0561 - Common Work Results for Flooring Preparation.

1.03 REFERENCE STANDARDS

A. ANSI A108/A118/A136.1 - Specifications for the Installation of Ceramic Tile; 2020.

B. ANSI A108.1a - American National Standard Specifications for Installation of Ceramic Tile in the Wet-Set Method, with Portland Cement Mortar; 2023.

C. ANSI A108.1b - Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set, Modified Dry-Set, or Improved Modified Dry-Set Cement Mortar; 2023.

D. ANSI A108.1c - Contractor's Option: Installation of Ceramic Tile in the Wet-Set Method with Portland Cement Mortar or Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set, Modified Dry-Set, or Improved Modified Dry-Set Cement Mortar; 2023.

E. ANSI A108.4 - American National Standard Specifications for Installation of Ceramic Tile with Organic Adhesive or Water Cleanable Tile-Setting Epoxy Adhesive; 2023.

F. ANSI A108.5 - Setting of Ceramic Tile with Dry-Set Cement Mortar, Modified Dry-Set Cement Mortar, EGP (Exterior Glue Plywood) Modified Dry-Set Cement Mortar, or Improved Modified Dry-Set Cement Mortar; 2023.

G. ANSI A108.6 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant, Water Cleanable Tile-Setting and -Grout Epoxy; 2023.

H. ANSI A108.8 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant Furan Resin Mortar and Grout; 1999 (Reaffirmed 2024).

I. ANSI A108.9 - American National Standard Specifications for Installation of Ceramic Tile with Modified Epoxy Emulsion Mortar/Grout; 2023.

J. ANSI A108.10 - American National Standard Specifications for Installation of Grout in Tilework; 2017 (Reaffirmed 2022).

K. ANSI A108.12 - Installation of Ceramic Tile with EGP (Exterior Glue Plywood) Modified Dry-Set Mortar; 2023.

L. ANSI A108.13 - American National Standard for Installation of Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone; 2005 (Reaffirmed 2021).

M. ANSI A118.3 - American National Standard Specifications for Chemical Resistant, Water Cleanable Tile-Setting and -Grouting Epoxy and Water Cleanable Tile-Setting Epoxy Adhesive; 2021.

N. ANSI A108/A118/A136.1 - Specifications for the Installation of Ceramic Tile; 2020.

O. ANSI A118.10 - American National Standard Specifications for Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone Installation; 2023.

P. TCNA (HB) - Handbook for Ceramic, Glass, and Stone Tile Installation; 2025.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by all affected installers.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturers' data sheets on tile, mortar, grout, and accessories. Include instructions for using grouts and adhesives.

C. Shop Drawings: Indicate tile layout, patterns, color arrangement, perimeter conditions, junctions with dissimilar materials, control and expansion joints, thresholds, ceramic accessories, and setting details.

D. Samples: Mount tile and apply grout on two plywood panels, minimum 18 by 18 inches (457 by 457 mm) in size illustrating pattern, color variations, and grout joint size variations.

E. Maintenance Data: Include recommended cleaning methods, cleaning materials, stain removal methods, and polishes and waxes.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements, for additional provisions.
   2. Extra Tile: 10 square feet (1 square meter) of each size, color, and surface finish combination, but not less than 10 % of each type

G. Provide physical tile samples to Architect for approval.

H. Provide physical grout samples to Architect for approval.

1.06 QUALITY ASSURANCE

A. Maintain one copy of and ANSI A108/A118/A136.1 and TCNA (HB) on site.

B. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, with minimum 5 years of documented experience.

C. Installer Qualifications: Company specializing in performing tile installation, with minimum of 5 years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

1.08 FIELD CONDITIONS

A. Do not install solvent-based products in an unventilated environment.

B. Maintain ambient and substrate temperature of 50 degrees F (10 degrees C) during installation of mortar materials.

PART 2 PRODUCTS

2.01 TILE - REFER TO FINISH SCHEDULE AND FINISH LEGEND ON DRAWINGS FOR MORE DETAILS AND SPECIFIC FINISHES

2.02 TRIM AND ACCESSORIES

A. Non-Ceramic Trim: Satin natural anodized extruded aluminum, style and dimensions to suit application, for setting using tile mortar or adhesive.
   1. Applications:Edge Strips and Thresholds: [Extruded Aluminum], color as selected byArchitect. Equal to Schluter, straight and radiused as required. Conform to ADAAGRequirements. Verify all tile and stone thickness in selection of trim.
      a. Open edges of wall tile. Equal to aluminum finished Schleuter Jolly.

b. At floors where ceramic tile terninates into carpet. Equal to aluminum finishedSchleuter Reno-TK) Center under doors where applicable.
c. Wall outside corners, to edge of tile wainscoting: Equal to Schluter Rondec. Providetermination components.
d. Refer to drawings

2. Manufacturers:
   a. Schluter-Systems: www.schluter.com/#sle.
   b. Substitutions: See Section 016000 - Product Requirements.

2.03 SETTING MATERIALS

A. Manufacturers:
   1. ARDEX Engineered Cements: www.ardexamericas.com/#sle.
   2. Bostik Inc: www.bostik-us.com/#sle.
   3. Custom Building Products: www.custombuildingproducts.com/#sle.
   4. Latticrete 4XLT polymer fortified, **Basis of Design**. Follow all manufacturer's installation and safety instructions.
   5. Merkrete, by Parex USA, Inc: www.merkrete.com/#sle.
   6. ProSpec, an Oldcastle brand: www.prospec.
   7. Substitutions: See Section 016000 - Product Requirements.

B. Dry-Set Portland Cement Mortar Bond Coat: ANSI A118.1.

2.04 GROUTS

A. Manufacturers:
   1. Bonsal American, Inc: www.prospec.com
   2. Bostik Inc: www.bostik-us.com/#sle.
   3. Custom Building Product; www.custombuildingproducts.com/#sle.
   4. **LATICRETE; LATICRETE SPECTRALOCK PRO Premium Grout:** Follow all manufacturer's installation and safety instructions. Provide proper ventilation in installation area(s) to accomplish all safety concerns. www.laticrete.com/#sle. **Basis of Design**
   5. Custom Building Products: www.custombuildingproducts.com.
   6. Substitutions: See Section 016000 - Product Requirements.

B. Epoxy Grout: non sage, ANSI A118.3, ISO 13007-3 RG and EN 13888 RG, anti microbial, grout joints from 1/16" to 1/2" , grout joint width per tile manufacturer's recomendations.
   1. Colors: To be selected by Architect from manufacturer's standard range of 40 colors.

2.05 MAINTENANCE MATERIALS

A. Tile Sealant: Gunnable, silicone, siliconized acrylic, or urethane sealant; moisture and mildew resistant type.
   1. Applications: Between tile and plumbing fixtures.
   2. Color(s): As selected by Architect from manufacturer's full line.
   3. Products:
      a. ARDEX Engineered Cements; ARDEX SX: www.ardexamericas.com/#sle.
      b. Custom Building Products; Commercial 100% Silicone Caulk: www.custombuildingproducts.com/#sle.
      c. LATICRETE International, Inc; LATICRETE LATASIL: www.laticrete.com/#sle.
      d. Merkrete, by Parex USA, Inc; Merkrete Colored Caulking: www.merkrete.com/#sle.
      e. ProSpec, an Oldcastle brand; ProColor Advantage Caulk: www.prospec.com.
      f. Substitutions: See Section 016000 - Product Requirements.

2.06 ACCESSORY MATERIALS

A. Concrete Floor Slab Crack Isolation Membrane: Material complying with ANSI A118.12; not intended as waterproofing.
   1. Thickness: 20 mils (0.5 mm), maximum.
   2. Crack Resistance: No failure at 1/16 inch (1.6 mm) gap, minimum.

3. Products:
   a. LATICRETE International, Inc; LATICRETE Blue 92 Anti-Fracture Membrane: www.laticrete.com/#sle.

B. Waterproofing Membrane at Floors: Specifically designed for bonding to cementitious substrate under thick mortar bed or thin-set tile; complying with ANSI A118.10. Waterproofing Membrane shall be at all tiled walls with plumbing fixtures up to 6'-0" high and all adjacent tiled walls 6'-0" back from plumbing wall up to 6'-0" high, all tiled floors and up adjacent walls a minimum of 6" high and 24" high at all wudu locations. Waterproofing shall be specifically designed for bonding to cementitious substrate under thick mortar bed or thin-set tile; complying with ANSI A118.10. ,low VOC.
   1. Type: Fluid-applied.
      a. Material: **Laticrete 9235** with manufacturer's fiber mesh at all corners, drains. intersections, and plumbing fixtures. Follow all manufacturer's installation and safety instructions. Other products must be approved by addendum prior to the bid. Latticrete hydro ban is not accepted.
         1) ASTM C627 Robinson Floor Test
         2) UL GREENGUARD GOLD certified
   2. Type: Bonded Sheet Membrane (Contractor's option):
      a. Material: Polyethylene sheet membrane with non-woven fabric laminated to bothsides, 20 to 30 mils (0.5 to 0.8 mm) thick, nominal.
      b. Provide waterproofing seaming membrane for seams and corners.
      c. Provide mixing valve and pipe seal accessories.
      d. Provide floor drain bonding flange.
      e. Product:
         1) Schluter®-KERDI-DS (waterproofing), Schluter®-KERDI-BAND (seams andcorners), Schluter®-KERD-SEAL (Valve and pipe seals), Schluter®-KERDI-DRAIN (Drain bonding flange).
         2) Substitutions: See Section 01 6000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that sub-floor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive tile.

B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive tile.

C. Verify that sub-floor surfaces are dust-free and free of substances that could impair bonding of setting materials to sub-floor surfaces.

D. Verify that concrete sub-floor surfaces are ready for tile installation by testing for moisture emission rate and alkalinity; obtain instructions if test results are not within limits recommended by tile manufacturer and setting materials manufacturer.

E. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

A. Protect surrounding work from damage.

B. Vacuum clean surfaces and damp clean.

C. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances.

D. Install backer board in accordance with ANSI A108.11> ANSI A108/A118/A136.1 and board manufacturer's instructions. Tape joints and corners, cover with skim coat of setting material to a feather edge. Refer to Section 09 2900

E. Install cementitious backer board in accordance with ANSI A108.11 and board manufacturer's instructions. Tape joints and corners, cover with skim coat of dry-set mortar to a feather edge.

3.03 INSTALLATION - GENERAL

A. Install tile and thresholds and grout in accordance with applicable requirements of ANSI A108.1a thru A108.13, manufacturer's instructions, and TCNA (HB) recommendations.

B. Lay tile to pattern indicated. Do not interrupt tile pattern through openings.

C. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align floor joints.

D. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make grout joints without voids, cracks, excess mortar or excess grout, or too little grout.

E. Form internal angles square and external angles bullnosed.

F. Install ceramic accessories rigidly in prepared openings.

G. Install non-ceramic trim in accordance with manufacturer's instructions.

H. Install thresholds where indicated.

I. Sound tile after setting. Replace hollow sounding units.

J. Keep control and expansion joints free of adhesive or grout. Apply sealant to joints. Sealant to match grout color.

K. Allow tile to set for a minimum of 48 hours prior to grouting or more if recommended by manufacturer. .

L. Grout tile joints. Use standard grout unless otherwise indicated.

M. At changes in plane and tile-to-tile control joints, use tile sealant instead of grout, with either bond breaker tape or backer rod as appropriate to prevent three-sided bonding.

N. Apply sealant to junction of tile and dissimilar materials and junction of dissimilar planes.

3.04 INSTALLATION - FLOORS - THIN-SET METHODS - ALL TILE FLOOR AREAS UNLESS NOTED OTHERWISE

A. Over concrete substrate install the following in accordance with Tile Council of America.
   1. Waterproof membrane at all tiled floors and turn waterproofing up walls 6" vertically, unless noted otherwise.
   2. Mortar Bed.
   3. Tile as shown on Finish Schedule.
   4. Epoxy Grout.
   5. Cleaning.

3.05 INSTALLATION - WALL TILE ON CEMENTIOUS BACKER BOARD ON METAL STUDS

A. Cementious backer board as specified in Section 09 2116.

B. Mortar Bed.

C. Tile as shown on Finish Schedule.

D. Epoxy Grout.

3.06 CLEANING:

A. Clean tile and grout surfaces.

B. PROTECTION:
   1. Do not permit traffic over finished floor surface for 4 days after installation.

END OF SECTION

SECTION 095100
ACOUSTICAL CEILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Acoustical units.

1.02 RELATED REQUIREMENTS

A. Section 053100 - Steel Decking: Placement of special anchors or inserts for suspension system.

B. Section 072100 - Thermal Insulation: Acoustical insulation.

C. Section 211300 - Fire-Suppression Sprinkler Systems: Sprinkler heads in ceiling system.

D. Section 265100 - Interior Lighting: Light fixtures in ceiling system.

E. Section 284600 - Fire Detection and Alarm: Fire alarm components in ceiling system.

F. Applicable sections from Divisions 21, 23, & 26.

1.03 REFERENCE STANDARDS

A. ASTM C635/C635M - Standard Specification for Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings; 2022.

B. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels; 2019.

C. ASTM E580/E580M - Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions; 2024a.

D. ASTM E1264 - Standard Classification for Acoustical Ceiling Products; 2023.

E. NFPA 286 - Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth; 2024.

F. UL (FRD) - Fire Resistance Directory; current edition.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate grid layout and related dimensioning, junctions with other ceiling finishes, and mechanical and electrical items installed in the ceiling.

C. Product Data: Provide data on suspension system components and acoustical units.

D. Samples: Submit two full size samples illustrating material and finish of acoustical units.

E. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. Extra Acoustical Units: Quantity equal to 5 percent of total installed.

1.05 QUALITY ASSURANCE

A. Suspension System Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

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

1.06 FIELD CONDITIONS

A. Maintain uniform temperature of minimum 60 degrees F (16 degrees C), and maximum humidity of 40 percent prior to, during, and after acoustical unit installation.

PART 2 PRODUCTS

2.01 ACOUSTICAL UNITS - SEE FINISH SCHEDULE

A. Acoustical Panels **(ACT-1): For colorations see Finish Schedule on drawings.** Wet-formed mineral fiber with factory applied latex paint with the following characteristics:
   1. Surface Texture: Smooth
   2. Composition: Mineral fiber
   3. Color: noted on Finish Schedule
   4. Size: 24 in x 24 in
   5. Edge Profile: Square Tegular
   6. Noise Reduction Coefficient (NRC) ASTM C 423 Classified w/ UL label on product carton 0.85
   7. Ceiling Attenuation Class (CAC): ASTM C 1414; Classified with UL label on product carton 35
   8. Articulation Class (AC): ASTM E 1111; Classified with UL label on product carton 170
   9. Flame Spread: ASTM E 1264; Class A (HPVA
   10. Light Reflectance (LR) White Panel: ASTM E 1477; 0.85
   11. Dimensional Stability: HumiGuard Plus
   12. Recycle Content: Up to 76% total recycled content. (Total recycled content: pre-consumer, post-consumer and post-industrial)
   13. Material Ingredient Transparency: Health Product Declaration (HPD); Declare Label
   14. Life Cycle Assessment: Third Party Certified Environment Product Declaration (EPD)
   15. Acceptable Product: **Calla as manufactured by Armstrong World Industries or approved equal**
   16. Exposed Steel Suspension System - **15/16" Prelude XL or approved equal.**

B. ACT-2, Gypsum Base with Vinyl Faced Overlay. For colorations, see "Finish Schedule" on drawings.
   1. Size: 24 by 24 inches (600 by 600 mm); 1/2" thick.
   2. Light Reflectance: 77 percent, determined in accordance with ASTM E1264.
   3. Panel Edge: Square.
   4. Surface Pattern: G, Smooth. Non-perforated.
   5. Surface Color: White.
   6. Products: **USG 3260 Vinyl Faced Sheetrock Brand Lay-In Gypsum Ceiling Panels with ClimaPlus Performance. or approved equal**
   7. Suspension System: Square Edge , Flat White 15/16" wide **DXL grid , Class A or approved equal.**
   8. CAC: 35.
   9. MUST BE NON-COMBUSTABLE PER ASTM E136 AND ISO 1182

2.02 SUSPENSION SYSTEM(S)

A. Suspension Systems - Main beams and cross tees, base metal and end detail, fabricated from commercial quality hot dipped galvanized steel complying with ASTM A 653. Main beams and cross tees are double-web steel construction exposed flange design. Exposed surfaces chemically cleansed, capping prefinished galvanized steel in baked polyester paint. Main beams and cross tees shall have rotary stitching.
   1. Structural Classification: ASTM C 635 Intermediate or Heavy Duty.
   2. Color: Refer to "Finish Schedule."
   3. Sustainability: Environmental Product Declaration (EPD), Health Product Declaration (HPD)

B. Exposed Steel Suspension System Type 1: Formed steel, commercial quality cold rolled; heavy-duty.
   1. Profile: Tee; 15/16 inch (24 mm) wide face.
   2. Finish: Refer to "Finish Schedule."
   3. Product: Equal to Armstong Prelude XL 15/16"

4. Attachment Devices: Size for five times design load indicated in ASTM C 635, Table 1, Direct Hung unless otherwise indicated.

2.03 ACCESSORIES

A. Perimeter Moldings: Same material and finish as grid.
   1. At Exposed Grid type I: Provide L-shaped molding for mounting at same elevation as face of grid.
   2. At Exposed Grid Type II, Provide L-shaped molding for mounting at same elevation as face of grid.

B. Touch-up Paint: Type and color to match acoustical and grid units.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that layout of hangers will not interfere with other work.

3.02 INSTALLATION - SUSPENSION SYSTEM

A. Install suspension system in accordance with ASTM C 636/C 636M, ASTM E 580/E 580M, ASTM C 636/C 636M, ASTM E 580/E 580M, ASTM C 636/C 636M, and ASTM E 580/E 580M and as supplemented in this section.

B. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.

C. Lay out system to a balanced grid design with edge units no less than 50 percent of acoustical unit size.

D. Install after major above-ceiling work is complete. Coordinate the location of hangers with other work.

E. Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.

F. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.

G. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.

H. Support fixture loads using supplementary hangers located within 6 inches (150 mm) of each corner, or support components independently.

I. Do not eccentrically load system or induce rotation of runners.

J. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
   1. Use longest practical lengths.
   2. Miter corners.

K. Coordinate with mechanical, plumbing and electrical.

L. Coordinate installation with Food Service hood manufacturer - provider.

3.03 INSTALLATION - ACOUSTICAL UNITS

A. Install acoustical units in accordance with manufacturer's instructions.

B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.

C. Fit border trim neatly against abutting surfaces.

D. Install units after above-ceiling work is complete.

E. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.

F. Cutting Acoustical Units:
   1. Cut to fit irregular grid and perimeter edge trim.
   2. Make field cut edges of same profile as factory edges.

G. Where round obstructions occur, provide preformed closures to match perimeter molding.

H. Install hold-down clips on panels within 20 ft (6 m) of an exterior door.

3.04 TOLERANCES

A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet (3 mm in 3 m).

B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

END OF SECTION

SECTION 096513
RESILIENT BASE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Resilient base.

1.02 RELATED REQUIREMENTS

A. Section 016116 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 033000 - Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors to receive adhesive-applied resilient flooring.

C. Section 090561 - Common Work Results for Flooring Preparation

1.03 REFERENCE STANDARDS

A. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2022.

B. ASTM F1913 - Standard Specification for Vinyl Sheet Floor Covering Without Backing; 2019.

C. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes; 2019a.

D. ASTM E662 - Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials; 2013b.

E. ASTM F137 - Standard Test Method for Flexibility of Resilient Flooring; 2011

F. ASTM F1514 - Standard Test Method for Measuring Heat Stability for Color Change; 2003 (Reapproved 2008)

G. ASTM F1515 - Standard Test Method for Measuring Light Stability of Resieleint Flooring by Color Change; 2003 (Reapproved 2008)

H. ASTM F1914 - Standard Test Method for Short-Term Indention and Residual Indention of Resileint FLoor Covering; 2007 (Reapproved 2011)

I. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anydrous Calcium Chloride; 2011

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate seaming plans and floor patterns.

C. Verification Samples: Submit two samples, 12 by 12 inch (___ by ___ mm) in size illustrating color and pattern for each resilient flooring product specified.

D. Concrete Subfloor Test Report: Submit a copy of the moisture and alkalinity (pH) test reports.

E. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements, for additional provisions.
   2. Extra Materials/ Attic Stock: Quantity equivalent to 3 percent of each type and color.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in installing specified flooring with minimum three years documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Upon receipt, immediately remove any shrink-wrap and check materials for damage and the correct style, color, quantity and run numbers.

B. Store all materials off of the floor in an acclimatized, weather-tight space.

C. Maintain temperature in storage area between 55 degrees F (13 degrees C) and 90 degrees F (72 degrees C).

D. Protect roll materials from damage by storing on end.

E. Do not double stack pallets.

1.07 FIELD CONDITIONS

A. Maintain ambient temperatures as recommeded by the manufacturer but not less than 65 degrees or more than 85 degrees.

B. Maintain the ambient relative humidity between 40-60% during installation.

1.08 RESILIENT BASE - SEE FINISH SCHEDULE

A. Traditional Rubber Resilient Base: ASTM F1861, Type TS rubber, vulcanized thermoset; top set Style B, Cove.
   1. Manufacturers:
      a. Burke Flooring; Commercial Wall Base - TS: www.burkeflooring.com/#sle.
      b. Johnsonite, a Tarkett Company: www.johnsonite.com/#sle. Basis of Deisgn
      c. Roppe Corp: www.roppe.com/#sle.
      d. Substitutions: See Section 016000 - Product Requirements.
   2. Length: Roll.
   3. Height: 4" tall
   4. Color: To be selected by Architect from manufacturer's full range, refer to finish schedule.
   5. Accessories: Premolded external corners.
   6. Style: Cove (with top-set toe)

PART 3 EXECUTION

2.01 EXAMINATION

A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.

B. Cementitious Subfloor Surfaces: Verify that substrates are ready for resilient flooring installation by testing for moisture and alkalinity (pH).
   1. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive manufacturer.

C. Flooring manufacturers to give architect written approval that substrate is acceptable prior to commencing with any floor installation. This shall not add any cost to the owner or time to the contract schedule.

D. Refer to paragraph 1.03 References for floor substrate testing.

E. Surface cracks, grooves, depressions, control joints or other non-moving joints, and other irregularities shall be filled or smoothed with patching or underlayment compound recommended by the resilient flooring manufacturer and for job conditions for filling or smoothing, or both. The flooring contractor shall include these cost in their bid.
   1. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.

2.02 INSTALLATION - GENERAL

A. Starting installation constitutes acceptance of subfloor conditions.

B. Install in accordance with manufacturer's written instructions.

2.03 CLEANING

A. Remove excess adhesive from floor, base, and wall surfaces without damage.

B. Clean in accordance with manufacturer's written instructions.

2.04 PROTECTION

A. Prohibit traffic on resilient flooring for 48 hours after installation.

B. No heavy traffic, rolling loads or furniture for 72 hours after installation.

SECTION 096519
RESILIENT TILE FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Resilient tile flooring.

B. Installation accessories:
   1. Adhesives.
   2. Finishes and cleaners.

1.02 RELATED REQUIREMENTS

A. Section 016116 - Volatile Organic Compound (VOC) Content Restrictions: SCS FloorScore certification documentation.

B. Section 03 3000 Cast in Place Concrete

C. Section 07 9005 - Joint Sealants.

D. Section 09 0561 Common Work Results from Flooring Prep.

1.03 REFERENCE STANDARDS

A. ASTM D2047 - Standard Test Method for Static Coefficient of Friction of Polish-Coated Flooring Surfaces as Measured by the James Machine; 2025.

B. ASTM E662 - Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials; 2021a, with Editorial Revision.

C. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2022.

D. ASTM F970 - Standard Test Method for Measuring Recovery Properties of Floor Coverings after Static Loading; 2022.

E. ASTM F1514 - Standard Test Method for Measuring Heat Stability of Resilient Flooring by Color Change; 2003 (Reapproved 2013).

F. ASTM F1515 - Standard Test Method for Measuring Light Stability of Resilient Flooring by Color Change; 2003 (Reapproved 2008).

G. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride; 2023.

H. ASTM F1914 - Standard Test Method for Short-Term Indentation and Residual Indentation of Resilient Floor Covering; 2007 (Reapproved 2011).

I. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes; 2019a.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Manufacturer's documentation for flooring and accessories:
   1. Technical Data.
   2. Installation and Maintenance.
   3. Warranty.

C. Verification Samples: Submit two samples, 6 by 30 inch (____ by ____ mm) in size illustrating color and pattern for each resilient flooring product specified.

D. Verification Samples: Submit two samples, full size, illustrating color and pattern for each resilient flooring product specified.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Upon receipt, immediately remove any shrink-wrap and check materials for damage and that the material is of the correct style, color, quantity and run number(s).

B. Store all materials flat and off of the floor in an acclimatized, weather-tight space between 65 to 85 degrees F (18 to 29 degrees C).

C. Do not double stack pallets.

1.06 FIELD CONDITIONS

A. Acclimate material at jobsite between 65 to 85 degrees F (18 to 29 degrees C) and 35 percent to 85 percent relative humidity for 48 hours prior to installation. Temperature and relative humidity should also be maintained at the same levels during installation, and after installation.

B. Spread unopened cartons no more than 6 cartons high and at least 4 inches (101 mm) apart.

C. Keep away from heating and cooling ducts and direct sunlight.

D. If permanent HVAC is not operational, temporary means should be used to maintain the recommended temperature and relative humidity levels.

E. Close areas to traffic during installation of flooring and accessories.

1.07 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

B. Installer Qualifications: Should only be installed by professional flooring mechanics that have demonstrated successful installations of jobs in similar size and scope.

1.08 WARRANTY

A. Manufacturer's 20-Year Limited Commercial Warranty for Luxury Vinyl Flooring

PART 2 PRODUCTS

2.01 RESILIENT TILE FLOORING

A. Luxury Vinyl Flooring: Refer to finish schedule for **LVT-1** for Basis of Design.
   1. Equal to: Tarkett
   2. Product Number: SKU: 251306005
   3. Color: See finish schedule.
   4. Physical Properties:
      a. Product Construction: 30 mil layer reinforced with a Techtonic finish
      b. Total Thickness (Gauge): 0.120 inch (3.0 mm).
      c. Installation Type: Dry Back
      d. Installation: Direct Glue
      e. Recommended Adhesive: provide manufacturer; recommended adhesive
      f. Dimenions: (91.44 cm x 15.24 cm) 36" x 6"
   5. Manufacturing, Performance, and Safety Standards:
      a. ASTM F1914, Residual Indentation: Meets requirements.
      b. ASTM E684 (Radiant Panel): Meets requirements
      c. ASTM F1514, Resistance to Heat: Meets requirements.
      d. ASTM F1515, Resistance to Light: Meets requirements.
      e. ASTM E662, Smoke Density (Flaming and Non-Flaming): Passes requirements.
      f. ASTM D2047, Coefficient of Friction (Dry): Greater than or equal to 0.6, meets the reccomended static coefficient of friction for ADA walking surfaces and accessible routes
      g. ASTM F970, Static Load Limit: Passes, *1500 lbs

B. Moldings, Transition and Edge Strips: See dwgs for transtion details.

C. Adhesive and Adhesive Encapsulators: As recommended by flooring manufacturer.

D. Finishes and Cleaners: As recommended by flooring manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION _____

A. Install flooring and accessories after other operations (including painting) have been completed.

B. Acceptance of Conditions: Carefully examine all installation areas with installer/applicator present, for compliance with requirements affecting work performance.
   1. Verify that field measurements, product, adhesives, substrates, surfaces, structural support, tolerances, levelness, temperature, humidity, moisture content level, pH, cleanliness and other conditions are as required by the manufacturer, and ready to receive work.

C. Verify that substrate is contaminant-free, including old adhesives and any chemicals.

D. Test substrates as required by manufacturer to verify proper conditions exist.
   1. Concrete:
      a. Check for concrete additives such as fly ash, curing compounds, hardeners, or other surface treatments that may prevent proper bonding of floor coverings.
      b. Moisture testing: Perform either the In-Situ Relative Humidity (RH) test (ASTM F2170) or Moisture Vapor Emission Rate (MVER) test (ASTM F1869). Refer to the Manufacturer's Installation Guide/Manual for the maximum allowable substrate moisture content. Substrates above the maximum allowable moisture content will require a moisture mitigation system.
      c. Perform alkalinity testing to verify pH level is between 5 to 9 per ASTM F710.

E. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

A. Prior to installation, the flooring installer should plan and attend an on-site construction meeting with the General Contractor, Architect and Property Owner to review all requirements and inspect site conditions as outlined in the manufacturer's installation document, as well as to review the requirements of ASTM F710 and any relevant building codes, or local, state, or national regulations.

B. Flooring installation should not begin until all site conditions have been assessed, testing has been completed and subfloor conditions have been approved.

C. Prepare per manufacturer's written instructions, Section 01 7000, and as follows:
   1. Prepare substrates to ensure proper adhesion of Luxury Vinyl Plank and Tile Flooring.
   2. Concrete Substrates: Prepare substrate per ASTM F710.
      a. Verify that subfloor is clean, flat, smooth, free of dirt, rust, paint, oil, wax or any contaminant that will interfere with adhesive bonding.
      b. Mechanically remove substrate coatings that are not compatible with adhesives, such as sealers, curing, hardening or parting compounds, soap, wax, oil, etc.
         1) Do not use solvents or adhesive removers.
      c. Expansion joints, isolation joints, or other moving joints must be honored and must not be filled with underlayment products or other materials, and floor coverings must not be laid over them. Expansion joint covering systems should be detailed by the architect or engineer, and based upon intended usage and aesthetic considerations.
      d. Surface cracks, grooves, depressions, control joints or other non-moving joints, and other irregularities shall be filled or smoothed with high-quality Portland cement or calcium aluminate based patching or underlayment compound for filling or smoothing, or both.
         1) Do not skim-coat large areas with patching compound, especially slick power-troweled surfaces.
         2) Sand smooth per manufacturer's instructions.
      e. Slick surfaces such as power-troweled concrete shall be profiled as needed to allow for a mechanical bond between the adhesive and subfloor.

f. Do not use gypsum-based underlayment products and do not skim coat concrete subfloors.
g. Self-Leveling Underlayments: Provide a dry and smoothly-sanded underlayment substrate ready for installation of Luxury Vinyl Plank Underlayment compound shall be moisture-resistant, mildew-resistant, and alkali-resistant and must have a minimum of 3,000 psi compressive strength per ASTM C109/C109M prior to installation of underlayment provide architect written approval by flooring manufacturer citing all specified warranties will be in affect.
h. Lightweight concrete shall have a compressive strength greater than 90 pounds per cubic foot with minimum compression strength of 2,500 psi or greater.

3. Existing and Other Substrates:
   a. Refer to manufacturer's professional installation guide and/or contact manufacturer, as special conditions may exist.

3.03 INSTALLATION

A. Installation per manufacturer's written instructions, Section 01 7000, and as follows:
   1. Layout shall be specified by Architect, Designer or End User.
   2. Follow layout and ensure installation reference lines are square.
   3. Field tiles shall be installed with directional arrows on back aligned in the same direction, or may be installed in quarter-turned fashion.
   4. Check cartons for and do not mix dye lots.
   5. Expansion Joints: Locate expansion, isolation, and other moving joints prior to installation.
      a. Do not fill expansion, isolation, and other moving joints with patching compound nor cover with resilient flooring.
      b. Install movement joint systems per manufacturer's instructions.
   6. Adhesives: Adhere flooring to substrate using the full spread method resulting in a completed installation without gaps, voids, raised edges, bubbles or any other surface imperfections.
      a. Select appropriate adhesive, trowel and follow manufacturer's instructions.
      b. Periodically spot-check transfer of adhesive to back of tile during installation.
      c. Roll floor with a 100 pound roller to ensure proper transfer of adhesive and bonding.
      d. Protect floor from traffic per manufacturer's instructions.
      e. Do not wet mop floor until the adhesive has properly set per written instructions.

3.04 FIELD QUALTITY CONTROL

A. Site tests and inspections per Section 01 4000 and as follows:
   1. Inspect flooring installation for non-conforming work including (but not limited to) the following:
      a. Lack of adhesion.
      b. Bubbles, loose tiles or raised edges.
      c. Dirt and debris underneath flooring.
      d. Excessive gaps.
      e. Improper substrate preparation (as indicated by telegraphing).
      f. Damage to tiles, including: dents/indentations, cuts, cracks, burns or punctures.

B. Non-conforming work per General Conditions and as follows:
   1. Repair or replace damaged material if not acceptable to the Architect.

3.05 ATTIC STOCK

A. 5% of installed amount.

3.06 CLEANING

A. Waste Management per Section 01 7000 and as follows:
   1. Coordinate material reclamation program with manufacturer, if applicable.

a. Store and return cartons and pallets to manufacturer or recycler for reuse or recycling.

B. Provide progress cleaning per manufacturer's written instructions, Section 01 7000, and as follows:
1. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the work.
a. Clean and protect completed construction until Date of Substantial Completion.
b. During installation, remove wet adhesive from surface of flooring per manufacturer's instructions.
2. Site: Maintain project site free of waste materials and debris.

C. Provide final cleaning immediately prior to Date of Substantial Completion inspection per manufacturer's written instructions and Section 01 7000 and 01 7800
1. Protection: Remove manufacturer's and other installed protection immediately prior to Date of Substantial Completion inspection, unless required otherwise.
2. Clean floor with a neutral 6-8 pH cleaner or as recommended by manufacturer.

3.07 MAINTENANCE

A. Initial maintenance per flooring manufacturer’s written instructions.

3.08 PROTECTION

A. Protect materials from construction operations until Date of Substantial Completion or Owner occupancy, whichever occurs first.
1. Protect finished floor from abuse and damage by using heavy non-staining kraft paper, drop cloths or equivalent. Use additional, non-damaging protective materials as needed.
2. Light foot traffic on a newly installed floor can be permitted after 24 hours.
3. Keep heavy traffic and rolling loads off the newly installed LVT flooring for 48 hours.
4. Protect the floor from rolling loads by covering with protective boards.

END OF SECTION

SECTION 096600
TERRAZZO FLOORING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Poured in place resinous matrix epoxy terrazzo flooring.
   2. Joint, edge, and termination strips.
      a. Prior to installation of structural floor slab, advise General Contractor, in writing, of all requirements of concrete substrate regarding finish, level tolerance, curing and below substrate vapor barrier; see inspection in Part 3.
   3. Locate all flexible joints required. See submittals below.
   4. Accessories necessary for complete installation.
      a. Sufficient water, temporary heat and light, and adequate electric power with suitable outlets connected and distributed for use within 100 feet of any working space.
      b. Note: Ambient temperature shall be maintained as per manufacturer recommendations, minimum 60 degrees Fahrenheit.

B. Related Sections:
   1. Concrete sub-floor to be level (maximum variation not to exceed ¼ inch in 10 feet) and to have a steel trowel finished surface. No curing agents or other additives which could prevent bonding should be used.
      a. The slab should have an efficient moisture barrier placed directly under the concrete slab when placed directly on grade. Saw cutting of control joints must be done between 12-24 hours after placement of the structural concrete.
   2. Adjacent floor finishes: Division 9.
      a. Shotblast or rough grind area to receive Terrazzo according to manufacturer's recommendations.
   3. Section 09 0561 Common Work Results from Flooring Prep.

1.02 QUALITY ASSURANCE

A. Acceptable Suppliers:
   1. Suppliers shall provide materials in accordance with NTMA standards.
   2. Materials used in the floor surfacing shall be the products of a single manufacturer.

B. Acceptable Installers:
   1. Approved Installer:
      a. Acceptable installer shall be a contractor member of the NTMA and perform all work in accordance with NTMA standards.
      b. If installer is not a contractor member of the NTMA, he shall submit a list of 5 completed projects of similar magnitude and complexity.
      c. Installation shall be performed by an applicator with minimum 3 years experience in work of similar nature and scope. Installer must be approved by the manufacturer of the floor surfacing materials. The contractor shall furnish a written statement from the manufacturer that the installer is acceptable.
      d. Installer to verify locations of all flexible joints required by the provisions of this Section and by the recommendations of the related material manufacturers.
         1) Joint locations may or may not be shown in drawings.
         2) Refer to drawings required under submittals below.
   2. Contractor to have proven experience with specified system.

1.03 SUBMITTALS

A. Samples:
   1. Submit maximum of three samples, 6 inches by 6 inches for each color and type of terrazzo as specified.
   2. Submit two 6-inch lengths of each type and kind of divider strips as specified.

3. Manufacturers Application Instructions: Submit descriptive data and specific recommendations for mixing, application, curing including any precautions of special handling instructions required to comply with the Occupational Safety and Health Act.
4. Shop Drawings: Shop Drawings shall be furnished showing installation of cove base and termination details, and details at floor material transitions and where adjoining equipment.
   a. Locate and provide detailing for flexible joints required for flooring in area of installation.

B. Maintenance Literature:
   1. Submit two copies of NTMA and/or manufacturer's maintenance recommendations.

C. Certification:
   a. Suppliers shall furnish certification attesting that materials meet specification requirements.
   2. Suppliers shall furnish properly labeled material and Material Safety Data Sheets which comply to current state and federal requirements.
   3. Suppliers shall submit certification that installer is an approved applicator of material selected.

1.04 DELIVERY, STORAGE AND HANDLING

A. All materials shall be delivered to project site in original manufacturer's sealed containers including type of material, batch numbers, date of manufacture, and pertinent labels intact and legible.

B. Store materials in dry protected area at a temperature between 60° F to 80° F.

C. Follow all manufacturer's specific instructions and prudent safety practices for storage and handling.

1.05 GUARANTEE

A. One year from date of completion of terrazzo installation.

1.06 PROJECT CONDITIONS

A. Maintain the ambient room and floor temperature at 60 degrees Fahrenheit, or above for a period extending from 72 hours before, during and after floor installation. Concrete to receive surfacing shall have cured for at least 28 days and be free of all curing compounds.

B. Pre-job meeting between General Contractor, Architect, and installer shall be held to discuss concrete substrate, location of joints and/or saw cuts to minimize subfloor cracking and locations of control joints and strips in terrazzo surface.

C. Acceptable Substrates:
   1. Level tolerance: Concrete subfloor shall be level with a maximum variation from level of 1/4" in 10 feet. Any irregularity of the surface requiring patching and/or leveling shall be done using material approved by the manufacturer.
   2. Concrete floor shall receive a light steel trowel finish.
   3. Concrete shall be cured a minimum of 28 days. No curing agents are to be used in areas to receive terrazzo.
   4. Concrete slab shall have an efficient puncture-resistant, vapor barrier 10 mils thick minimum placed directly under the concrete slab (for slab on grade). Testing must be done to verify that the moisture vapor emission rate of the slab does not exceed that as recommended by the manufacturer at time of installation of the flooring or at any future date. Moisture vapor emission and moisture content testing must conform with the requirements of ASTM F-1869 (Calcium Chloride Test) and ASTM F-2170 (Relative Humidity Probe Test). If test results show excessive levels of moisture content or vapor emission rate, apply manufacturer’s recommended moisture vapor emission control material based upon the highest test reading.
   5. Saw cutting of control joints must be done between 12 and 24 hours after placement of the structural concrete.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Basis of design Concord Terrazzo Co,TERRAZZCO GroutLess EZpour 158 Thin Set Epoxy Terrazzo Flooring System.

B. Acceptable mamufactures:
   1. Concord Terrazzo Co: https://terrazzco.com/concord-terrazzo-company/
   2. Key Resin :https://www.keyresin.com/

2.02 MATERIALS

A. Primer: Only as recommended by the manufacturer.

B. Epoxy resin binder mixed according to manufacturer's recommendation and tested without aggregate added. All specimens cured for 7 days at 75 degrees plus or minus 2 degrees Fahrenheit and 50% plus or minus 2% R.H. The product shall meet the following requirements:

Property	Test Method	Requirement
Hardness	ASTM D-2240 using Shore D Durometer	60-85
Tensile Strength	ASTM D-412 Specimen made using “C” die	3,000 psi Minimum
Compressive Strength	ASTM D-695 Specimen “B” cylinder	10,000 psi Minimum
Chemical Resistance	ASTM D-1308 seven days at room temperature by immersion method	No deleterious effects: Distilled Water Mineral Oil Isopropanol Ethanol 0.025 Detergent Solution 1% Soap Solution 10% Sodium Hydroxide 10% Hydrochloric Acid 30% Sulfuric Acid

1. Epoxy Resin mixed according to manufacturers recommendations and blended with 3 volumes of Georgia White marble blended 60% #1 chip and 40% #0 chip, ground and grouted with epoxy resin according to 3.02 C-2. All specimens cured 7 days at 75 degrees plus or minus 2 degrees Fahrenheit and 50% plus or minus R.H. The finished epoxy terrazzo shall meet the following requirements:

Property	Test Method	Requirement
Flammability	ASTM D-635	Self-extinguishing, extent of burning .025 inches maximum.
Thermal Coefficient of Linear Expansion	ASTM-D-696	25 x 10-6 inches per inch per degree to 140 degrees Fahrenheit

Bond Strength	ACI Committee No. 403/503 Bulletin Title No.59-43 (Pages 1139-1141)	100% concrete failure minimum, with 300 PSI minimum tensile strength.

Note: This test is intended to evaluate the bond to the concrete subfloor and is to be tested at the discretion of the architect. A 100% concrete failure indicates a good bond.

C. Marble Chips or Glass Aggregate:
   1. Size: To conform with NTMA gradation standards.
      a. Note: Match owner selected sample to involve specialty aggregates
      b. Hardness according to ASTM C-24l Ha-10 minimum.
   2. Note: This test indicates the abrasion resistance of marble chips.
      a. 24 hours absorption rate not to exceed 0.75 percent.
      b. Chips shall contain no deleterious or foreign matter.
      c. Dust content less than 1% by weight.

D. Strips:
      a. Stop and divider "L" strips: Zinc gauge.
         1) 16 gauge,1/16 inch high heavy top "L" type control joints.
         2) 16 gauge,1/8 inch high heavy top "L" type decorative joints.
         3) Construction joint double "L" strips (do not use neoprene joint filler material), back to back... 16 gauge white alloy of zinc.

E. Terrazzo Cleaner:
      a. pH factor between 7 and 10 where applicable.
      b. Biodegradable and phosphate free.

F. Sealer:
   1. Betco Sure Cure Should be applied at 1-2 coats for initial protective barrier on the terrazzo.
      a. Betco Untouchable Floor Finish should be applied over the top of the Sure Cure at 3-5 additional coats for a high Gloss Finish.
      b. pH factor between 7 and 10, where applicable.
      c. Shall not discolor or amber.
   2. Flash Point: ASTM D-56, 80 degrees Fahrenheit minimum, where applicable.
   3. Special stain and/or chemical resistant sealers are needed for certain areas such as resistance to iodine or Betadine.

2.03 MIXES

A. Terrazzo Selection: Refer to Drawings for colors.

B. Proportions:
   1. Epoxy Terrazzo Topping: In accordance with resin supplier's recommendations.

C. Mixing:
   1. Terrazzo Topping: Charge and mix marble chips and epoxy resin in accordance with supplier's instructions.

PART 3 EXECUTION

3.01 INSPECTION

A. Examine areas to receive terrazzo for:
   1. Deviations beyond allowable tolerances for the concrete slab work.
      Note: Subfloor not to vary more that 1/4 inch from true plane in 10 feet. Epoxy thin-set terrazzo, as specified, is not intended to level substrate and will only follow the contour of the concrete slab. If for any reason the subcontractor questions the suitability of the substrate, any work required to eliminate nonconformity of subsurface specifications is the responsibility of others. Any materials used to correct nonconformity must be compatible with terrazzo system selected and be approved by the terrazzo material manufacturer.

B. Proceed with installation only when all defects have been corrected.

3.02 INSTALLATION

A. Subfloor:
   1. Prepare substrate to receive epoxy terrazzo in accordance with manufacturer's recommendations.
   2. Substrate Crack Repair: Hairline cracks less than 1/16” width may be filled with neat epoxy resin, EZpour #158 or EZpour #162. Treat cracks larger than 1/16” width as recommended in NTMA Technical Bulletin #111 “Crack Detailing and Joint Treatments for Thin Set Terrazzo”, Detail #6. Route out all cracks larger than 1/16” width and fill with rigid epoxy. Apply TERRAZZCO #528 Flexible Epoxy across the crack a minimum width of 24 inches at a spread rate of 40-50 square feet per gallon to achieve 32-40 mils dry film thickness over the crack and allow to cure. Optional reinforcement: Imbed fiberglass scrim cloth into wet primer and saturate with additional TERRAZZCO #528 Flexible Membrane. Alternatively, scrim cloth may be gently placed onto surface of tacky TERRAZZCO #528 without pressing down into resin. Allow to cure.
   3. Alternate to Step #2: If cracks are too numerous to treat individually, apply TERRAZZO #528 Flexible Epoxy over entire floor surface as a crack isolation membrane following procedure outlined in step #2. Refer also to NTMA Technical Bulletin #111 “Crack Detailing and Joint Treatments for Thin Set Terrazzo”, Detail #5.
   4. Install divider strips over all concrete joints as recommended in NTMA Technical Bulletin #111 “Crack Detailing and Joint Treatments for Thin Set Terrazzo”, Details #1-#7. Divider strips must be bonded to joint edges for contraction joints (aka control joints/sawcuts) and isolation joints (aka expansion joints) in subfloor. For contraction joints, refer to Details #1-#3. For Isolation joints, refer to Detail #4. For Construction joints (aka cold joints), refer to Detail #7. For exposed contraction joints, fill with TERRAZZCO Flex-a-fill #1200 Joint Filler. Fill isolation joints with urethane sealant formulated for use in floor expansion joints supplied by others. Do not use prefabricated double divider strips filled with neoprene.
   5. Install divider strips as shown on drawings.

B. Placing Terrazzo:
   1. Prime subfloor in accordance with resin supplier's instructions. If required, install moisture vapor control material before other terrazzo system materials.
   2. Place terrazzo mixture and trowel to a dense flat surface to top of divider strips.

C. Finishing:
   1. Rough Grinding:
      a. Grind with 24 or finer grit stones or with comparable diamond plates.
      b. Follow initial grind with 80 or finer grit stones or with comparable diamond plates.
   2. Grouting:
      a. Cleanse floor with clean water and rinse.
      b. Remove excess rinse water, dry, and apply epoxy grout, supplied by epoxy manufacturer, to fill voids.
   3. Cure Grout.

   Note: Grout may be left on terrazzo until all heavy and messy work in project is completed.
   1. Fine Grinding / Polishing:
      a. Grind with 80 or finer grit stones or with comparable diamond plates until all grout is removed from surface. Follow Grout removal by polishing with 100 grit, 200 grit, 400 grit, and 800 grit diamond pads.
      b. Upon completion, terrazzo shall reasonably match approved samples with overall uniform chip density.
   2. Burnishing: After Betco Untchable Floor Finish as been applied (3-5 coats) the floor should be burnished with a high-speed buffer and a natural hair or Purple polishing pad for high gloss finish.

D. Cleaning and Sealing:
   1. Wash all surfaces with a neutral cleaner.
   2. Rinse with clean water and allow surface to dry.
   3. Apply sealer in accordance with manufacturer's directions. For ADA slip resistance requirement, use UL approved sealer supplied by others as necessary.
      (Note: Delete sealer step if substituting alternative maintenance finish system that requires installation over unsealed epoxy terrazzo)

E. Protection:
   1. Upon completion, the work shall be ready for final inspection and acceptance by the owner or his agent.
   2. The General Contractor shall protect the finished floor from the time that the terrazzo contractor completes the work.

END OF SECTION

SECTION 096813
TILE CARPETING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Carpet tile, Adhered per written instructions of manufacturer.

1.02 RELATED REQUIREMENTS

A. Section 016116 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 01 60 00 Product Requirements

C. Section 033000 - Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors.

D. Division 26: Electrical floor boxes with carpet inserts.

E. Section 09 0561 Common Work Results from Flooring Prep

1.03 REFERENCE STANDARDS

A. ASTM D2859 - Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials; 2016 (Reapproved 2021).

B. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source; 2025.

C. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2022.

D. CRI 104 - Standard for Installation of Commercial Carpet; 2015.

E. CRI (CIS) - Carpet Installation Standard; Carpet and Rug Institute; 2011.

F. CRI (GLP) - Green Label Plus Testing Program - Certified Products; Current Edition.

G. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source; 2023.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.

C. Shop Drawings: Indicate layout of joints.

D. Samples: Submit two carpet tiles illustrating color and pattern design for each carpet color selected.

E. Manufacturer's written Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention, and ____.

F. Maintenance Data: Include written maunufactueres maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements, for additional provisions.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing specified carpet tile with minimum three years documented experience.

B. Installer Qualifications: Company specializing in installing carpet tile with minimum 3 years documented experience and approved by carpet tile manufacturer.

1.06 FIELD CONDITIONS

A. Store materials in area of installation for minimum period of 24 hours prior to installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Tile Carpeting: Refer to finish schedule.
   1. Substitutions: See Section 016000 - Product Requirements.

2.02 MATERIALS

A. Tile Carpeting, Type Basis of Design:

B. Product Type: (CPT-1)(**Basis of Design**)
   1. Collection name: Green Border Masjid Carpet
   2. Basis of Design Manufacturer: Musalla Masjid Carpets
   3. Product Number: SKU:012
   4. Construction: 100 % Polypropylene (PP) and Jute
   5. Fiber/Dye: 100% Solution Dyed
   6. Color: See Finish Schedule
   7. Installation: 32 oz Fiber Pad or 8 Pounds Rebound Pad Recommended – 4″ Seam Type – Extra wide tack strips – Cut 1″ from both sides to have invisible seam/joint – Keep the carpets in warm temperature (72F) before the installation

C. Product Type:(CPT-2) (**Basis of Design**)
   1. Collection name: Kickoff
   2. Basis of Design Manufacturer: Shaw Contract
   3. Product Number: 5T499
   4. Construction: multi-level pattern loop
   5. Fiber/Dye: 100% Solution Dyed
   6. Color: See Finish Schedule
   7. Primary backing: Ecoworx® Tile
   8. Product size: 23 cm x 91 cm | 9 in x 36 in
   9. Gauge: 1/12"
   10. Finished pile thickness: 0.113 in

2.03 ACCESSORIES

A. Sub-Floor Filler: ____; per written recommendations of flooring materials manufacturer.

B. Edge Strips and Thresholds: Extruded Aluminum, color as selected by Architect. Refer to drawings for details. Equal to Schluter, straight and radiused as required. Conform to ADAAG Requirements.

C. Adhesives:
   1. Compatible with materials being adhered; maximum VOC content as specified in Section 016116.
   2. Carpet Tile Adhesive: Per written recommendations of carpet tile manufacturer; releasable type.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that sub-floor surfaces are smooth and flat within tolerances specified for that type of work and are ready to receive carpet tile.

B. Verify that sub-floor surfaces are dust-free and free of substances that could impair bonding of adhesive materials to sub-floor surfaces.

C. Cementitious Sub-floor Surfaces: Verify that substrates and concrete sub-floor are dry enough and ready for flooring installation by testing for moisture emission rate and pH in accordance to ASTM F 170.
   1. Obtain manufacturers written instructions if test results are not within limits recommended by flooring manufacturer and adhesive manufactuer.

D. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

A. Prepare floor substrates as recommended by flooring and adhesive manufacturers written instructions.

B. Remove sub-floor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with sub-floor filler per written instructions of flooring manufacturer.

C. Vacuum clean substrate per manufacturers written instructions.

3.03 INSTALLATION

A. Starting installation constitutes acceptance of sub-floor conditions. Provide maunfacturers written approval of substrate prior to installation of carpet.

B. Install carpet tile in accordance with manufacturer's instructions.

1. Install using a 'releasble' glue system, 'peel and sitck', or tackable dots, in accordance with manufacturer's written instructions. Direct-glue method is unacceptable.

C. Blend carpet from different cartons to ensure minimal variation in color match.

D. Cut carpet tile clean. Fit carpet tight to intersection with vertical surfaces without gaps.

E. Lay carpet tile in as directed on finish schedule pattern, with pile direction parallel to next unit, set parallel to building lines.

F. Trim carpet tile neatly at walls and around interruptions.

G. Complete installation of edge strips, concealing exposed edges.

3.04 ATTIC STOCK

A. 5% of installed amount

3.05 CLEANING

A. Remove excess adhesive without damage, from floor, base, and wall surfaces.

B. Clean and vacuum carpet surfaces.

END OF SECTION

SECTION 099113
EXTERIOR PAINTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints.

C. Scope: Finish exterior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated, including the following:
   1. Both sides and edges of plywood backboards for electrical and telecom equipment before installing equipment.
   2. Exposed surfaces of steel lintels and ledge angles.

D. Do Not Paint or Finish the Following Items:
   1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
   2. Items indicated to receive other finishes.
   3. Items indicated to remain unfinished.
   4. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
   5. Non-metallic roofing and flashing.
   6. Stainless steel, anodized aluminum, bronze, terne coated stainless steel, zinc, and lead.
   7. Marble, granite, slate, and other natural stones.
   8. Floors, unless specifically indicated.
   9. Ceramic and other types of tiles.
   10. Brick, glass unit masonry, architectural concrete, cast stone, integrally colored plaster and stucco.
   11. Glass.
   12. Concealed pipes, ducts, and conduits.

1.02 RELATED REQUIREMENTS

A. Section 016116 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 055000 - Metal Fabrications: Shop-primed items.

C. Section 099123 - Interior Painting.

D. Section 08 1113 - Hollow Metal Doors and Frames

E. Section 07 9005 - Joint Sealers

F. Section 099300 - Staining and Transparent Finishing. Wood substrates.

G. Section 210553 - Identification for Fire Suppression Piping and Equipment: Painted identification.

H. Division 32 - Painted Pavement Markings.
   1. unless noted in Civil Drawings.

1.03 DEFINITIONS

A. Conform to ASTM D16 for interpretation of terms used in this section.

1.04 REFERENCE STANDARDS

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; Current Edition.

B. ASTM D4258 - Standard Practice for Surface Cleaning Concrete for Coating; 2023.

C. ASTM D4259 - Standard Practice for Preparation of Concrete by Abrasion Prior to Coating Application; 2024.

D. MPI (APL) - Master Painters Institute Approved Products List; Master Painters and Decorators Association; Current Edition.

E. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition.

F. SCAQMD 1113 - Architectural Coatings; 1977, with Amendment (2016).

G. SSPC V1 (PM1) - Good Painting Practice: Painting Manual Volume 1; 2024.

H. SSPC V2 (PM2) - Systems and Specifications: Steel Structures Painting Manual Volume 2; 2021.

I. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).

J. SSPC-SP 2 - Hand Tool Cleaning; 1982 (Ed. 2004).

K. SSPC-SP 3 - Power Tool Cleaning; 2024.

L. SSPC-SP 6 - Commercial Blast Cleaning; 2007.

M. SSPC-SP 13 - Surface Preparation of Concrete; 2018.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide complete list of products to be used, with the following information for each:
   1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
   2. MPI product number (e.g. MPI #47).
   3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.
   4. Manufacturer's installation instructions.
   5. If proposal of substitutions is allowed under submittal procedures, explanation of substitutions proposed.

C. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches (216 by 279 mm) in size, illustrating range of colors available for each finishing product specified.
   1. Where sheen is specified, submit samples in only that sheen.
   2. Where sheen is not specified, discuss sheen options with Architect before preparing samples, to eliminate sheens definitely not required.
   3. Paint color submittals will not be considered until color submittals for major materials not to be painted, such as masonry, have been approved.

D. Samples: Submit two paper chip samples, 8 1/2" x 11" inch (____) in size illustrating range of colors and textures available for each surface finishing product scheduled.

E. Certification: By manufacturer that paints and finishes comply with VOC limits specified.

F. Manufacturer's Instructions: Follow manufacturer's recommended preparation prodcures.

G. Maintenance Data: Submit data including product technical data sheets, material safety data sheets (MSDS), care and cleaning instructions, touch-up procedures, repair of painted and finished surfaces, and color samples of each color and finish used.

H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements, for additional provisions.
   2. Extra Paint and Finish Materials: 1 gallon (4 L) of each color; from the same product run, store where directed.
   3. Label each container with color in addition to the manufacturer's label.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum 3 years experience and approved by manufacturer.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Paint Materials: Store at minimum ambient temperature of 45 degrees F (7 degrees C) and a maximum of 90 degrees F (32 degrees C), in ventilated area, and as required by manufacturer's instructions.

1.08 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Do not apply exterior paint and finishes during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.

D. Minimum Application Temperatures for Latex Paints: 50 degrees F (10 degrees C) for exterior; unless required otherwise by manufacturer's instructions.

E. Provide lighting level of 80 ft candles (860 lx) measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide paints and finishes used in any individual system from the same manufacturer; no exceptions.

B. Paints:
   1. Sherwin-Williams Company: www.sherwin-williams.com/#sle. Basis of Design (or equal)

C. Primer Sealers: Same manufacturer as top coats.

D. Substitutions: See Section 016000 - Product Requirements.

2.02 PAINTS AND FINISHES - GENERAL

A. Paints and Finishes: Ready mixed, unless required to be a field-catalyzed paint.
   1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
   2. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
   3. Supply each paint material in quantity required to complete entire project's work from a single production run.
   4. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

B. Volatile Organic Compound (VOC) Content: Comply with Section 016116.

C. Flammability: Comply with applicable code for surface burning characteristics.

D. Sheens: Satin.

E. Colors: As indicated on drawings

2.03 PAINT SYSTEMS - EXTERIOR

A. Paint GE-OP-2A - Exterior Gypsum Board and Exterior Plaster, Opaque, Alkyd, 2 Coat:

1. One coat of alkyd primer sealer.
2. Satin: One coat of alkyd enamel.
3. location: Loggia Ceiling.

B. Paint ME-OP-3A - Ferrous Metals, Unprimed, Alkyd, 3 Coat:
1. One coat of alkyd primer, equal to SW B507Kromik Universal Metal Primer.
2. Gloss: Two coats of alkyd enamel; equal to SW B54W00151 Industrial Urethane Alkyd Enamel.

C. Paint MgE-OP-3A - Galvanized Metals, Alkyd, 3 Coat:
1. One coat galvanize primer, equal to SW B66W00310 Pro Industrial Pro Cryl Universal Primer Off White.
2. Gloss: Two coats of alkyd enamel; equal to SW B54W00151 Industrial Urethane Alkyd Enamel .

2.04 ACCESSORY MATERIALS

A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.

B. Patching Material: Latex filler.

C. Fastener Head Cover Material: Latex filler.warra

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin application of paints and finishes until substrates have been properly prepared.

B. Commencement of paint opperations indicates applicators acceptance of surfaces and conditions.

C. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

D. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially effect proper application.

E. Test shop-applied primer for compatibility with subsequent cover materials.

3.02 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or repair existing paints or finishes that exhibit surface defects.

D. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces for finishing.

E. Seal surfaces that might cause bleed through or staining of topcoat.

F. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

G. Galvanized Surfaces:
1. Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.

H. Ferrous Metal:
1. Solvent clean according to SSPC-SP 1.
2. Remove rust, loose mill scale, and other foreign substances using using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 "Commercial Blast Cleaning". Protect from corrosion until coated.

3.03 APPLICATION

A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.

B. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".

C. Where adjacent sealant is to be painted, do not apply finish coats until sealant is applied.

D. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

E. Apply each coat to uniform appearance.

F. Dark Colors and Deep Clear Colors: Regardless of number of coats specified, apply additional coats until complete hide is achieved.

G. Sand metal surfaces lightly between coats to achieve required finish.

H. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

I. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for general requirements for field inspection.

3.05 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.06 PROTECTION

A. Protect finishes until completion of project.

B. Touch-up damaged finishes after Substantial Completion.

END OF SECTION

SECTION 099123
INTERIOR PAINTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints, stains, and varnishes.

C. Scope: Finish interior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated.
   1. Both sides and edges of plywood backboards for electrical and telecom equipment before installing equipment.
   2. Gypsum walls and ceilings.
   3. Exposed steel surfaces.
   4. Mechanical and Electrical:
      a. In finished areas, paint insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, mechanical equipment, and electrical equipment, unless otherwise indicated.
      b. In finished areas, paint shop-primed items.
      c. Paint interior surfaces of air ducts that are visible through grilles and louvers with one coat of flat paint to visible surfaces.
      d. Linear diffusers.
   5. Hollow metal frames and doors.

D. Do Not Paint or Finish the Following Items:
   1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
   2. Items indicated to receive other finishes.
   3. Items indicated to remain unfinished.
   4. Fire rating labels, equipment serial number and capacity labels, bar code labels, and operating parts of equipment.
   5. Stainless steel, anodized aluminum, bronze, terne coated stainless steel, and lead items.
   6. Marble, granite, slate, and other natural stones.
   7. Floors, unless specifically indicated.
   8. Ceramic and other tiles.
   9. Brick, architectural concrete, cast stone, integrally colored plaster and stucco.
   10. Electrical devices and plates.
   11. Door hardware and cabinet hardware.
   12. Glass.
   13. Toilet accessories and toilet partitions.
   14. Acoustical materials, unless specifically indicated.
   15. Concealed pipes, ducts, and conduits.

1.02 RELATED REQUIREMENTS

A. Section 016116 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 055000 - Metal Fabrications: Shop-primed items.

C. Section 08 1113 - Hollow Metal Doors and Frames

D. Section 099113 - Exterior Painting.

E. Section 07 9005 - Joint Sealants

1.03 DEFINITIONS

A. Conform to ASTM D16 for interpretation of terms used in this section.

1.04 REFERENCE STANDARDS

A. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials; 2020.

B. MPI (APL) - Master Painters Institute Approved Products List; Master Painters and Decorators Association; Current Edition.

C. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition.

D. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).

E. SSPC-SP 6 - Commercial Blast Cleaning; 2007.

F. SSPC-SP 13 - Surface Preparation of Concrete; 2018.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide complete list of products to be used, with the following information for each:
   1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
   2. Cross-reference to specified paint system(s) product is to be used in; include description of each system.
   3. Manufacturer's installation instructions.
   4. If proposal of substitutions is allowed under submittal procedures, explanation of substitutions proposed.

C. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches (216 by 279 mm) in size, illustrating range of colors available for each finishing product specified.
   1. Where sheen is specified, submit samples in only that sheen.
   2. Where sheen is not specified, discuss sheen options with Architect before preparing samples, to eliminate sheens definitely not required.
   3. Paint color submittals will not be considered until color submittals for major materials not to be painted, such as masonry, have been approved.

D. Certification: By manufacturer that paints and finishes comply with VOC limits specified.

E. Manufacturer's Instructions: Indicate special surface preparation procedures.

F. Maintenance Data: Submit data including finish schedule showing where each product/color/finish was used, product technical data sheets, material safety data sheets (MSDS), care and cleaning instructions, touch-up procedures, repair of painted and finished surfaces, and color samples of each color and finish used.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements, for additional provisions.
   2. Extra Paint and Finish Materials: 1 gallon (4 L) of each color; from the same product run, store where directed.
   3. Label each container with color in addition to the manufacturer's label.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum 3 years experience and approved by manufacturer.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Paint Materials: Store at minimum ambient temperature of 45 degrees F (7 degrees C) and a maximum of 90 degrees F (32 degrees C), in ventilated area, and as required by manufacturer's instructions.

1.08 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Do not apply materials when relative humidity exceeds 85 percent; at temperatures less than 5 degrees F (3 degrees C) above the dew point; or to damp or wet surfaces.

D. Minimum Application Temperatures for Paints: 50 degrees F (10 degrees C) for interiors unless required otherwise by manufacturer's instructions.

E. Provide lighting level of 80 ft candles (860 lx) measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide paints and finishes used in any individual system from the same manufacturer; no exceptions.

B. Paints:
   1. Sherwin-Williams Company: www.sherwin-williams.com/#sle. Basis of Design (or equal).

C. Primer Sealers: Same manufacturer as top coats.

D. Substitutions: See Section 016000 - Product Requirements.

2.02 PAINTS AND FINISHES - GENERAL

A. Paints and Finishes: Ready mixed, unless intended to be a field-catalyzed paint.
   1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
   2. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
   3. Supply each paint material in quantity required to complete entire project's work from a single production run.
   4. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

B. Volatile Organic Compound (VOC) Content: Comply with Section 016116.

C. Flammability: Comply with applicable code for surface burning characteristics.

D. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.

E. Colors: As indicated on drawings.
   1. In finished areas, finish pipes, ducts, conduit, and equipment the same color as the wall/ceiling they are mounted on/under or as indicated on drawings.

2.03 PAINT SYSTEMS - INTERIOR

A. Paint I-OP - Interior Surfaces to be Painted, Unless Otherwise Indicated: Including gypsum board, wood, uncoated steel, and shop primed steel.
   1. Two top coats and one coat primer.

2. Top Coat Sheen:
   a. Satin: MPI gloss level 3; use this sheen at all locations.
3. Primer: As recommended by top coat manufacturer for specific substrate.

B. Paint I-OP-DF - Dry Fall: Metals; exposed structure and overhead-mounted services in utilitarian spaces, including shop primed steel deck, structural steel, metal fabrications, galvanized ducts, galvanized conduit, and galvanized piping.
1. Shop primer as recommended by manufacturer of top coat.
2. Two top coats;white. Equal to B42W82 SW Pro Industrial Waterborne EggShell Dryfall (Flat, B42W181 – S/G, B42W83.

C. Paint I-TR -W - Transparent Finish on Wood.
1. Sealer: Sanding Sealer, Clear.
   a. Products:
      1) Equal to SW Wood Classics Fast Dry Sanding Sealer, B26V43
      2) Substitutions: Section 016000 - Product Requirements.
2. Top Coat(s): Polyurethane Varnish.
   a. Products:
   b. Equal to SW Wood Classics Polyurethane Varnish A67F1 Hand Rubbed Satin.
      1) Substitutions: Section 016000 - Product Requirements.

D. Paint MI-OP-3L - Ferrous Metals, Unprimed, Latex, 3 Coat:
1. One coat of latex primer equal to SW B66W00310 Pro Industrial Pro-Cryl Universal Primer Off White.
2. Semi-gloss: Two coats of latex enamel; equal to SW B66W650 Pro Industrial HP Acrylic Coating..

E. Paint GI-OP-3L - Gypsum Board/Plaster, Latex, 3 Coat:
1. One coat of latex primer sealer equal to SW B26-2800 ProMar 200 Zero VOC Interior Latex Primer White.
2. Satin: Two coats of latex enamel; equal to SW B20W2651 ProMar 200 Zero VOC Satin Extra White.

2.04 ACCESSORY MATERIALS

A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.

B. Patching Material: Latex filler.

C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin application of paints and finishes until substrates have been properly prepared.

B. Commencement of paint operations indicates applicators acceptance of surfaces and conditions.

C. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

D. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially effect proper application.

E. Test shop-applied primer for compatibility with subsequent cover materials.

F. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
1. Gypsum Wallboard: 12 percent.
2. Interior Wood: 15 percent, measured in accordance with ASTM D4442.

3.02 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or repair existing paints or finishes that exhibit surface defects.

D. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.

E. Seal surfaces that might cause bleed through or staining of topcoat.

F. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

G. Gypsum Board: Fill minor defects with filler compound. Spot prime defects after repair.

H. Copper: Remove contamination by steam, high pressure water, or solvent washing.

I. Galvanized Surfaces:
   1. Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.

J. Ferrous Metal:
   1. Solvent clean according to SSPC-SP 1.
   2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.
   3. Remove rust, loose mill scale, and other foreign substances using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 "Commercial Blast Cleaning". Protect from corrosion until coated.

K. Wood Surfaces to Receive Opaque Finish: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats. Back prime concealed surfaces before installation.

L. Wood Surfaces to Receive Transparent Finish: Wipe off dust and grit prior to sealing, seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after sealer has dried; sand lightly between coats. Prime concealed surfaces with gloss varnish reduced 25 percent with thinner.

M. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

3.03 APPLICATION

A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.

B. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".

C. Where adjacent sealant is to be painted, do not apply finish coats until sealant is applied.

D. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

E. Apply each coat to uniform appearance in thicknesses specified by manufacturer.

F. Dark Colors and Deep Clear Colors: Regardless of number of coats specified, apply as many coats as necessary for complete hide.

G. Sand wood and metal surfaces lightly between coats to achieve required finish.

H. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

I. Wood to Receive Transparent Finishes: Tint fillers to match wood. Work fillers into the grain before set. Wipe excess from surface.

J. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for general requirements for field inspection.

3.05 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.06 PROTECTION

A. Protect finishes until completion of project.

B. Touch-up damaged finishes after Substantial Completion.

END OF SECTION

SECTION 101423
SIGNAGE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Panel signage

1.02 SUMMARY

A. Furnish room signs at all locations required by code. These include, but may not be limited to:
   1. Fire Sprinkler Room
   2. Occupancy Loads
   3. Restrooms
   4. Exits

1.03 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

B. ASTM A475 - Standard Specification for Metallic-Coated Steel Wire Strand; 2022.

C. ASTM A555/A555M - Standard Specification for General Requirements for Stainless Steel Wire and Wire Rods; 2023.

D. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2023.

E. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

F. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.

G. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

H. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

I. UL 879 - Electric Sign Components; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Manufacturer's product literature for each type of panel sign, indicating styles, font, foreground and background colors, locations, and overall dimensions of each sign.

C. Shop Drawings:
   1. Include dimensions, locations, elevations, materials, text and graphic layout, attachment details, and schedules.
   2. Schedule: Provide information sufficient to completely define each panel sign for fabrication, including room number, room name, other text to be applied, sign and letter sizes, fonts, and colors.
      a. When room numbers to appear on signs differ from those on drawings, include the drawing room number on schedule.
      b. When content of signs is indicated to be determined later, request such information from Owner through Architect at least 2 months prior to start of fabrication; upon request, submit preliminary schedule.
      c. Submit for approval by Owner through Architect prior to fabrication.

D. Samples: Submit two samples of each type of sign, of size similar to that required for project, indicating sign style, font, and method of attachment.

E. Selection Samples: Where colors, materials, and finishes are not specified, submit two sets of color selection charts or chips.

F. Verification Samples: Submit samples showing colors, materials, and finishes specified.

G. Manufacturer's Installation Instructions: Include installation templates and attachment devices.

H. Manufacturer's qualification statement.

1.05 QUALITY ASSURANCE

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

1.06 DELIVERY, STORAGE, AND HANDLING

A. Package signs as required to prevent damage before installation.

B. Store under cover and elevated above grade.

C. Store tape adhesive at normal room temperature.

1.07 FIELD CONDITIONS

A. Do not install tape adhesive when ambient temperature is lower than recommended by manufacturer.

B. Maintain minimum ambient temperature during and after installation.

1.08 WARRANTY

A. Manufacturer's Warranty: Provide manufacturer's 5 year warranty against fading, defects in materials, and workmanship. Letters shall be guaranteed for the life of the business against defects.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Panel Signage/Dimensional Letters sigange:
1. Best Sign Systems, Inc: www.bestsigns.com/#sle.
2. LEEDS Architectural Letters of Alabama, Inc.: www.leedssign.com
3. A.R.K. Ramos Architectural Signage: www.arkramos.com
4. FASTSIGNS International, Inc: www.fastsigns.com
5. Knight Sign Industries, Inc.: www.knightsign.com
6. Takeform: www.takeform.net
7. Inpro Corporation: www.inprocorp.com
8. Clarke Systems, Inc: www.clarkesystems.com
9. APCO Signs: www.apcosigns.com.
10. Substitutions: See Section 016000 - Product Requirements.

2.02 PANEL SIGNAGE

A. Panel Signage:
1. Application: Room and door signs. Refer to architect's sheet T01 for additional information and requirements.
2. Description: Layered signs, tactile characters. (Signs: ID-RR and ID-RM on sheet T01)
3. Total Thickness: ¼ inch (two layers of 1/8 inch acrylic as per Sheet T01)
4. Material: Acrylic plastic base with applied plastic letters and braille.
5. Finish: 90% Black, Metallic Gold – (Or equivalent, to be coordinated with Architect and Manufacturer).
6. Tactile Letters / Pictograms: Raised 1/32 inch minimum.
7. One-Sided Wall Mounting: Tape adhesive, unless otherwise indicated
8. Sign Height: varies, for multiline text or signage with pictograms. ADA-compliant.

2.03 ALUMINUM PANEL SIGNS

A. Aluminum panel signage:
1. Application: Room and door signs. Refer to architect's sheet T01 for additional information and requirements.
2. Description: Flat signs, tactile characters with ½ inch radiused corners.

3. Total Thickness: 1/8 inch.
4. Material: Painted Aluminum.
5. Finish 90% Black, White - (Or equivalent, to be coordinated with Architect and Manufacturer).
6. Tactile Letters / Pictograms: Raised 1/32 inch minimum.
7. Mount with concealed mechanical fasteners.
8. Braille: Grade II, ADA-compliant.
9. Sign Height: varies, for multiline text or signage with pictograms. ADA-compliant.
10. Protect with exterior rated coating.

2.04 DIMENSIONAL LETTERS

A. Dimensional Letters sigange:
1. Application: Interior Building Sign. Refer to sheets T01 and A07.50.
2. Description: Cast aluminum dimensional letter sign.
3. Total Thickness: 1 inch.
4. Material: Cast aluminum.
5. Finish: Metallic Gold - (Or equivalent, to be coordinated with Architect and Manufacturer).
6. Mounting: A mounting template designating stud locations shall be provided. Stud size and type shall be as required by manufacturer for application and design intent.
7. Cast metal letters shall have threaded stud bosses or drilled and tapped for stud insertion.
8. Sign Height: Refer to sheet A07.50.

2.05 ACCESSORIES

A. Concealed Screws: Noncorroding metal; stainless steel, galvanized steel, chrome plated, or other.

B. Exposed Screws: Stainless steel.

C. Tape Adhesive: Double-sided tape, permanent adhesive.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.

B. Verify that power and data service is correctly sized and located to accommodate panel signs.

C. Notify Architect if conditions are not suitable for installation of signs; do not proceed until conditions are satisfactory.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install with horizontal edges level.

C. Protect from damage date of substantial completion; repair or replace damaged items.

END OF SECTION

SECTION 102800
TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Commercial toilet accessories.

B. Under-lavatory pipe supply covers.

C. Diaper changing stations.

D. Grab bars.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry for Concealed Wood Blocking

B. Section 093000 - Tiling: Wall Tile

C. Section 224000 - Plumbing Fixtures: Under-lavatory pipe and supply covers.

1.03 REFERENCE STANDARDS

A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines; current edition.

B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2024.

C. ASTM A167 - Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip; 1999 (Reapproved 2009).

D. ASTM A269/A269M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service; 2024.

E. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

F. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2023.

G. ASTM C1036 - Standard Specification for Flat Glass; 2025.

H. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2025.

1.04 SUBMITTALS

A. See Section 01 3001 - Submittals

B. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.

C. Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design: Bobrick.

B. Commercial Toilet, Shower, and Bath Accessories:
   1. AJW Architectural Products: www.ajw.com/#sle.
   2. American Specialties, Inc: www.americanspecialties.com/#sle.
   3. Bradley Corporation: www.bradleycorp.com/#sle.
   4. Substitutions: Section 016000 - Product Requirements.

C. Provide products of each category type by single manufacturer.

2.02 MATERIALS

A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.

B. Stainless Steel Sheet: ASTM A666, Type 304.

C. Stainless Steel Tubing: ASTM A269/A269M, Grade TP304 or TP316.

D. Mirror Glass: Tempered safety glass, ASTM C1048; and ASTM C1036 Type I, Class 1, Quality Q2, with silvering as required.

E. Fasteners, Screws, and Bolts: Hot dip galvanized; tamper-proof; security type.

2.03 FINISHES

A. Stainless Steel: Satin finish, unless otherwise noted.

B. Back paint components where contact is made with building finishes to prevent electrolysis.

2.04 COMMERCIAL TOILET ACCESSORIES

A. Recessed Toilet Tissue Dispenser:
   1. Basis of Design: Bobrick B-35883 or approved equal.
      a. Description: Satin-finish stainless steel unit with all-welded construction. Flush lock. Unit is theft resistant and equipped with a tumbler lock keyed like other Bobrick washroom accessories. Dispenser holds two standard-core toilet tissue rolls up to 5-1/8″ (130mm) diameter (1500 sheets).

B. Recessed Manual Liquid Soap Dispenser
   1. Basis of Design Bobrick B-306
      a. Description:Satin-finish stainless steel*. Door: 90° return, conceals flange. Vessel on back of door swings open for filling. Hinge and tumbler lock secure door to cabinet. Capacity: 45-fl oz (1.3-L). Valve dispenses all-purpose soaps. Soap refill window. Rough Wall Opening: 8 3⁄8″ W, 4 3⁄8″ H, 3 7⁄8″ min

C. Countertop-Mounted Paper Towel Dispenser
   1. Basis of Design Bobrick B-536
      a. Satin-finish stainless steel. Flange has 90° return. Towels load into top of dispenser. Dispenses 300 C-fold or multifold towels. Unit 12 ¾” W, 6″ front to back depth (325 x 150mm); 17″ (430mm) min. clearance below mounting surface is required. Rough Countertop Cutout: 12 ¼” W (310mm), 4 ½” front to back depth (115mm), ¾” to 1 ½” (19 to 38mm) mounting thickness.

D. Mirror with Stainless Steel Angle Frame:
      a. Basis of Design: Bobrick B-2908 1836 (18"W x 36"H) or approved equal, refer to interior elevations for sizes.
         1) Finish: Satin Stainless Steel

E. Straight Grab Bar: B-5806.99 x 18 or Approved Equal (peened)
   1. Description: 18" (455mm) long, 1-1/4" (32mm) dia. tubing. Constructed of 18-gaug (1.2mm), type 304 satin-finish stainless steel tubing. Concealed mounting flange 1/8" (3mm) thick, type 304 stainless steel plate, 2" W x 3 1/8" H (50 x 80mm), with screw holes for concealed anchors. Cover is 22-gauge (0.8mm), type 304 stainless steel with satin finish, 3 1/4" (85mm) diameter. Cover snaps over mounting flange to conceal screws.

F. Straight Grab Bar: B-5806.99 x 18 or Approved Equal (peened)
   1. Description: 24" (455mm) long, 1-1/4" (32mm) dia. tubing. Constructed of 18-gaug (1.2mm), type 304 satin-finish stainless steel tubing. Concealed mounting flange 1/8" (3mm) thick, type 304 stainless steel plate, 2" W x 3 1/8" H (50 x 80mm), with screw holes for concealed anchors. Cover is 22-gauge (0.8mm), type 304 stainless steel with satin finish, 3 1/4" (85mm) diameter. Cover snaps over mounting flange to conceal screws.

G. Straight Grab Bar: B-5806.99 x 42 or Approved Equal (peened)

1. Description: 42" (1065mm) long, 1-1/4" (32mm) dia. tubing. Constructed of 18-gauge (1.2mm), type 304 satin-finish stainless steel tubing. Concealed mounting flange 1/8" (3mm) thick, type 304 stainless steel plate, 2" W x 3 1/8" H (50 x 80mm), with screw holes for concealed anchors. Cover is 22-gauge (0.8mm), type 304 stainless steel with satin finish, 3 1/4" (85mm) diameter. Cover snaps over mounting flange to conceal screws.

H. Straight Grab Bar: B-5806.99 x 36 or Approved Equal (peened)
1. Description: 36" (915mm) long, 1-1/4" (32mm) dia. tubing. Constructed of 18-gauge (1.2mm), type 304 satin-finish stainless steel tubing. Concealed mounting flange 1/8" (3mm) thick, type 304 stainless steel plate, 2" W x 6 1/2" H x 2 1/4" deep, with screw holes for concealed anchors. Mounting Strip[is 18-gauge (0.8mm), type 304 stainless steel with satin finish, 12 gauge hooks.

I. Straight Grab Bar: B-5806.99 x 48 or Approved Equal (peened)
1. Description:48" (915mm) long, 1-1/4" (32mm) dia. tubing. Constructed of 18-gauge (1.2mm), type 304 satin-finish stainless steel tubing. Concealed mounting flange 1/8" (3mm) thick, type 304 stainless steel plate, 2" W x 6 1/2" H x 2 1/4" deep, with screw holes for concealed anchors. Mounting Strip[is 18-gauge (0.8mm), type 304 stainless steel with satin finish, 12 gauge hooks.

J. Clothes Hook:Kingsley Robe Hook or Approved Equal
1. Description: Solid cast brass with (PVD) brush brass finish.

K. Recessed Sanitary Napkin Disposal: B-353 or Approved Equal
1. Satin-finish stainless steel. Seamless beveled flange. Door has tumbler lock. Self-closing panel covers disposal opening. Removable, leak-proof, 1.3-gal. (4.8-L) plastic receptacle. Rough Wall Opening: 11 1/4″ W, 15 5/8″ H, 4″ min. depth (285 x 395 x 100mm).

L. Horizontal, Wall-Mounted Baby Changing Station: Koala Kare KB310-SSWM or Approved Equal

M. Semi-recessed Waste Receptacle and Paper Towel Dispenser:
1. Basis of Design: Bobrick B-3942 or approved equal.

N. ADA Approved Under Lavatory Trap Wrap Kit. Combination kit includes one trap protector, two supply stop protectors, and one offset drain protector.
1. Install on all wall hung sinks with exposed plumbing, if not shown on plumbing.

O. Utility shelf with mop or broom holders and rag hooks. Equal to B-224 x 36. Provide at all mop sinks including at Kitchen and Concessions area.

P. Electric Hand Dryer:
1. Operating Airflow: 44 cfm.
2. Activation: Touch-Free infra-red activation
3. Product:
   a. Equal to Excel Dryer TA-SBH ThinAir ADA Compliant Hand Dryer with HEPA Filter, Graphite Textured Painted Steel, with Heat, or
   b. Equal to World Dryer VERDEdri model Q-962A2
4. Warranty: 5 year warranty.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify exact location of accessories for installation.

C. Veryify quantitees of each above item with architect's drawings.

D. Verify that field measurements are as indicated on drawings.

E. See Section 06 1000 for installation of blocking in walls.

3.02 PREPARATION

A. Deliver inserts and rough-in frames to site for timely installation.

B. Provide templates and rough-in measurements as required.

C. Install concealed wood blocking in wood stud framing walls prior to installing toilet accessories.

3.03 INSTALLATION

A. Install accessories in accordance with manufacturers' instructions in locations indicated on drawings.

B. Install plumb and level, securely and rigidly anchored to substrate.

C. Mounting Heights: As required by accessibility regulations, unless otherwise indicated.

D. Mounting Heights and Locations: As required by accessibility regulations, as indicated on drawings, and as follows:

3.04 PROTECTION

A. Protect installed accessories from damage due to subsequent construction operations.

END OF SECTION

SECTION 104400
FIRE PROTECTION SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fire extinguishers.

B. Fire extinguisher cabinets.

C. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 061000 - Rough Carpentry: Wood blocking product and execution requirements.

B. Section 099123 - Interior Painting: Field paint finish.

1.03 REFERENCE STANDARDS

A. FM (AG) - FM Approval Guide; current edition.

B. NFPA 10 - Standard for Portable Fire Extinguishers; 2022.

C. UL (DIR) - Online Certifications Directory; Current Edition.

1.04 SUBMITTALS

A. See Section 01 3001 - Submittals

B. Product Data: Provide extinguisher operational features.

C. Shop Drawings: Indicate locations of cabinets and cabinet physical dimensions.

D. Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.

E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

F. Maintenance Data: Include test, refill or recharge schedules and re-certification requirements.

1.05 FIELD CONDITIONS

A. Do not install extinguishers when ambient temperature may cause freezing of extinguisher ingredients.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fire Extinguishers:
   1. Ansul, a Tyco Business: www.ansul.com/#sle.
   2. Nystrom, Inc: www.nystrom.com/sle.
   3. Pyro-Chem, a Tyco Business: www.pyrochem.com/#sle.
   4. Larsen's
   5. Substitutions: See Section 016000 - Product Requirements.

B. Fire Extinguisher Cabinets and Accessories:
   1. Ansul, a Tyco Business: www.ansul.com/#sle.
   2. JL Industries, Inc: www.jlindustries.com.
   3. Larsen's Manufacturing Co: www.larsensmfg.com/#sle.
   4. Nystrom, Inc: www.nystrom.com/sle.
   5. Pyro-Chem, a Tyco Business: www.pyrochem.com/#sle.
   6. Substitutions: See Section 016000 - Product Requirements.

2.02 FIRE EXTINGUISHERS

   1. Provide extinguishers labeled by UL (DIR) or FM (AG) for purpose specified and as indicated.

B. Multipurpose Dry Chemical Type Fire Extinguishers: Carbon steel tank, with pressure gage.
   1. Size: 10 pound (4.54 kg).

2. Finish: Baked polyester powder coat color as selected from manufacturer's standard range.

2.03 FIRE EXTINGUISHER CABINETS

A. Cabinet Construction: Non-fire rated.

B. Cabinet Configuration: Semi-recessed type. 2 1/2" rolled edge
   1. Size to accommodate accessories.
   2. Trim: rolled edge, with 13 inch (____ mm) wide face.
   3. Provide cabinet enclosure with right angle inside corners and seams, and with formed perimeter trim and door stiles.

C. Door: 0.036 inch (0.9 mm) thick, reinforced for flatness and rigidity; latch. Hinge doors for 180 degree opening with continuous piano hinge. Provide nylon or roller type catch.

D. Door Glazing: Tempered glass, clear, 1/8 inch (3 mm) thick, and set in resilient channel glazing gasket.

E. Cabinet Mounting Hardware: Appropriate to cabinet, with pre-drilled holes for placement of anchors. Recessed ADA door handle.

F. Weld, fill, and grind components smooth.

G. Finish of Cabinet Exterior Trim and Door: Painted steel.

H. Finish of Cabinet Interior: White colored enamel.

2.04 ACCESSORIES

A. Extinguisher Brackets: Formed steel, chrome-plated. ,

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify rough openings for cabinet are correctly sized and located.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install cabinets plumb and level in wall openings, as indicated from finished floor per architect's drawings.

C. Secure rigidly in place.

D. Place extinguishers in wall-mounted cabinets or on wall-hung brackets as located on Life Safety drawings.

E. Class designation of extinguishers as directed in Fire Protection plans FP1.1 and FP2.1

END OF SECTION

SECTION 122400
WINDOW SHADES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Interior manual roller shades.

1.02 REFERENCE STANDARDS

A. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015, with Editorial Revision (2021).

B. NFPA 701 - Standard Methods of Fire Tests for Flame Propagation of Textiles and Films; 2023, with Errata.

C. WCMA A100.1 - Standard for Safety of Window Covering Products; 2022.

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets, including materials, finishes, fabrication details, dimensions, profiles, mounting requirements, and accessories.

C. Shop Drawings: Include shade schedule indicating size, location and keys to details, head, jamb and sill details, mounting dimension requirements for each product and condition, and operation direction.

D. Selection Samples: Include fabric samples in full range of available colors and patterns.

E. Verification Samples: Minimum size 6 inches (150 mm) square, representing actual materials, color and pattern.

F. Manufacturer's Instructions: Include instructions for storage, handling, protection, examination, preparation, and installation of product.

G. Operation and Maintenance Data: List of all components with part numbers, sources of supply, and operation and maintenance instructions; include copy of shop drawings.

H. Warranty: Submit sample of manufacturer's warranty and documentation of final executed warranty completed in Owner's name and registered with manufacturer.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver shades in manufacturer's unopened packaging, labeled to identify each shade for each opening.

B. Handle and store shades in accordance with manufacturer's recommendations.

1.05 FIELD CONDITIONS

A. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.06 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Provide manufacturer's warranty from Date of Substantial Completion, covering the following:
   1. Shade Hardware: ____ years.
   2. Fabric: 25 years.
   3. Aluminum and Steel Coatings: 25 years.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Interior Manually Operated Roller Shades:
   1. MechoShade Systems LLC; Mecho/7 System: www.mechoshade.com/#sle.
   2. Draper, Inc; Clutch Operated FlexShade: www.draperinc.com/#sle.

2.02 ROLLER SHADES

A. General:
   1. Provide shade system components that are easy to remove or adjust without removal of mounted shade brackets.
   2. Provide shade system that operates smoothly when shades are raised or lowered.

B. Roller Shades:
   1. Basis of Design: MechoShade Systems LLC; Mecho/7 System.
   2. Description - Interior Roller Shades: Single roller, manually operated fabric window shade system complete with mounting brackets, roller tubes, hembars, hardware, and accessories.
      a. Drop Position: Regular roll.
      b. Roll Direction: Roll down, closed position is at window sill.
      c. Mounting: Window jamb mounted - inside, between jambs.
      d. Location and Size: As indicated on drawings.
      e. Fabric: EcoVeil - GREY - 1563 - 1550 SERIES
      f. Fabric Openness: 3%
   3. Brackets, Mounting Hardware, and cord holder: As recommended by manufacturer for mounting indicated and to accommodate shade fabric roll-up size and weight.
      a. Material: Stamped steel.
   4. Roller Tubes: As required for type of shade operation.
      a. Size: As recommended by manufacturer; selected for suitability for installation conditions, span, and weight of shades.
      b. Fabric Attachment: Utilize extruded channel in tube to accept vinyl spline welded to fabric edge.
   5. Hembars: Designed to maintain bottom of shade straight and flat.
      a. Style: Full wrap fabric covered bottom bar, flat profile with heat sealed closed ends.
   6. Manual Operation for Interior Shades:
      a. Clutch Operator: Manufacturer's standard material and design, permanently lubricated.
      b. Drive Chain: Continuous loop beaded ball chain, 95 lb (43 kg) minimum breaking strength. Provide upper and lower limit stops.
      c. Chain Retainer:
         1) Chain tensioning device complying with WCMA A100.1.

2.03 ROLLER SHADE FABRICATION

A. Field measure finished openings prior to ordering or fabrication.

B. Dimensional Tolerances: Fabricate shades to fit openings within specified tolerances.
   1. Vertical Dimensions: Fill openings from head to sill with 1/2 inch (13 mm) space between bottom bar and window stool.
   2. Horizontal Dimensions - Inside Mounting: Fill openings from jamb to jamb.
   3. Horizontal Dimensions - Inside Mounting: Provide symmetrical light gaps on both sides of shade not to exceed 3/4 inch (19.05 mm) total.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine finished openings for deficiencies that may preclude satisfactory installation.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

C. Start of installation shall be considered acceptance of substrates.

3.02 PREPARATION

A. Prepare surfaces using methods recommended by manufacturer for achieving best result for substrate under the project conditions.

B. Coordinate with window installation and placement of concealed blocking to support shades.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions and approved shop drawings, using mounting devices as indicated.

B. Replace shades that exceed specified dimensional tolerances at no extra cost to Owner.

C. Adjust level, projection, and shade centering from mounting bracket. Verify there is no telescoping of shade fabric. Ensure smooth shade operation.

3.04 CLEANING

A. Clean soiled shades and exposed components as recommended by manufacturer.

B. Replace shades that cannot be cleaned to "like new" condition.

3.05 PROTECTION

A. Protect installed products from subsequent construction operations.

B. Touch-up, repair, or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 123216
MANUFACTURED PLASTIC-LAMINATE-CLAD CASEWORK

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Furnish and install plastic laminate casework and accessories as shown and listed on drawings and specified herein. Includes all countertops, sink cutouts, supports, shelving, and filler panels necessary for a complete casework installation.

B. Wall mounted, heavys duty, aluminum brackets for supporting, countertops, work surfaces, and vanities.

1.02 RELATED REQUIREMENTS

A. Section 016000 - Product Requirements: Requirements for sustainably harvested wood.

B. Section 016116 - Volatile Organic Compound (VOC) Content Restrictions: VOC limitations for adhesives and sealants.

C. Section 061000 - Rough Carpentry: Blocking and nailers for anchoring casework.

D. Section 079200 - Joint Sealants: Sealing joints between casework and countertops and adjacent walls, floors, and ceilings.

E. Section 088000 - Glazing: Methods for shop-glazing of casework.

F. Section 123600 - COUNTERTOPS AND WINDOW SILLS: Additional requirements for countertops.

G. Section 224000 - Plumbing Fixtures: Sinks and fittings installed in casework.

H. Section 262726 - Wiring Devices: Switches, receptacles installed in casework.

1.03 DEFINITIONS

A. Exposed: Portions of casework visible when drawers and cabinet doors are closed, including end panels, bottoms of cases more than 42 inches (1.066 m) above finished floor, tops of cases less than 72 inches (1.82 m) above finished floor and all members visible in open cases or behind glass doors.

B. Semi-Exposed: Portions of casework and surfaces behind solid doors, tops of cases more than 72 inches (1.828 m) above finished floor and bottoms of cabinets more than 30 inches (0.762 m) but less than 42 inches (1.066 m) above finished floor.

C. Concealed: Sleepers, web frames, dust panels and other surfaces not generally visible after installation and cabinets less than 30 inches (762 mm) above finished floor.

1.04 REFERENCE STANDARDS

A. ANSI A135.4 - Basic Hardboard; 2012 (Reaffirmed 2020).

B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test; 2015 (Reaffirmed 2020).

C. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2023.

D. ASTM C1172 - Standard Specification for Laminated Architectural Flat Glass; 2024.

E. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018 (Reapproved 2024).

F. ASTM C1036 - Standard Specification for Flat Glass; 2025.

G. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2025.

H. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

I. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2024.

J. AWI (QCP) - Quality Certification Program; Current Edition.

K. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).

L. AWMAC (GIS) - Guarantee and Inspection Services Program; Current Edition.

M. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards; 2021, with Errata.

N. BHMA A156.9 - Cabinet Hardware; 2020.

O. ISFA 2-01 - Classification and Standards for Solid Surfacing Material; 2013.

P. ISFA 3-01 - Classification and Standards for Quartz Surfacing Material; 2013.

Q. MIA (DSDM) - Dimensional Stone Design Manual, Version VIII; 2016.

R. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

S. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.

B. Review: Project conditions, manufacturer requirements, delivery, and storage, staging and sequencing, and protection of completed work.

1.06 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Product data for support brackets and shop drawings indicating dimensions and installation details.

C. Shop Drawings: Component dimensions, configurations, construction details, joint details, attachments. Indicate casework types, sizes, and locations, using large scale plans, elevations, and cross sections. Include rough-in and anchors, reinforcements, and blocking, placement dimensions and tolerances, clearances required, and keying information.
   1. Finish, hardware, construction options selection sheet.
   2. Small scale floor plan showing casework in relation to the building.
   3. Large scale elevations and plan views.
   4. Cross-sections; service runs; locations of blocking within walls; rough-in requirements and, sink centerlines

D. Samples: Fully finished, for laminate color and texture selection. Minimum sample size: 2 inches by 3 inches (51 mm by 75 mm).

E. Hardware and Accessory Installation Instructions.

F. Manufacturer's Qualification Statement.
   1. Manufacturer qualification statement.
   2. Comprehensive quality assurance standard documentation.

G. Installer's Qualification Statement.

H. Closeout Requirement:
   1. Maintenance Data: Manufacturer's recommendations for care and cleaning.
   2. Maintenance Materials: Furnish the following for Owner's use in maintenance of project:
      a. See Section 016000 - Product Requirements for additional provisions.
      b. Spare Parts: One _____.
   3. Finish touch-up kit for each type and color of materials provided.

1.07 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum 10 years of experience of manufacturing architectural casework for similar projects, with a cataloged product line, and can show evidence of long-lasting financial stability.
   1. Licensed under Architectural Woodwork Institute (AWI) Quality Certification Program (QCP).
   2. Certified for chain of custody by third party group approved by Forest Stewardship Council (FSC).

B. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than 3 years of documented experience and approved by manufacturer.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Protect items provided by this section, including finished surfaces and hardware items during handling and installation. For metal surfaces, use polyethylene film or other protective material standard with the manufacturer.

B. Acceptance at Site:
   1. Do not deliver or install casework until the conditions specified under Part 3, Examination Article of this section have been met. Products delivered to sites that are not enclosed and/or improperly conditioned will not be accepted if warping or damage due to unsatisfactory conditions occurs.

C. Storage:
   1. Store casework in the area of installation. If necessary, prior to installation, temporarily store in another area, meeting the environmental requirements specified under Part 3, "Site Verification of Conditions" Article of this section.

1.09 SITE CONDITIONS

A. Ambient Conditions:
   1. Do not deliver or install the casework until concrete, masonry, and drywall/plaster work is dry; ambient relative humidity is maintained between 25 – 55% prior to delivery and throughout the life of installation; and the temperature is controlled above 55.
   2. Casework shall not be stored or installed in non-climate controlled conditions.

1.10 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Correct defective Work in materials and workmanship, including non-casework accessories, within a 5 year period after Date of Substantial Completion, at no additional cost to Owner. Defects include, but are not limited to:
   1. Ruptured, cracked, or stained finish coating.
   2. Discoloration or lack of finish integrity.
   3. Cracking or peeling of finish.
   4. Delamination of components.
   5. Failure of adhesives.
   6. Failure of hardware.
   7. All non-casework items supplied, but not manufactured, by the casework manufacturer including, but not limited to, sinks, fixtures, apparatus, support brackets, keyboard trays, lights, power outlets, and power strips shall be covered under the original manufacturers' warranty.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Plastic Laminate Casework:
   1. Case Systems; ____: www.casesystems.com/#sle.
   2. _____.

3. Substitutions: See Section 016000 - Product Requirements.

B. Substitution Limitations:
1. Additional manufacturers may submit substitution requests in accordance with procurement substitution and/or substitution procedures, or provide a comparable product with the following support information detailed below:
   a. Written documentation stating specification compliance regarding construction, materials, and standard of quality and manufacturing techniques.
   b. Note all deviations to the drawings and/or specifications in writing.
   c. Provide the Architect with a full-scale base cabinet not less than ten days prior to bid date. The sample shall represent typical construction and materials for the product the casework manufacturer proposes, meeting the quality standards set forth by this specification. The sample may be impounded by the owner and retained until completion of the casework installation.
   d. The owner, or its designated representative, reserves the right to reject any proposal that in his opinion fails to meet the criteria established by this specification. Such a decision shall be final.

C. Obtain casework from single source and manufacturer, unless otherwise indicated.

2.02 CASEWORK MATERIALS

A. Provide Plastic Laminate Faced Cabinets Manufactured with:
1. Particleboard Core:
   a. M-2, CARB2 compliant for emission levels of urea formaldehyde, and shall meet or exceed all requirements as set by ANSI A208.1-2016, were specified.
      1) Density: 40-50 lbs/cu.ft.
      2) Modulus of Rupture: 1885 psi
      3) Modulus of Elasticity: 290,100 psi
      4) Internal Bond: 58 psi
      5) Face Screw Holding: 202 pounds min.

B. Cabinet Joinery:
1. Concealed Interlocking Mechanical Fasteners or Dowel construction: For cabinet body components. Manufacturer's discretion on best suited joinery method for project.
2. Construction: Meets requirements in AWS Manual, Edition 2, including errata and appendix section.

C. Adhesives Used for Assembly: Comply with VOC requirements for adhesives and sealants; see Section 016116.
1. PVA:
   a. Adhesive shall be mechanically applied.
   b. ULEF, no VOC
2. EVA
   a. Adhesive shall be mechanically applied.

D. Surface Material:
1. High Pressure Decorative Laminate (HPDL): NEMA LD 3, Grade as indicated under Casework Fabrication.
2. High-Pressure Cabinet Liner (CLS): NEMA LD 3, Grade CLS, where specified. Surface texture shall be similar to exterior finish.
3. Low Pressure Decorative Laminate (LPDL): NEMA LD 3, for GP-28, where specified.
4. Non-Decorative Backer (BKH): Grade BKH

E. Plastic Edge Banding: Extruded PVC, flat shaped; smooth finish; of width to match component thickness.
1. Shall be applied utilizing hot melt adhesive and radiused by automatic trimmers.

2.03 CASEWORK FABRICATION

A. Assembly: Shop assemble casework items for delivery to site in units easily handled and to permit passage through building openings.

B. General Cabinet Body Construction:
   1. Cabinet Box Style shall be Flush Overlay with 1/8" reveal between cabinet doors and drawers and 1/16" reveal at cabinet edge for offset of the hinge around the door and 1/8" reveal on adjacent cabinets. All door and drawer fronts to be adjusted to maintain these tolerances.
   2. Cabinet Box Core shall be M-2 industrial particleboard.
   3. Sink Cabinet Box Core shall be M-2 industrial particleboard.
   4. Bottoms and ends of cabinets, and tops of tall cabinets and tops and bottoms of wall cabinets (all structural components) shall be 3/4-inch thick.
   5. All panels shall be manufactured with balanced construction. Cabinet components may use CLS cabinet liner or BKH backer to balance VGS HPDL laminate at semi-exposed and non-exposed surfaces.
   6. Fixed interior components such as fixed shelves, dividers, and cubicle compartments shall be full 3/4" thick and attached with concealed interlocking mechanical fasteners.
   7. Fixed and adjustable shelves at open cabinets shall be 1” thick.
   8. Cabinet body exterior surfaces shall be considered Exposed Surfaces.
   9. Open cabinet interior surfaces and interiors behind clear glass doors shall be considered Exposed Surfaces.
   10. Closed cabinet body interior surfaces shall be considered Semi-Exposed Surfaces.
   11. Visible cabinet bottoms (e.g. wall cabinet bottoms) shall be considered Exposed if 42” or more A.F.F., Semi-Concealed between 24” and 42” and Concealed below 24”: A.F.F.
   12. Visible cabinet tops (e.g. wall cabinet tops, hutch cabinet tops, tall cabinet tops) shall be considered Exposed if 80” or less A.F.F. or if visible from above and Concealed if more than 80” A.F.F. and not visible from above.
   13. Cabinet edges:
      a. Cabinet body front edge shall be: 3mm thick PVC.
      b. Top edge of wall, tall, and hutch cabinet ends shall be: 1mm thick PVC matching cabinet box edge if visible from above.
      c. All other edges shall be: unfinished.
   14. Mounting stretchers are 3/4" thick structural components fastened to end panels and back by mechanical fasteners, and are concealed by the cabinet back.
   15. When the rear of a cabinet is exposed, a separate finished 3/4" thick decorative laminate back panel may be required.
   16. Backs of cabinets are 1/2" thick surfaced both sides for balanced construction and fully captured on both sides and bottom.
   17. A 5mm diameter row hole pattern 32mm (1-1/4") on center shall be bored in cabinet ends for adjustable shelves. This row hole pattern shall also serve for hardware mounting and replacement and/or relocation of cabinet components.

C. Base Cabinet Construction:
   1. Sink cabinets shall have a split removable back panel and be constructed in such a manner as to provide maximum clearance for sink installation. A formed metal front brace, and steel corner gussets, may be utilized to achieve maximum clearance and provides support and secure fastening for the top in all four corners. Front face shall be powder coated black.
   2. A minimum 4” wide stretcher shall be provided below drawers and shall be mechanically fastened to the end panels.

D. Wall Cabinet Construction:
   1. All wall cabinet bottoms shall be 3/4" thick core (type specified above), mechanically fastened between end panels and secured to the bottom back stretcher. A lower 3/4" thick stretcher shall be located behind the back panel and attached between the end

panels with mechanical fasteners. The stretcher is also secured through the back and into the cabinet bottom. Cabinets wider than 36” shall include a vertical partition mid-cabinet for added bottom and shelf support.

2. All wall cabinet tops shall be 3/4" thick.

E. Tall and Wall Cabinet Top Edges shall be unfinished if not visible from above or nominal 1mm PVC edge band matching the cabinet box edge if visible from above.

F. Tall, Wall and Hutch Tops shall be considered Exposed or Semi-Exposed based on visibility as previously defined. Semi-Exposed surfaces shall utilize BKL, LPDL or CLS. LPDL and CLS shall match the color selected for Semi-Exposed surfaces.

G. Reveal above the top door and drawer front shall be a maximum of 15mm for all cabinets.

H. Toe Base of Cabinet:
1. Individual bases shall be constructed of: Marine grade CDX plywood factory applied to base and tall cabinets and shall support and carry the load of the end panels, and the cabinet bottom, directly to the floor. The base shall be let in from the sides and back of the cabinet to allow cabinets to be installed tightly together and tight against a wall, also to conceal the top edge of applied vinyl base molding. There shall be a front to back center support for all bases over 30" wide.
2. Toe Base Height: 3-3/4” unless noted otherwise on the drawings to permit shimming to accommodate variances in the floor.
3. Toe bases shall be securely attached to the base cabinet at the manufacturer.

I. Drawer Fronts and Solid Doors:
1. All drawer fronts and solid door components shall be: M-2 industrial particleboard surfaced both sides for balanced construction.
2. Exterior of door and drawer fronts shall be surfaced with VGS HPDL, balanced with either VGS HPDL or CLS cabinet liner at Semi-Exposed interior surfaces and with VGS HPDL on Exposed interior surfaces. The interior surface of a glazed door is an Exposed Surface.
3. Door and drawer front edge shall be: Machine applied 3mm thick PVC radiused to eliminate sharp edges and corners.

J. Drawer Boxes:
1. Drawer box core shall be M-2 industrial particleboard.
2. Drawer box surface at finished interiors shall match semi-exposed interior finish.
3. Drawer box sides, backs and sub-front shall be ½” thick, carried by a non-racking, non-deflecting ½” thick plant-on bottom mechanically fastened to the sides, sub-front and back 4” on center. The top edge shall be nominal 1mm PVC matching the drawer color. Drawer box corners shall be joined with fluted hardwood dowels and glue spaced at a minimum of 32mm on center.
4. Side-mount slides are secured with ½” long screws driven into the drawer box sides. Drawer box fronts shall be removable and attached to drawer box sub-front with screws from inside of drawer. Screws shall be located a maximum of 1-1/2” from the inside corner of the sub-front and shall be spaced a maximum of 12” on center. Horizontal parting rails between drawers shall be 3/4" thick core, with balanced surfaces, secured to and further reinforcing cabinet ends. File drawer box shall have full-height sides supporting a heavy-duty support rail for hanging file folders.

K. Doors:
1. Solid Doors shall be surfaced both sides for balanced construction.

L. Shelves:
1. Adjustable:
   a. Adjustable Shelf Core shall be: M-2 industrial particle board. Top and bottom surfaces shall be finished the same.
   b. Adjustable shelves in closed cabinets shall be: 3/4” shelves, 1" for shelves over 36" wide.

c. All adjustable shelves in open cabinets shall be: 1" thick, except for special use cabinets such as mail, cubical, instrument or locker type units.
d. Adjustable shelf edge on closed cabinets shall be: nominal 1mm PVC at front edge.
e. Adjustable shelf shall be set back a maximum of 15mm from the front of the cabinet.

M. Structural Performance: Safely support the following minimum loads:
1. Base Units: 500 pounds per linear foot (744 kgs/linear m) across the cabinet ends.
2. Suspended Units: 300 pounds (136 kg) static load.
3. Drawers: 125 pounds (57 kg), minimum.
4. Hanging Wall Cases: 300 pounds (135 kg).
5. Shelves: 100 pounds (45 kg), minimum.

N. Seismic Performance: Casework, including attachments to other work, able to withstand the effects of earthquake motions determined according to ASCE/SEI 7.
1. See drawings for design earthquake spectral response acceleration, short period (Sds), for Project.
2. Component Importance Factor: 1.0.

O. Fittings and Fixture Locations: Cut and drill components for fittings and fixtures.

P. Hardware Application: Factory-machine casework members for hardware that is not surface applied.

Q. Access Panels: Where indicated, for maintenance of utility service and mechanical and electrical components.

R. Fixed panels at backs of open spaces between base cabinets.
1. Provide cutouts for power and data receptacles where indicated on drawings.

S. Edging: Fit shelves, doors, and exposed edges with specified and detailed edging. Do not use more than one piece for any single length.

T. Scribes and Fillers: Panels of matching construction and finish, for locations where cabinets do not fit tight to adjacent construction.

U. Apron Frames: Construction similar to other cabinets, with modifications.
1. Frames fabricated from panels standard with the manufacturer. Include front and back panels, with drawer suspension framing mechanically fastened to support channels spanning between them.
2. Apron Drawers: Manufacturer's standard drawer construction and size for apron installation. Single drawer for aprons up to 48 inches (1219 mm) wide, two drawers for wider aprons.

2.04 CASEWORK FINISHES & COLORS

A. High Pressure Decorative Laminate (HPDL):
1. Color, pattern, texture, and finish as either scheduled or otherwise indicated on drawings or as selected by Architect from Manufacturer's full range of colors, patterns, textures, and finishes.
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following as indicated by manufacturer's designations or as indicated on drawings: Formica, Nevamer, Pionite, and/or Wilsonart.

B. High-Pressure Cabinet Liner (CLS):
1. Color: White

C. Low Pressure Decorative Laminate (LPDL):
1. Color: White

D. Plastic Edge Banding (Extruded PVC):
1. Cabinet box edge band color: Match high pressure decorativelaminate color selection.
2. Sheleving edge band color: Match shelving color selection.

2.05 CASEWORK HARDWARE

A. Comply with BHMA A156.9 requirements.
   1. Acceptable base materials for plated finishes include brass, bronze, and steel.

B. Shelves in Cabinets:
   1. Shelf Standards and Rests: Vertical standards with rubber button fitted rests, satin chromium plated over nickel on base material.

C. Swinging Doors: Hinges, pulls, and catches.
   1. Hinges: Visible, number as required by referenced standards for width, height, and weight of door.
      a. Visible Hinges: Installed on framed cabinet face, and on door face, bright chromium plated over nickel on base material.
      b. Concealed Hinges: Installed in cabinet edge, and on door back, bright chromium plated over nickel on base material.
         1) European-Style Hinges for Overlay Doors: 110 degree opening angle.
         2) Pivot Hinge for Inset Doors: Top and bottom door mount.
   2. Pulls: Chrome wire pulls, 4 inches (102 mm) wide.
      a. Pull design to comply with project's referenced accessibility requirements.
   3. Catches: Magnetic. Provide roller catch at tall cabinets. Roller catch shall be a heavy-duty, spring-loaded roller, with molded plastic bumper mounted at door top to keep door securely shut.

D. Drawers: Pulls and slides.
   1. Pulls: Chrome wire pulls, 4 inches (102 mm) wide.
      a. Pull design to comply with project's referenced accessibility requirements.
   2. Slides: Steel, full extension arms, ball bearings; self-closing; capacity as recommended by manufacturer for drawer height and width.

2.06 ACCESSORIES

A. Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application; galvanized or chrome-plated finish in concealed locations and stainless steel or chrome-plated finish in exposed locations.

B. Concealed Joint Fasteners: Corrosion-resistant, standard with manufacturer.

C. Sealant for Use in Casework Installation:
   1. Manufacturer's recommended type.
   2. One component, paintable silicone base sealant, chemical curing complying with ASTM C920, Type S, Grade NS, Class 25, Use NT, when tested to glass and aluminum, anti-fungus composition.

D. Counter Support Brackets:
   1. System Description: Provide wall mounted, heavy duty, welded aluminum brackets for supporting counter tops, work surfaces, and vanities. Support brackets shall be fabricated by welding miter cut extruded aluminum sections, grinding and deburring sharp edges and welds, drilling holes for field attachment, and factory finishing.
      a. ADA-Compliant Vanity Support Brackets: Custom surface mounted bracket fabricated from miter cut and welded aluminum sections, C shaped with vertical rear leg for attachment to wall, horizontal member supporting vanity top, and vertical front leg with sloped return for attachment of front baffle. Provide vanity bracket configuration as required to accommodate plumbing fixtures and to comply with all accessibility clearances.
         1) Load capacity per bracket: 450 pounds
   2. Manufacturer: Equal to Rangine Corporation, 330 Reservoir Street, Needham, Massachusetts 02494; (800) 826-6006; www.rakks.com
   3. Material: Fabricate components from extruded aluminum sections complying with ASTM B221, 6063-T5 alloy and temper.

4. Finish: Exposed aluminum surfaces shall be free of scratches and other serious blemishes and be finished as follow
   a. Primer suitable for field painting. Field paint color as selected by Architect.

2.07 COUNTERTOPS

A. Types: More than one type is required. See drawings for location of each type of countertop. See section 12 3600 Countertops for additional information.

PART 3 EXECUTION

3.01 PREPARATION

A. Large Components: Ensure that large components can be moved into final position without damage to other construction.

3.02 EXAMINATION

A. Site Verification of Environmental Conditions:
   1. Do not deliver casework until the following conditions have been met:
      a. Building has been enclosed (windows and doors sealed and weather-tight).
      b. An operational HVAC system that maintains temperature and humidity at occupancy levels has been put in place.
      c. Ceiling, overhead ductwork, piping, and lighting have been installed.
      d. Installation areas do not require further “wet work” construction.

B. For Base Cabinets Installation: Examine floor levelness and flatness of installation space. Do not proceed with installation if encountered floor conditions required more than 1/2 inch (13 mm) leveling adjustment. When installation conditions are acceptable, for each space, establish the high point of the floor. Set and make level and plumb first cabinet in relation to this high point.

C. For Wall Cabinets Installation: Examine wall surfaces in installation space. Do not proceed with installation if the following conditions are encountered:
   1. Maximum variation from plane of masonry wall exceeds 1/4 inch in 10 ft (6 mm/3 m) and 1/2 inch in 20 ft (13 mm/6 m) or more, and/or maximum variation from plumb exceeds 1/4 inch (6 mm)per story.
   2. Maximum Variation of finished gypsum board surface from true flatness: 1/8 inch in 10 feet (3 mm in 3 m) in any direction.

D. Verify adequacy of support framing and anchors.

E. Verify that service connections are correctly located and of proper characteristics.

3.03 COORDINATION

A. Casework:
   1. The casework contractor shall verify all critical building dimensions prior to fabrication of casework.

B. Support Brackets:
   1. Coordinate provision of support brackets with design and fabrication of counter tops, work surfaces, and components] to be supported to ensure compatibility of dimensions and load capacity.
   2. Coordinate requirements for stud spacing, blocking, and auxiliary structural supports to ensure adequate means for installation and anchorage of support brackets.
   3. Coordinate installation of flush mounted support brackets with application of gypsum board finish and other specified wall finishes. Ensure that brackets are delivered to site and installed in a timely manner to allow for vertical bracket leg to be concealed by gypsum board and other specified wall finishes.
   4. After gypsum board has been applied to stud framing, install adhesive backed aluminum face plates around flush mounted brackets penetrating gypsum board.
   5. Coordinate installation of surface mounted support brackets with application of wall finishes. To the extent possible install brackets after finishes have been applied.

3.04 INSTALLATION

A. Perform installation in accordance with manufacturer's instructions and with SEFA 2.3.

B. Use anchoring devices to suit conditions and substrate materials encountered. Use concealed fasteners to the greatest degree possible. Use exposed fasteners only where allowed by approved shop drawings, or where concealed fasteners are impracticable.

C. Set casework items plumb and square, securely anchored to building structure.

D. Align cabinets to adjoining components, install filler and/or scribe panels where necessary to close gaps.

E. Fasten together cabinets in continuous runs, with joints flush, uniform and tight. Misalignment of adjacent units not to exceed 1/16 inch (1.6 mm). In addition, do not exceed the following tolerances:
   1. Variation of Tops of Base Cabinets from Level: 1/16 inch (1.6 mm) in 10 feet (3 m).
   2. Variation of Bottoms of Wall Cabinets from Level: 1/8 inch (3 mm) in 10 feet (3 m).
   3. Variation of Faces of Cabinets from a True Plane: 1/8 inch (3 mm) in 10 feet (3 m).
   4. Variation of Adjacent Surfaces from a True Plane (Lippage): 1/32 inch (0.8 mm).
   5. Variation in Alignment of Adjacent Door and Drawer Edges: 1/16 inch (1.6 mm).

F. Secure wall and floor cabinets to concealed reinforcement at gypsum board assemblies.

G. Base Cabinets: Fasten cabinets to service space framing and/or wall substrates, with fasteners spaced not more than 16 inches (407 mm) on center. Bolt adjacent cabinets together with joints flush, tight, and uniform.
   1. Where base cabinets are installed away from walls or service space framing, anchor to floor at toe space at not more than 24 inches (610 mm) on center, and at sides of cabinets with not less than two fasteners per side.

H. Wall Cabinets: Fasten to hanging strips, and/or wall substrates. Fasten each cabinet through back, near top, at not less than 16 inches (407 mm) on center.

I. Install hardware uniformly and precisely.

J. Countertops: Install countertops intended and furnished for field installation in one true plane, with ends abutting at hairline joints, and no raised edges.

K. Replace units that are damaged, including those that have damaged finishes.

L. Support Brackets:
   1. Install support brackets in accordance with reviewed shop drawings and manufacturer's installation instructions.
   2. Install brackets at locations and heights indicated on drawings. Verify locations in field with Architect.
   3. Install brackets rigidly to blocking, metal studs, wood studs, and supporting substrate so that they are secure, plumb, and aligned.
   4. Install with fasteners of type, size, and quantity as supplied or recommended by bracket manufacturer for type of application and substrate.

3.05 ADJUSTING

A. Adjust operating parts, including doors, drawers, hardware, and fixtures to function smoothly.

3.06 CLEANING

A. See Section 017419 - Construction Waste Management and Disposal for additional requirements.

B. Clean casework and other installed surfaces thoroughly.

3.07 PROTECTION

A. Do not permit finished casework to be exposed to continued construction activity.

B. Protect casework and countertops from ongoing construction activities. Prevent workmen from standing on, or storing tools and materials on casework or countertops.

C. Repair damage, including to finishes, that occurs prior to Date of Substantial Completion, using methods prescribed by manufacturer; replace units that cannot be repaired to like-new condition.

END OF SECTION

SECTION 123600
COUNTERTOPS AND WINDOW SILLS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Countertops for architectural cabinet work.

B. Countertops for manufactured casework.

C. Wall-hung counters and vanity tops.

D. Soild Surface Window sills.

1.02 RELATED REQUIREMENTS

A. Section 06 2000 - Finish Carpentry

B. Division 22 - Plumbing Fixtures: Sinks.

C. Section 07 9005 - Joint Sealants.

D. Section 12 3216 - Manufactured Plastic-Laminate-Clad Casework.

1.03 REFERENCE STANDARDS

A. ANSI A208.1 - American National Standard for Particleboard; 2022.

B. ASTM D635 - Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position; 2022.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

D. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).

E. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards; 2021, with Errata.

F. PS 1 - Structural Plywood; 2023.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Specimen warranty.

C. Shop Drawings: Complete details of materials and installation ; combine with shop drawings of cabinets and casework specified in other sections.

D. Selection Samples: For each finish product specified, color chips representing manufacturer's full range of available colors and patterns.

E. Test Reports: Chemical resistance testing, showing compliance with specified requirements.

F. Certificate: Submit labels and certificates required by quality assurance and quality control programs.

G. Installation Instructions: Manufacturer's installation instructions and recommendations.

H. Maintenance Data: Manufacturer's instructions and recommendations for maintenance and repair of countertop surfaces.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of documented experience.

B. Quality Certification:

1. Provide labels or certificates indicating that the installed work complies with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade or grades specified.
2. Provide designated labels on shop drawings as required by certification program.
3. Provide designated labels on installed products as required by certification program.
4. Submit certifications upon completion of installation that verifies this work is in compliance with specified requirements.

1.06 DELIVERY, STORAGE, AND HANDLING

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

B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.07 FIELD CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2 PRODUCTS

2.01 COUNTERTOPS

A. Quartz and Resin Composite Sills and Countertops: Sheet or slab of natural quartz and plastic resin over continuous substrate. Refer to finish schedule for manufacturer and color selections.
   1. Quartz Flat Sheet Thickness: 1/2 inch (____ mm), minimum.
   2. Natural Quartz and Resin Composite Sheets, Slabs and Castings: Complying with ISFA 3-01 and NEMA LD 3; orthophthalic polyester resin, mineral filler, and pigments; homogenous, non-porous and capable of being worked and repaired using standard woodworking tools; no surface coating; color and pattern consistent throughout thickness.
      a. Factory fabricate components to the greatest extent practical in sizes and shapes indicated; comply with the MIA Dimension Stone Design Manual.
      b. Surface Burning Characteristics: Flame spread index of 25, maximum; smoke developed index of 450, maximum; when tested in accordance with ASTM E84.
      c. Finish on Exposed Surfaces: Polished.
      d. Color and Pattern: As indicated on drawings.
   3. Other Components Thickness: 3/4 inch (19 mm), minimum.
   4. Exposed Edge Treatment: Built up to minimum 1-1/4" thick; edge profile as indicated on drawingsEased edge.
   5. Fabricate in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 11 - Countertops, Premium Grade.
   6. Polish all exposed edges.

2.02 MATERIALS

A. Plywood for Supporting Substrate: PS 1 Exterior Grade, A-C veneer grade, minimum 5-ply; minimum 3/4 inch (19 mm) thick; join lengths using metal splines.

B. Adhesives: Chemical resistant waterproof adhesive as recommended by manufacturer of materials being joined.

C. Joint Sealant: Mildew-resistant silicone sealant, clear.

2.03 FABRICATION

A. Fabricate tops and splashes in the largest sections practicable, with top surface of joints flush.
   1. Join lengths of tops using best method recommended by manufacturer.
   2. Fabricate to overhang fronts and ends of cabinets 1 inch (25 mm) except where top butts against cabinet or wall.
   3. Prepare all cutouts accurately to size; replace tops having improperly dimensioned or unnecessary cutouts or fixture holes.

B. Quartz Surfacing: Fabricate tops up to 144 inches (3657 mm) long in one piece; join pieces with adhesive sealant in accordance with manufacturer's recommendations and instructions.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

C. Verify that wall surfaces have been finished and mechanical and electrical services and outlets are installed in proper locations.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

A. Securely attach countertops to cabinets using concealed fasteners. Make flat surfaces level; shim where required.

B. Seal joint between back/end splashes and vertical surfaces.

3.04 TOLERANCES

A. Variation From Horizontal: 1/8 inch in 10 feet (3 mm in 3 m), maximum.

B. Offset From Wall, Countertops: 1/8 inch (3 mm) maximum; 1/16 inch (1.5 mm) minimum.

C. Field Joints: 1/8 inch (3 mm) wide, maximum.

3.05 CLEANING

A. Clean countertops surfaces thoroughly.

B. Clean other solid surface material thoroughly.

3.06 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 133419
METAL BUILDING SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Manufacturer-engineered, shop-fabricated structural steel building frame.

B. Metal wall and roof panels including gutters and downspouts.

C. Coordination of exterior doors, windows, and louvers.

1.02 RELATED REQUIREMENTS

A. Section 03 3000- Cast In Place Concrete

B. Section 07 9005 - Joint Sealers.

C. Section 08 43 13 - Aluminum Storefront.

D. Section 09 9113 - Exterior Paint.

E. Section 09 9123 - Interior Paint.

1.03 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.

C. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2021.

D. ASTM A325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength; 2014.

E. ASTM A325M - Standard Specification for Structural Bolts, Steel, Heat Treated 830 MPa Minimum Tensile Strength (Metric); 2014.

F. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2013.

G. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 2014.

H. ASTM A529/A529M - Standard Specification for High-Strength Carbon-Manganese Steel of Structural Quality; 2019.

I. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

J. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2024.

K. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018 (Reapproved 2024).

L. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink); 2020.

M. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi, 144 ksi, and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength; 2025.

N. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2020.

O. IAS AC472 - Accreditation Criteria for Inspection Programs for Manufacturers of Metal Building Systems; 2024.

P. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); 2002 (Ed. 2004).

1.04 DESIGN REQUIREMENTS

A. Installed Thermal Resistance of Wall System: R value of 19 (RSI value of ____).

B. Installed Thermal Resistance of Roof System: R value of 29 (RSI value of ____).

1.05 SYSTEM PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide metal building systems capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
   1. Engineer metal building systems according to procedures in MBMA's "Metal Building Systems Manual."
   2. Design Loads: As indicated on Structural Drawings, as minimum and as required by MBMA's "Metal Building Systems Manual." AISC Standards, IBC 2021.
   3. Live Loads: Include vertical loads induced by the building occupancy indicated on Drawings. Include loads induced by maintenance workers, materials, and equipment for roof live loads.
   4. Wind Loads: Include horizontal loads induced by a basic wind speed corresponding to a 10-year, mean-recurrence interval at project site as required by code. Comply with all local minimum design wind load requirements and as idndicated on Strutcural Drawings.
   5. Collateral Loads: Include additional dead loads other than the weight of metal building system for permanent items such as sprinklers, mechanical systems, electrical systems, and ceilings.
   6. Load Combinations: Design metal building systems to withstand the most critical effects of load factors and load combinations as required by MBMA, AISC and IBC 2021.
   7. Deflection Limits: Engineer assemblies to withstand design loads with deflections no greater than the following:
      a. Purlins and Rafters: Vertical deflection of 1/240 of the span.
      b. Girts: Horizontal deflection of 1/240 of the span.
   8. Design secondary framing system to accommodate deflection of primary building structure and construction tolerances, and to maintain clearances at openings.

B. Seismic Performance: Design and engineer metal building systems capable of withstanding the effects of earthquake motions determined according to IBC 2021.

1.06 ADMINISTRATIVE REQUIREMENTS

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

1.07 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on profiles, component dimensions, fasteners.

C. Shop Drawings: Indicate assembly dimensions, locations of structural members, connections; wall and roof system dimensions, panel layout, general construction details, anchorages and method of anchorage, installation; framing anchor bolt settings, sizes, and locations from datum, foundation loads; indicate welded connections with AWS A2.4 welding symbols; indicate net weld lengths; provide professional seal and signature for the state where project is located.

D. Samples: Submit two samples of precoated metal panels for each color selected, __2__by__2__ inch (____by____ mm) in size illustrating color and texture of finish.

E. Manufacturer Qualification Statement: Provide documentation showing metal building manufacturer is accredited under IAS AC472. Include statement that manufacturer designs and fabricates metal building system as integrated components and assemblies, including but not limited to primary structural members, secondary members, joints, roof, and wall cladding components specifically designed to support and transfer loads and properly assembled components form a complete or partial building shell.

F. Manufacturer's Instructions: Indicate preparation requirements, anchor bolt placement, and all other information for correct and complete erection and installation of all componenets.

G. Manufacturer Qualification Statement: Provide documentation showing metal building manufacturer is accredited under IAS AC472.
   1. Include statement that manufacturer designs and fabricates metal building system as integrated components and assemblies, including but not limited to primary structural members, secondary members, joints, roof, and wall cladding components specifically designed to support and transfer loads and properly assembled components form a complete or partial building shell.

H. Project Record Documents: Record actual locations of concealed components and utilities.

I. Samples for Verification: For each type of exposed finish required, prepared on Samples of sizes indicated below.
   1. Accessories: Nominal 12 inch long Samples for each type of accessory.

J. Product Certificates: For each type of metal building system, signed by product manufacturer.
   1. Letter of Design Certification: Signed and sealed by a qualified professional engineer licensed to practice in the State of Alabama. Include the following:
      a. Name and location of Project.
      b. Order number.
      c. Name of manufacturer.
      d. Name of Contractor.
      e. Building dimensions including width, length, height, and roof slope.
      f. Indicate compliance with AISC standards for hot-rolled steel and AISI standards for cold-rolled steel, including edition dates of each standard.
      g. Governing building code and year of edition.
      h. Design Loads: Include dead load, roof live load, collateral loads, roof snow load, deflection, wind loads/speeds and exposure, seismic design category or effective peak velocity-related acceleration/peak acceleration, and auxiliary loads (cranes).
      i. Load Combinations: Indicate that loads were applied acting simultaneously with concentrated loads, according to governing building code.
      j. Building-Use Category: Indicate category of building use and its effect on load importance factors.
      k. AISC Certification for Category MB: Include statement that metal building system and components were designed and produced in an AISC-Certified Facility by an AISC-Certified Manufacturer.

K. Welding certificates.

L. Erector Certificate: Signed by manufacturer certifying that erector complies with the following requirements:
   1. Qualification Data: Installation of the metal roofing panel and roof related accessories shall be performed by roofers, preferred, certified and authorized by the manufacturer as trained and qualified to erect the manufacturer's product. Certification of the contractor cannot exceed 3 years from date of original certification without proof of re-certification from the manufacturer. Roofing contractor must provide a certified project manager, full time, throughout the duration of the roofing installation. The project manager will represent the certification program provided by the manufacturer, representing the correct standards and procedures as detailed by the manufacturers specifications and designs.
   2. Roofing contractor must submit a letter from the manufacturer of the PEMB metal roofing system, certifying the date of certification from the manufacturer and the dates and year the roofing contractor attended school for certification or re-certification.
   3. Maintain a minimum of $1,000,000 general liability coverage for each loss and/or provide Certificate of Insurance for Full Value of the project as directed by the Architect/Owner or Owner representative.
   4. Maintain sufficient worker's compensation coverage as mandated by law.
   5. Have no viable claims pending, regardless of negligent acts, defective workmanship on previously performed or current projects.

6. Have not filed for protection from creditors under any state or federal insolvency or debtor relief statues or codes.
7. Have installed five (5) projects of similar scope and magnitude that have been in service for minimum of 2 years with satisfactory performance of the entire roof system.
8. Installer must execute 100% of roof system installation, utilizing employees that are confirmed as full time employees of the contractor. Second and third tier subcontractors for the installation of the work in this section shall not be permitted.
9. Installer shall be identified as “primary source of business” for PEMB metal roof system.

M. Material Test Reports: Signed by manufacturers certifying that the following products comply with requirements:
1. Structural steel including chemical and physical properties.
2. Bolts, nuts, and washers including mechanical properties and chemical analysis.
3. Tension-control, high-strength, bolt-nut-washer assemblies.
4. Nonshrink grout.

N. Source quality-control test reports.

1.08 QUALITY ASSURANCE

A. Erector Qualifications: An experienced erector who has specialized in erecting and installing work similar in material, design, and extent to that indicated for this Project and who is acceptable to manufacturer.

B. Manufacturer Qualifications: A qualified manufacturer and member of MBMA and AISC.
1. AISC Certification for Category MB: An AISC-Certified Manufacturer that designs and produces metal building systems and components in an AISC-Certified Facility.
2. Engineering Responsibility: Designated design by a qualified licensed engineer in the state of Aalabama. Preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer licensed in the State of Alabama. Affix engineering seal to all shop drawings and calculations and submit to architect.

C. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing surveying services of the kind indicated. Verify finished floor elevations and Sanitary and Storm systems inverts prior to construction. Report any descrepancies to architect unless the general contractror will be providing land surveying services.

D. Testing Agency Qualifications: An independent agency qualified according to ASTM E 329 for testing indicated, as documented according to ASTM E 548.

E. Source Limitations: Obtain primary metal building system components, including structural framing and metal panel assemblies, through one source from a single manufacturer.

F. Product Options: Drawings indicate size, profiles, and dimensional requirements of metal building system and are based on the specific system indicated. Refer to Division 01 Section "Product Requirements."
1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

G. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel," and AWS D1.3, "Structural Welding Code--Sheet Steel."

H. Structural Steel: Comply with AISC's "Specification for Structural Steel Buildings--Allowable Stress Design, Plastic Design," or AISC's "Load and Resistance Factor Design Specification for Structural Steel Buildings," for design requirements and allowable stresses.

I. Cold-Formed Steel: Comply with AISI's "Specification for the Design of Cold-Formed Steel Structural Members," or AISI's "Load and Resistance Factor Design Specification for Steel Structural Members," for design requirements and allowable stresses.

1.09 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal roof panel assemblies that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Structural failures, including rupturing, cracking or puncturing.
      b. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
   2. Warranty period: Twenty (20) years from date of Substantial Completion.
   3. Metal roof warranties to be able to transfer a minumum of once and have No Dollar Limit.
   4. Standard manufacturer's roofing guarantees which contain language regarding the governing of the guarantee by any state other than the **State of Alabama Form ACCS 6-L,** must be amended to exclude such language, and substituting the requirement that the Laws of the State of Alabama shall govern all such guarantees.

C. Special Warranty on panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or reaplace metal roof panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
   1. Finish Warranty Period: Thirty Five (35) years from date of Substantial Completion. (Roof and Walls)
   2. Standard manufacturer's roofing guarantees which contain language regarding the governing of the guarantee by any state other than the State of Alabama, must be amended to exclude such language, and substituting the requirement that the Laws of the State of Alabama shall govern all such guarantees.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Metal Buildings:
   1. Butler Manufacturing Company; ____ www.butlermfg.com/#sle.
   2. Ceco Building Systems; ____ www.cecobuildings.com/#sle.
   3. Chief Buildings; ____ www.chiefbuildings.com/#sle.
   4. Kirby Building Systems; _____www.kirbybuildingsystems.com/#sle.
   5. Metallic Building Company; _____ www.metallic.com/#sle.
   6. Nucor Building Systems; _____ www.nucorbuildingsystems.com/#sle.
   7. VP Buildings; ____ www.vp.com/#sle.
   8. ACI Building Systems
   9. Vulcan Steel Structures
   10. American Buildings Company
   11. United Steel Structures of America
   12. Substitutions: See Section 016000 - Product Requirements.

2.02 METAL BUILDING

A. Single span rigid frame.

B. Primary Framing: Rigid frame of rafter beams and columns, canopy beams, and wind bracing.

C. Secondary Framing: Purlins, and other items detailed.

D. Roof System: Preformed metal panels oriented parallel to slope, with sub-girt framing/anchorage assembly, insulation, and liner panels and accessory components.

E. Roof Slope : Refer to drawings

2.03 MATERIALS - FRAMING

A. Structural Steel Members: ASTM A36/A36M.

B. Structural Tubing: ASTM A500/A500M Grade B cold-formed.

C. Plate or Bar Stock: ASTM A529/A529M, Grade 50.

D. Anchor Bolts: ASTM A307, galvanized to ASTM A153/A153M.

E. Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1; galvanized to ASTM A153/A153M.

F. Welding Materials: Type required for materials being welded.

G. Primer: SSPC-Paint 20 zinc rich.

H. Grout: ASTM C1107/C1107M; Non-shrink; premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents.
   1. Minimum Compressive Strength at 48 Hours: 2,000 pounds per square inch (13.7 MPa).
   2. Minimum Compressive Strength at 28 Days: 7,000 pounds per square inch (48 MPa).

2.04 MATERIALS - WALLS AND ROOF

A. Roof Panel
   1. Concealed Finish: ASTM D 1005 Backer .5 mils minimum PVDF thickness.
   2. Standing Seam Roof Panels equal to Butler MR-24 with PVDF fi. Exposed fasteners are not acceptable.
   3. Comply with ASHRAE 90.1, provide thermal blocks as required between framing and roof system.
   4. Insulation: Double Layer Banded Insulation System (Total R Value = R-29)
      a. Provide thermal space block. Prior to installation of materials, contractor to allow architect to field verify thermal block installation.
      b. Top Layer at roof Unfaced insulation over purlins, R-10
      c. Bottom Layer at roof: Vinyl-faced insulation between purlins, R-19, white
         1) Vinyl faced insulation to have 2 vinyl tab extensions of 12" minimum each for overlapping Z purlin.
      d. Banded steel support system, white. Attached per manufacturers requirements.
      e. Insulation shall be Type II NAIMA 202-96 certified
      f. Flame spread index of 25 or less.

B. Joint Seal Gaskets: Manufacturer's standard type.

C. Fasteners: Manufacturer's standard type, galvanized to comply with requirements of ASTM A153/A153M, finish to match adjacent surfaces when exterior exposed.

D. Bituminous Paint: Asphaltic type.

E. Sealant: ASTM C920, elastomeric sealant with movement capability of at least plus/minus 50 percent; 100 percent silicone; for exposed applications, match adjacent colors as closely as possible.

F. Trim, Closure Pieces, Caps, Flashings, Gutters, Downspouts, Fascias and Infills: Same material, thickness and finish as exterior sheets; brake formed to required profiles.

G. Ridge Cap - Continuous non-ventilating, equal to Butler.

2.05 ACCESSORY COMPONENTS

2.06 FABRICATION - FRAMING

A. Hot-Rolled structural shapes: Comply with requirements of ASTM A36 or A529

B. Tubing or Pipe: Comply with requirements of ASTM A500, Grade B, ASTM A501

C. Plate or Bar Stock: Provide 42,000 psi minimum yield strength. Comply with ASTM A529, A570

D. Members fabricated from Cold Form: Comply with requirements for ASTM A307 as necessary for design loads and connections details.

E. Pre-engineered frame shapes to be per architectural sections. PEMB columns to be straight.

F. Anchor Bolts: Formed with bent shank, assembled with template for casting into concrete.

G. Provide wall opening framing for doors, windows, and other accessory components.

H. Structural Framing - General:
   1. Primary Framing: Shop fabricate framing components to indicated size and section with base plates, bearing plates, stiffeners, and other items required for erection welded into place. Cut, form, punch, drill, and weld framing for bolted field assembly.
      a. Make shop connections by welding or by using high-strength bolts.
      b. Join flanges to webs of built-up members by a continuous submerged arc-welding process.
      c. Brace compression flange of primary framing with steel angles or cold-formed structural tubing between frame web and purlin or girt web, so flange compressive strength is within allowable limits for any combination of loadings.
      d. Weld clips to frames for attaching secondary framing members.
      e. Shop Priming: Prepare surfaces for shop priming according to SSPC-SP 2. Shop prime primary structural members with specified primer after fabrication.
   2. Secondary Framing: Shop fabricate framing components to indicated size and section by roll-forming or break-forming, with base plates, bearing plates, stiffeners, and other plates required for erection welded into place. Cut, form, punch, drill, and weld secondary framing for bolted field connections to primary framing.
      a. Make shop connections by welding or by using non-high-strength bolts.
      b. Shop Priming: Prepare uncoated surfaces for shop priming according to SSPC-SP 2. Shop prime uncoated secondary structural members with specified primer after fabrication.

I. Primary Framing: Manufacturer's standard structural primary framing system, designed to withstand required loads and specified requirements. Primary framing includes transverse and lean-to frames; rafter, rake, and canopy beams; sidewall, intermediate, end-wall, and corner columns; and wind bracing.
   1. General: Provide frames with attachment plates, bearing plates, and splice members. Factory drill for field-bolted assembly. Provide frame span and spacing indicated.
      a. Slight variations in span and spacing may be acceptable if necessary to meet manufacturer's standard, as approved by Architect.
   2. Rigid Clear-Span Frames: I-shaped frame sections fabricated from shop-welded, built-up steel plates or structural-steel shapes. Interior columns are not permitted.
   3. Frame Configuration: See drawings.
   4. Exterior Column Type: See drawings.

J. Secondary Framing: Manufacturer's standard secondary framing members, including purlins, girts, eave struts, flange bracing, base members, gable angles, clips, headers, jambs, and other miscellaneous structural members. Fabricate framing from cold-formed, structural-steel sheet or roll-formed, metallic-coated steel sheet pre painted with coil coating, unless otherwise indicated, to comply with the following:
   1. Purlins: C- or Z-shaped sections; fabricated from minimum of 16ga thick steel sheet, built-up steel plates, or structural-steel shapes;
   2. Girts: C- or Z-shaped sections; fabricated from minimum of 16ga steel sheet, built-up steel plates, or structural-steel shapes. Form ends of Z-sections with stiffening lips angled 40 to 50 degrees to flange and with minimum 2-1/2-inch-wide flanges.
   3. Eave Struts: Unequal-flange, C-shaped sections; fabricated from 16ga steel sheet, built-up steel plates, or structural-steel shapes; to provide adequate backup for metal panels.
   4. Sag Bracing: Minimum 1-by-1-by-1/8-inch structural-steel angles.
   5. Base or Sill Angles: Minimum 3-by-2-by-0.0598-inch zinc-coated (galvanized) steel sheet.
   6. Purlin and Girt Clips: Minimum 0.0598-inch thick, steel sheet. Provide galvanized clips where clips are connected to galvanized framing members.
   7. Secondary End-Wall Framing: Manufacturer's standard sections fabricated from minimum 0.0598-inch- thick,
   8. Framing for Openings: Channel shapes; fabricated from minimum 0.0598-inch- thick, cold-formed, structural-steel sheet or structural-steel shapes. Frame head and jamb of door openings, and head, jamb, and sill of other openings.

9. Miscellaneous Structural Members: Manufacturer's standard sections fabricated from cold-formed, structural-steel sheet; built-up steel plates; or zinc-coated (galvanized) steel sheet; designed to withstand required loads.

K. Canopy Framing: Manufacturer's standard structural-framing system, designed to withstand required loads, fabricated from shop-welded, built-up steel plates or structural-steel shapes. Provide frames with attachment plates and splice members, factory drilled for field-bolted assembly.
   1. Type: **Straight Column**

L. Bracing: Provide adjustable wind bracing as follows:
   1. Rigid Portal Frames: Fabricate from shop-welded, built-up steel plates or structural-steel shapes to match primary framing; of size required to withstand design loads.

M. Bolts: Provide plain finish bolts for structural-framing components that are primed or finish painted. Provide zinc-plated bolts for structural-framing components that are galvanized.

N. Factory-Primed Finish: Apply specified primer immediately after cleaning and pretreating.
   1. Prime primary, secondary, and end-wall structural-framing members to a minimum dry film thickness of 1 mil.
      a. Prime secondary steel framing formed from uncoated steel sheet to a minimum dry film thickness of 0.5 mil on each side.
   2. Prime galvanized members with specified primer, after phosphoric acid pretreatment.

2.07 MISCELLANEOUS MATERIALS

A. Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads. Provide fasteners with heads matching color of materials being fastened by means of plastic caps or factory-applied coating.
   1. Fasteners for Metal Panels: Self-drilling Type 410 stainless-steel or self-tapping Type 304 stainless-steel or zinc-alloy-steel hex washer head, with EPDM or PVC washer under heads of fasteners bearing on weather side of metal panels.
   2. Blind Fasteners: High-strength aluminum or stainless-steel rivets.

B. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

C. Metal Flashing, Gutters, Downspouts as specified in Section 07600. The Metal Building System Manufacturer shall supply these materials as part of the metal building systems.

D. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

E. Sheet Metal and Flashing.

2.08 FABRICATION - GUTTERS AND DOWNSPOUTS

A. Fabricate of same material and finish as roofing metal.

B. Form gutters and downspouts and scuppers of standard profile and size indicated to collect and remove water. Fabricate with connection pieces.

C. Form sections in maximum possible lengths. Hem exposed edges. Allow for expansion at joints.

D. Fabricate support straps of same material and finish as roofing metal, color as selected.

E. Provide concrete splash block a each downspout on metal building.

F. Size gutters and downspouts to be in compiance with local rain requirements.

2.09 FINISHES

A. Framing Members: Clean, prepare, and shop prime. Do not prime surfaces to be field welded.

B. Exterior Surfaces of Roof panels and Accessories: PVDF color as selected from manufacturer's full range..

C. All exposed structure to be painted white. Refer to paint specificaiton 09 9123.

D. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

E. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Erector present, for compliance with requirements for installation tolerances and other conditions affectin performance of work.
   1. For the record, prepare written report, endoresed by Erector, listing conditions detrimental to performance of work.

B. Before erection proceeds, survey elevations and locations of concrete - and masonry-bearing surface and locations of anchor rods, bearing plates, and other embedments to receive structural frmaing, with Erector present, for compliance with requirements and metal buildng systems manfufactures tolerances.
   1. Engage land surveyor to perform surveying. Verify finished floor elevations are correct prior to pouring slab unless general contractor is providing land surveying services.

C. Proceed with erection only after unsatisfactory conditions have been corrected.

3.02 ERECTION - FRAMING

A. Erect metal building system according to manufacturer's written erection instructions and erection drawings.

B. Do not field cut, drill, or alter structural members without written approval from metal building system manufacturer's professional engineer.

C. Set structural framing accurately in locations and to elevations indicated and according to AISC specifications referenced in this Section. Maintain structural stability of frame during erection.

D. Base Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.
   1. Set plates for structural members on wedges, shims, or setting nuts as required.
   2. Tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
   3. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.

E. Align and adjust structural framing before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with framing. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
   1. Level and plumb individual members of structure.
   2. Make allowances for difference between temperature at time of erection and mean temperature when structure will be completed and in service.

F. Primary Framing and End Walls: Erect framing true to line, level, plumb, rigid, and secure. Level baseplates to a true even plane with full bearing to supporting structures, set with double-nutted anchor bolts. Use grout to obtain uniform bearing and to maintain a level base-line elevation. Moist cure grout for not less than seven days after placement.

1. Make field connections using high-strength bolts installed according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
   a. Joint Type: Snug tightened or pretensioned.

G. Secondary Framing: Erect framing true to line, level, plumb, rigid, and secure. Fasten secondary framing to primary framing using clips with field connections using non-high-strength bolts.
   1. Provide rake or gable purlins with tight-fitting closure channels and fasciae.
   2. Locate and space wall girts to suit openings such as doors and windows.
   3. Provide supplemental framing at entire perimeter of openings, including doors, windows, louvers, ventilators, and other penetrations of roof and walls.

H. Bracing: Install bracing in roof and sidewalls where indicated on erection drawings, use portal frames where required.
   1. Locate interior end-bay bracing only where indicated or where approved by A/E.

I. Framing for Openings: Provide shapes of proper design and size to reinforce openings and to carry loads and vibrations imposed, including equipment furnished under mechanical and electrical work. Securely attach to structural framing.

J. Erection Tolerances: Maintain erection tolerances of structural framing within AISC's "Code of Standard Practice for Steel Buildings and Bridges."

3.03 ERECTION - ROOF PANELS

A. Install in accordance with manufacturer's instructions.

B. Exercise care when cutting prefinished material to ensure cuttings do not remain on finish surface.

C. Fasten cladding system to structural supports, aligned level and plumb.

D. Locate end laps over supports. End laps minimum 2 inches (50 mm). Place side laps over bearing.

E. Provide expansion joints where indicated.

F. Use concealed fasteners.

G. Install sealant and gaskets, providing weather tight installation.

3.04 ACCESSORY INSTALLATION

A. Rigidly support and secure components. Join lengths with formed seams sealed watertight. Flash and seal gutters to downspouts.

B. General: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.
   1. Install components required for a complete metal roof panel assembly including trim, copings, ridge closures, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.
   2. Install components for a complete metal wall panel assembly including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.
   3. Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by manufacturer.

3.05 INSTALLATION - ACCESSORY COMPONENTS IN WALL SYSTEM

A. where door frames and windows must be attached to PEMB framing, install in accordance with manufacturer's instructions and appropriate specification Sections.

B. Seal wall and roof accessories watertight and weather tight with sealant in accordance with Section 079005.

3.06 TOLERANCES

A. Framing Members: 1/4 inch (6 mm) from level; 1/8 inch (3 mm) from plumb.

B. Roofing: 1/8 inch (3 mm) from true position.

3.07 CLEANING AND PROTECTION

A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Touchup Painting: After erection, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted structural framing and accessories.

1. Clean and prepare surfaces by SSPC-SP 2, "Hand Tool Cleaning," or SSPC-SP 3, "Power Tool Cleaning."
2. Apply a compatible primer of same type as shop primer used on adjacent surfaces.

C. Touchup Painting: Cleaning and touchup painting are specified in Division 09 painting Sections. NOTE: Requirement to paint metal building components prior to installation of roof

END OF SECTION

SECTION 221113

FACILITY WATER DISTRIBUTION PIPING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

B. City of Auburn Water Resource Management Design and Construction Manual – latest edition.

C. City of Auburn Standard Specifications – latest edition.

D. Backflow Prevention and Cross-Connection Policy of the Water Works Board of the City of Auburn – latest edition.

1.02 SUMMARY

A. This Section includes water-distribution piping and related components outside the building for combined water service and fire-service mains.

B. Utility-furnished products include water meters that will be furnished to the site, ready for installation.

1.03 DEFINITIONS

A. PVC: Polyvinyl chloride plastic.

1.04 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Detail precast concrete vault assemblies and indicate dimensions, method of field assembly, and components.

1. Wiring Diagrams: Power, signal, and control wiring for alarms.

1.05 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: For piping and specialties including relation to other services in same area, drawn to scale. Show piping and specialty sizes and valves, meter and specialty locations, and elevations.

B. Field quality-control test reports.

1.06 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For water valves and specialties to include in emergency, operation, and maintenance manuals.

SECTION 21 05 29 HANGERS AND SUPPORTS FOR FIRE SUPPRESSION PIPING & EQUIPMENT

PART 1 - GENERAL

A. RELATED DOCUMENTS

B. The Conditions of the Contract and applicable requirements of Division 1, “General Requirements”, and Section 21 11 00 “Fire Protection Systems”, govern this Section.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide pipe hangers, supports, and required appurtenances as specified and indicated

1.3 QUALITY ASSURANCE

A. MSS Standard Compliance: Provide pipe hangers and supports of materials, design, and manufacture which comply with ANSI/MSS SP-58, SP-59, SP-89, and SP-90.

B. Acceptable Manufacturers: The model numbers listed in the Specification establish a level of quality and material. Subject to compliance with requirements, provide products and materials by the following:
1. ITT Grinnell Corporation,
2. Fee and Mason,
3. Central Iron Manufacturing Company, and
4. F& S Manufacturing Company

PART 2 - PRODUCTS

2.1 PIPE HANGERS AND SUPPORTS

A. General: Provide pipe hangers and supports as specified. Comply with local codes and standards for pipe and equipment support and anchorage. Pipe supports shall be of material that will prevent electrolytic action.

B. Inserts: Provide Grinnell No. 282 inserts for concrete construction.

C. Piping in Multiple Parallel Runs: Provide Grinnell No. 45 or No. 50 with Grinnell No. 137 U-bolt pipe clamps or structural channels or angles with U-bolt clamps, supported as trapeze hangers where multiple parallel runs of piping are shown. Select and size members for weights to be carried and span dimensions between supports.

D. Piping in Single Runs: Provide Fee and Mason Fig. 239 or Grinnell No. 260 clevis hanger.

E. Hanger Rod: Provide hanger rods of required length. Rod diameters shall be as listed in the following table. Rod diameters may be adjusted after consultation with the Structural Engineer concerning the building framing system, the method of attachment to the structure and the support rod spacing.

Pipe Sizes	Rod Diameter
3/4”-2”	3/8”
2-1/2”–3	1/2”
4”–5	5/8”

6”	3/4”
8”–12”	7/8”
14”–18”	1”

F. Riser Clamps: Provide Fee and Mason Figure 241 riser clamps. Riser clamps for copper tube shall be copper-plated.

G. Saddles and Shields:
   1. Saddles for Horizontal Insulated Piping Without Vapor Barrier: At each hanger or support on horizontal runs, provide Grinnell No. 160 or Fee and Mason Figure 171, 1710, 1712, or 172 saddles, as applicable. Shields as described below may be used instead of the saddles. Hangers may be sized for the pipe size and of a material compatible with the pipe. Where dissimilar materials are used, provide dielectric separation. Carry insulation over the hanger and seal where hanger is sized for pipe.
   2. Shields for Horizontal Insulated Water Piping with Vapor Barrier: At each hanger or support for water piping, provide a half section of preformed 6 PCF density fiberglass or rigid calcium silicate, with jacket of adjacent insulation brought across unbroken, supported on semicircular 16 gauge shields. Shields for pipe 4” and smaller shall be 12” long; shields for pipe 5” to 8” shall be 18” long; and shields for larger pipe shall be 24” long.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Independent Support: Support fire sprinkler and standpipe piping independently of other piping in accordance with NFPA-approved methods and local codes and standards.

B. Provisions for Movement:
   1. Movement: Install hangers and supports to allow controlled movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate the action of expansion joints, expansion loops, expansion bends, and similar units.
   2. Load Distribution: Install hangers and supports so piping live and dead loading stresses from movement will not be transmitted to any pipe or connected equipment. Pipe supports shall properly transmit the weight of the pipe and its contents to the building structure, or to independent posts, piers, or foundations.
   3. Pipe Slopes: Install hangers and supports to provide the indicated pipe slopes so maximum pipe deflections allowed by ANSI B31 are not exceeded.

C. Insulated Piping: Comply with the following installation requirements:
   1. Clamps: Attach clamps, including spacers (if any), to piping with clamps projecting through the insulation; do not exceed pipe stresses allowed by ANSI B31.
   2. Shields: Where low-compressive-strength insulation of vapor barriers are indicated, install coated protective shields. For pipe 8” and over, install rigid calcium silicate insulation between saddles and pipe.

D. Spacing: Install hangers and supports in piping systems to remove stress from equipment flanges and rotating equipment. Space hangers and supports as shown in the following table. Rod spacing may be adjusted after consultation with the Structural Engineer concerning the building framing system, the method of attachment to the structure and the support rod diameters.

Trade Pipe Size	Maximum Spacing
1/2"	5'
3/4"	6'

1" and 1-1/4"	7'
1-1/2"	9'
2"	10'
2-1/2"	11'
3"	12'
4"	14'
5"	16'
6"	17'
8"	19'
10"	22'
12"	23'
14"	25'
16"	27'
18"	28'

E. Saddles: Where insulation without vapor barrier is indicated, install protection saddles, or use hangers as indicated in Paragraph 2.1/E.

F. Guides: Install pipe guides complying with the manufacturer's published product literature. Where not otherwise indicated, install pipe guides near expansion loops, expansion joints, and ball joints.

G. Anchors: Install anchors at the proper locations to prevent stresses from exceeding those permitted by ANSI B31 and to prevent the transfer of loading and stresses to connected equipment. Anchors shall include vibration isolation in accordance with the pipe support system specified. Where the piping system is floating, the anchors shall be termed restraints or braces.
   1. Where expansion compensators are indicated, install anchors in accordance with the expansion unit manufacturers written instructions, to limit movement of piping and forces to the maximums recommended by the manufacturer of each unit.
   2. Where not otherwise indicated, install anchors at the ends of principal pipe runs and at intermediate points in pipe runs between expansion loops and bends. Make provisions for preset of anchors as required accommodating both expansion and contraction of piping.

H. Leveling: Adjust hangers and supports and place grout as required under supports to bring piping to proper levels and elevations.

I. Hangers: Pipe hangers made of wood, wire, or sheet iron shall not be permitted.

J. Riser Supports: Vertical piping shall be secured at sufficiently close intervals to keep the pipe in alignment and carry the weight of the pipe and contents.
   1. Cast iron soil pipe shall be supported at the base and at each story level, but in no case at intervals greater than 10'.
   2. Steel pipe shall be supported at the base and at no less than every other story level, but in no case at intervals greater than 25'.
   3. Copper tube shall be supported at each story level, but in no case at intervals greater than 10'.
   4. Plastic pipe shall be supported at mid-point between floors and at ceiling to prevent movement, but in no case at intervals greater than 8'.

END OF SECTION

SECTION 21 11 00 FIRE PROTECTION SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY:

A. The General Provisions, Supplemental General Provisions, section 23 01 00, Division 1 Specifications and Special Provisions apply to all Work specified in this Section.

B. This section describes the basic materials and installation methods for the fire protection system. Comply with other Division 21 sections and drawings as applicable. Refer to other divisions for coordination of work.

C. Furnish and install all components of the fire protection system specified herein, as indicated on the drawings, and as required to provide complete and operating systems.

1.2 DESCRIPTION OF WORK:

A. Work Included: Provide a complete fire sprinkler system, including pipe, tube fittings, and appurtenances as indicated, in compliance with these Specifications and as required by local code agencies.

B. Related Work by Others: The following work shall be provided by the Contractor:
   1. The Sprinkler Contractor shall pipe the discharge of the sprinkler piping main drain(s) to the exterior of the building or other location approved by the Architect.
   2. The Electrical/Fire Alarm Contractor will provide a complete fire alarm system and will make connections to flow switches and gate supervisory switches from the fire panel.

C. Applications: Application of the fire protection system shall include, but are not limited to, the systems as listed below:
   1. Supply mains, valves, risers, and drains.
   2. Standard pattern Siamese connections per local Fire Department Regulations.
   3. Flow switches.
   4. Hydraulically designed sprinkler system.

D. Quality Assurance:
   1. Materials shall be installed in accordance with NFPA. Valves, fittings, sprinkler heads, and equipment shall be UL- and FM-labeled.
   2. Hose threads shall conform to local fire department requirements.
   3. Coordination Drawings: The following supplements, and does not replace, the provisions for submittals called for in Section 23 01 00, "General Mechanical Requirements", of this Specification.
      a) Before starting fabrication or installation of equipment, the Contractor shall submit to Architect, for his consideration, Shop Drawings noted as reviewed by the ISO for insurance rate making purposes only via electronic format (e.g. PDF).
      b) After Contract award and prior to releasing any equipment orders for fabrication, Shop Drawings showing dimensions, weights, performance data, structural details, valves, and controls, along with hydraulic calculations, shall be submitted to the Architect for review and approval via electronic format (e.g. PDF).
   4. Acceptable Manufacturers: The model numbers listed in the Specifications establish a level of quality and material. The following manufacturers are acceptable subject to compliance with the requirements of these Specifications:
      a) Sprinkler Equipment
         (i) Viking Corporation

(ii) Grinnell Fire Protection Systems Co., Inc.
(iii) Automatic Sprinkler Corporation
(iv) Central Sprinkler Corporation
(v) Reliable Automatic Sprinkler Company

b) Fire Hose Equipment
(vi) Potter Roemer, Inc.
(vii) Elkhart Brass Company
(viii) Badger Powhatten
(ix) Croker

E. Pipe Hangers and Supports: Support fire protection pipe with UL-listed and approved hangers and support devices. Provide any special hangers or supports that may be required. The design, selection, spacing, and application of horizontal pipe hangers, supports, restraints, anchors, and guides shall be in accordance with the NFPA 13.

F. Sprinkler System:
1. Sprinklers will be provided for zones and spaces as shown on drawings.
2. System piping shall be hydraulically designed throughout areas in accordance with the rules and regulations of NFPA 13, using design densities of:
   a) Light Hazard: 0.10 gpm per square foot with maximum Sprinkler head spacing of 225 square feet per sprinkler head.
   b) Ordinary Hazard Group 1: 0.15 gpm per square foot with maximum Sprinkler head spacing of 130 square feet per sprinkler head.
3. Cross main pipe sizes shall be a minimum of 2" diameter for loop systems and 2 1/2" for single main (non-loop) systems. Generally, provide coverage at the rate required by NFPA and applicable state and local codes.
4. System shall include required drain lines, drum drip (for maintenance), test connections, spare heads, tools, fire department inlet connections, water motor alarms, circuit closers, monitor switches, alarm valves, isolation valves and similar items.
5. Sprinkler heads, valves, alarms, and similar items shall be as manufactured by Viking, Grinnell, or other approved manufacturer. Sprinkler heads shall be plain brass, up-right type in unfinished areas and recessed type in areas with ceilings. Material and equipment used in the installation of the sprinkler systems and standpipes shall be listed and approved by the Underwriters' Laboratories, Inc., and shall be the latest design of the manufacturer.

G. Valves: Valves shall be UL-listed and approved for the pressures at which they are installed.
1. Check valves shall be swing type with iron body, bronze trim, cast iron disc, bolted cover, and screwed or flanged ends. Check valves in the pump discharge may be spring loaded, quiet type and shall be UL-listed. Swing check valves may be installed in horizontal pipe only.
2. Gate valves 2" and smaller shall be bronze body, OS&Y, and screwed ends. 150 psig valves shall have bronze trim, single disc, screwed bonnet, and bronze seats. 300 and 400 psig valves shall have bronze wedge disc, union bonnet, and bronze body seat rings.
3. Gate valves over 2" shall be iron body, OS&Y, bolted bonnet, bronze seats, ANSI 16.1, flanged ends. 150 psig valves shall have double or single disc, and bronze trim. 300 and 400 psig valves shall have wedge disc and brass stem.
4. Butterfly valves 2" and larger shall be grooved type. Furnish with built-in supervisory switches.
5. Supervised valves shall include valve tamper switches. Valve tamper switches shall be double-pole single-throw type with cast aluminum housing and tamperproof cover. Switch rating shall be at least 7 amperes at 125/250 volts.

PART 2 - PRODUCTS

2.1 PIPING

A. Pipe: Standpipe and sprinkler piping shall be ASTM A135, Schedule 40 black steel. Thin-wall pipe, ASTM A135, may be used for sprinkler piping where permitted by local codes. All code approvals shall be secured before shop drawing submittal to Architect.

B. Fittings: Fittings shall be cast iron threaded sprinkler fittings ANSI B16.4 or grooved ends fittings joined by Victaulic Firelock System or welded fittings, ANSI B16.9. Flanges shall be screwed or welded neck type ANSI B16.5.

2.2 EQUIPMENT

A. Fire Department Connection (Siamese): Remote Siamese fire department connection with chains and caps shall be polished brass or polished chrome. Verify actual material and finish with the Architect.

B. Water Flow Switch: Include water flow switch, with adjustable retard feature in supply pipe to each riser for remote alarm. Switch shall be double-pole single-throw type and shall be rated at least 7 amperes at 125/250 volts.

C. Sight Flow Connection: Sight flow connection in test lines.
   1. Sprinkler Heads: Brass up-right or pendant heads as required with ordinary temperature rating, except in specially designated areas of high-temperature where heads shall be rated per NFPA 13. Verify color of sprinkler cover plate with Architect. Heads exposed to weather shall be dry pendant type. Furnish spare heads equal to 1% of total number of heads installed. The heads shall be representative of, and in proportion to, the number of each type and temperature rating of heads installed. Furnish spare head cabinet and wrench for each riser. Locate cabinets as directed by Architect.
   2. Rating: 165°F.
   3. Sprinklers in suspended ceilings:
      a) Recessed, pendant type
      b) White finish, and matching escutcheon.
   4. Locate heads in center of tile or on quarter points in the long direction of tiles.
   5. Sprinklers in “hard” ceilings:
      a) Recessed, pendant type
      b) White finish, and matching escutcheon.
   6. Sprinklers in areas without ceilings:
      a) Standard upright type
      b) chrome plated finish.
   7. Sidewall type sprinklers
      a) standard horizontal sidewall type
      b) chrome plated finish with matching escutcheon.

D. Extra Sprinklers:
   1. Provide not less than four (4) extra sprinkler heads including at least one of each type of head, and one (1) sprinkler wrench near the sprinkler riser.

E. Alarm Bell: Viking Model F-2 or equal.

PART 3 - EXECUTION

3.1 INSTALLATION OF PIPING SYSTEMS

A. General: Comply with the requirements of the piping section of this Specification, NFPA 13 for installation and testing of piping system and per local code.
   1. Piping shall be concealed, except in mechanical equipment rooms, stairwells, or where otherwise required.
   2. Grade piping to eliminate traps and pockets. Where air pockets or water traps cannot be avoided, provide hose bibs for drainage.
   3. The Sprinkler Contractor shall arrange with the General Contractor to notch or pre-drill the occasional beam in order to maintain the sprinkler mains as high as possible.
   4. All required sprinkler heads shall be individually dropped from the main to the ceiling. Provide each drop with a horizontal swing arm type branch run to allow future movement of the head.
   5. All sprinkler heads in areas to be finished shall be installed at finished ceiling height only where the ceiling is to be installed at this time such as elevator lobbies and restrooms. In future tenant spaces, install upright heads at a maximum of 180 square feet per sprinkler head, pending development of the areas. Also, in future tenant spaces, a 1” outlet shall be provided with a temporary 1” x ½” bushing and a temporary sprinkler head. Coordinate locations to ensure sprinkler heads are centered in ceiling tiles.
   6. Sprinkler piping shall be installed and coordinated with the duct and other mechanical and electrical services in the ceiling cavities by this Contractor, to provide the clearances for lighting fixtures as required.
   7. Sprinkler piping shall be installed so as not to impede access to mechanical, electrical, or plumbing equipment.
   8. Sprinkler piping shall be flushed to remove excess oils and contaminants that support the growth of microorganisms.
   9. Sprinkler systems shall not be drained/flushed on finished surfaces such as sidewalks and parking lots.
   10. Install a ½” Weld-o-let with plug in the main sprinkler line, on the downstream side (building side) of the flow switch for introduction of micro biocides by the Owner at a later date.

B. Protection during Construction: Provide necessary fire protection during construction and initial occupancy in accordance with NFPA and Local Codes. Provide active sprinkler systems in areas requiring sprinklers during this period before tenant finish-out. If specifically approved for this Project by the local inspector, this Contractor may install active sprinklers only in areas designated as storage areas, in public areas to be finished with the base building, mechanical spaces, and limited other areas required by the inspector during construction. Coordinate these areas with the General Contractor.

C. Inspections and Tests: All inspections, examinations, and tests required by the authorities and/or agencies specified hereinbefore shall be arranged and paid for by this Contractor, as necessary, to obtain complete and final acceptance of the system as installed. The certificates of inspection shall be in quadruplicate, and shall be delivered to the Architect for distribution.

D. Underground Fire Protection Piping: Material for pipe cushion shall comply with local codes and or the geo-technical report. In absence of local code requirements or geo-technical report, the cushion shall be bank sand or select backfill material approved by the Architect. Any material used shall pass a one-inch screen.

END OF SECTION

SECTION 22 01 00 GENERAL PLUMBING REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY:

A. Provide the necessary interface with other Divisions to provide a complete project. Carefully check the Documents of this Division with those Documents of other Divisions. Determine the requirements of any interfacing materials or equipment being furnished and/or installed by those Sections and Divisions, and provide proper installation and required interface.

B. No deviation from the Contract Documents shall be made without the written consent of the Architect and Engineer.

C. All Specifications and Drawings are to be considered together as the Contract Documents. Any work shown in one and not the other, or is implied by either, shall be provided to make a complete project. Should conflicts exist between the Specifications and Drawings or there is an item shown or noted for which is not clearly defined, immediately submit a request for clarification. Under no circumstance will conflicts between the Specifications and Drawings be grounds for additional cost to the Contract after the Contract is established.

D. The Drawings are schematic and are not intended to show the exact location of piping, equipment, etc.

E. Dimensions and information regarding accurate locations of equipment, and structural limitations and finish shall be coordinated and verified with other Divisions of Work. Be prepared to furnish dimensions and information regarding the Work of this Division to other trades.

1.2 REFERENCE STANDARDS

A. All work shall comply with the most recently revised versions of all local, state and federal codes, ordinances of the authority having jurisdiction, laws, rules and regulations. Any modifications required by any of the above shall be made without any additional cost to the Owner. Where requirements between governing Codes and Regulations vary, the more restrictive provision shall apply.

B. Nothing contained in the Contract Documents shall be construed as authority or permission to disregard legal requirements and regulations. The Contractor shall thoroughly review the Documents and bring any such conflicts to the attention of the Architect and Engineer prior to Installation.

C. All materials, installation, and workmanship shall comply standards and/or codes of the following:

1. International Building Code – 2021 edition
2. International Mechanical Code - 2021 edition
3. International Plumbing Code - 2021 edition
4. International Fuel Gas Code - 2021 edition
5. International Fire Code - 2021 edition
6. International Energy Conservation Code - 2015 edition
7. National Electrical Code

8. National Fire Protection Association
9. ANSI - American National Standards Institute
10. ASTM - American Society of Testing and Materials
11. NEMA - National Electrical Manufacturer's Association
12. OSHA - Occupational Safety and Health Act
13. UL - Underwriter's Laboratories
14. ASHRAE - American Society of Heating and Air Conditioning Engineers
15. SMACNA - Sheet Metal and Air Conditioning Contractors' Nat'l Assoc.

D. All materials shall be new and shall bear the label of UL where applicable.

1.3 DEFINITIONS

A. Provide: to furnish, install and connect.

B. Furnish: to supply all materials, labor, equipment, testing apparatus, controls, tests, accessories and all other items customarily required for the proper and complete application.

C. Install: to join, unite, fasten, link, attach, set-up or connect together, complete, tested, and ready for normal satisfactory operation.

D. Engineer: the Engineer-of-record.

E. Contract Documents: the complete set of Specifications and Drawings of all Divisions.

F. Work: labor, materials, equipment, accessories, controls and other items required for a complete installation.

G. Concealed: embedded in masonry or other construction, installed in furred spaces, within double partitions or hung ceilings, in trenches, in crawl spaces or in enclosures.

H. Exposed: not installed underground or concealed.

I. Equal: equal in quality, workmanship, materials, weight, size, design and efficiency of the specified product, conforming with manufacturers.

J. Supply: to purchase, procure, acquire and deliver complete with related accessories.

K. Authority Having Jurisdiction (AHJ): applicable local, state and federal authorities having jurisdiction over any part of the Scope within this Division <u>and</u> other Divisions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturer's names and catalog numbers specified in the Contract Documents are intended to describe the material and set the standard of quality. All bids shall be based on manufacturers or products specified. Request for approval of manufacturers or products not specified shall be considered if the request is in written form and submitted to the Architect no later than fourteen (14) days prior to the bid date. All requests shall conform to the provisions of the general and supplementary conditions.

B. When specific names are not stated, only the best available quality of material or equipment shall be submitted for review and used in the installation.

2.2 SHOP DRAWINGS AND PRODUCT DATA

A. Shop drawings and/or product data shall be submitted for the following for review: Equipment, including but not limited to: water heaters, plumbing fixtures, insulation, piping materials, piping specialties, etc.

B. After installation, the sanitary sewer piping shall be scoped with a light-enabled camera, capable of video recording, for the longest length of piping run underground. The recording shall be from the furthest point in the building from the street to the connection to the sanitary main. If the access point most available is not at the furthest point in the pipe, then the camera shall be scoped and recorded in each direction from that access point. This recording shall be turned over to the owner for their files.

C. The Contractor shall obtain complete shop drawings, product data and samples from the manufacturers, suppliers, vendors, and all Division 22 Subcontractors, for all materials and equipment as specified herein in various Sections of the Specifications, and shall submit data and details of such materials and equipment for review by the Architect and Engineer. Prior to submission of the shop drawings, product data and samples to the Architect and Engineer, the Contractor shall thoroughly review the shop drawings, product data and samples and certify they are in compliance with the Contract Drawings. Further, the Contractor shall check all materials and equipment upon their arrival on the Project site and verify their condition and compliance with the Contract Documents. Any Work which proceeds prior to receiving reviewed shop drawings shall be modified as required to comply with the Contract Documents and the shop drawings. A minimum period of fourteen (14) working days, exclusive of transmittal time, will be required in the Design Team offices each time a shop drawing, product data and/or sample is resubmitted for review. This time period shall be considered by the Contractor when scheduling his Work. The initial shop drawing review for equipment and materials may be expedited through the mutual consent of the Contractor, Architect, Engineer, and Owner providing the Contractor agrees to submit complete, certified, documented, and coordinated shop drawings for review in accordance with the requirements of the Contract Documents.

D. The review of shop drawings, product data, and samples by the Architect and Engineer shall not relieve the Contractor of the responsibility for dimensions or errors that may be contained therein, or for deviations from requirements in the Contract Documents. It shall be clearly understood that the noting of some errors by the Engineer but overlooking others does not grant the Contractor permission to proceed in error.

E. All shop drawings and product data/submittals shall be submitted in compliance with the requirements of the general and supplementary conditions. Shop drawings and product data submittals shall be submitted via electronic format (e.g. PDF). The responsibility of copying review comments on any additional copies or rescanning returned hard copy prints will rest solely with the Contractor.

F. All product data/submittals shall bear the name of the manufacturer to be used.

G. All shop drawings and submittals shall include a stamped indication signifying that the submittal has been reviewed for compliance with the Contract Documents by the Contractor. This stamped indication also represents the fact that the Contractor has checked this submittal for its interaction with all other Divisions and certifies by his signature or initials that all coordination has taken place. The stamp shall include the date, name of the Contracting Firm, the signature of the Contractor, certification of compliance and approval. This stamp shall be on the submittal before the Engineer will review it.

H. The Design Team will review an individual submittal not more than twice. If the submittal is rejected again on the second review, the Contractor will bare all responsibility for paying for the Design Team's time for additional reviews.

2.3 AS-BUILT DRAWINGS

A. The Contractor shall maintain on a daily basis at the Project site a complete set of "Record Drawings". The "Record Drawings" shall consist of a set of black-line or blue-line prints or AutoCAD files of the Contractor Coordination Drawings for this Division. The prints shall be marked or the AutoCAD file electronically updated to show the precise location of all work and equipment, and all changes and deviations in the work from that shown on the Contract Documents. This requirement shall not be construed as authorization for the Contractor to make changes in the layout or work without definite instructions from the Architect or Engineer. The continuously updated coordination drawings (shop drawings previously described) shall be used to produce the final "Record Drawings" which shall be delivered to the Owner in AutoCAD electronic format (CD) upon Project completion.

B. Record dimensions shall clearly and accurately delineate the work as installed; locations shall be suitably identified by at least two dimensions to permanent structures.

C. All underground and concealed utilities shall be located by dimension to known building elements and invert to project datum at exterior wall of the building.

D. The Contractor and Subcontractor shall mark all "Record Drawings" on the drawings with a rubber stamp impression or an AutoCAD image that states such.

PART 3 - EXECUTION

3.1 INSTALLATION

A. The equipment selections used in the preparation of the Contract Documents will fit into the physical spaces provided and indicated, allowing ample room for access, servicing, removal and replacement of parts, etc. Adequate space shall be allowed for clearance in accordance with the Code requirements and the requirements of the local Authorities having jurisdiction, and the equipment manufacturer's recommendations.

B. In the preparation of Drawings, a reasonable effort to accommodate acceptable equipment manufacturer's space requirements has been made. However, since space requirements and equipment arrangement vary according to each manufacturer, the responsibility for initial access, maintenance access, code required access, and proper fit rests with the Contractor.

C. Physical dimensions and arrangements of equipment to be installed shall be subject to the Architect's and Engineer's review.

D. The General Contractor and all Subcontractors shall coordinate the installation of ductwork, conduit, busway, piping, cable trays, etc., installation with lighting fixtures, special ceiling construction, air distribution equipment, and the structure. Provide additional rises, drops and offsets as required.

E. Accessibility and Clearance:
   1. Piping, etc. shall be installed in accessible locations, avoiding obstructions, preserving headroom, and keeping openings and passageways clear.

2. Minor adjustments in the locations of equipment shall be made where necessary, providing such adjustments do not adversely affect functioning of the equipment.

F. Scaffolds and staging for installation of plumbing work shall be provided under the work of this Division.

3.2 STRUCTURAL FITTINGS

A. Furnish and install the necessary sleeves, inserts, hangers, anchor bolts, and related structural items. Install at the proper time.

B. Openings may have been indicated on the Architectural and Structural drawings. Should any additional openings or holes be required, the same shall be provided at no additional cost to the Owner. No structural members are to be cut, notched, or drilled for piping.

C. Location: At a time in advance of the work, verify openings shown on the Architectural and Structural drawings, and coordinate any additional openings.

D. If the work of this Section requires modification of the Architectural or Structural drawings, furnish new instructions as to requirements for these openings. Submit for review and coordination to Architect.

E. Sleeves shall be supplied for mechanical piping passing through walls or slabs and shall be placed before concrete is poured.

F. Equipment supports for mechanical work shall be fastened to the structure by inserts, anchor bolts, bolting to drilled and tapped structural members, or be welded to the structure.
1. Welding shall be done by the electric arc method with fully competent and certified welders. Supporting members shall be shop coated with a suitable primer.
2. Surfaces damaged by installation of supports shall be touched up with primer to match shop coat. Any drilling of structural members shall be approved by the Architect.

G. Flashing:
1. Wherever piping passes through the roof or outer walls, base flashing and counter-flashing shall be provided.
2. Such flashing shall be properly installed by skilled workmen, and shall include grouting, mastic or tar application, or other means to insure a permanent, waterproof, neat and workmanlike installation.
3. Insofar as possible, flashing shall comply with and be similar to requirements for flashing in General Construction Work.

H. Anchor bolts and inserts shall be galvanized and of adequate size and strength for installation of plumbing work and shall be placed in forms before concrete is poured.
1. Placement of bolts in bases shall be done under other Division. Furnish detail drawings, templates, and anchor bolts for bases to the General Contractor in time to avoid delaying work schedules.
2. Expansion shields shall only be used with specific approval of the Architect. Wooden or soft metal plugs shall not be used.

I. Cutting and patching:
1. All additional cutting, patching and reinforcement of construction of building, subject to review by the Architect, shall be performed under this Section.
2. Refer to appropriate Division for requirements.

3.3 WEATHERPROOF EQUIPMENT

A. Plumbing devices or equipment located in damp, semi-exposed areas shall be weather-resistant. Enclosures shall comply with NEMA Type 3R requirements.

B. Air distribution devices located in damp areas outside shall be weather-resistant (aluminum, etc.).

3.4 CLEANING

A. Brush and clean work prior to concealing, painting and acceptance. Perform in stages if directed.

B. Painted exposed work soiled or damaged: Clean and repair to match adjoining work before final acceptance.

C. Remove dust and debris from inside and outside of material and equipment.

3.5 TESTS AND DEMONSTRATIONS

A. All systems shall be tested in the presence of the Owner or an Owner designated representative upon completion of the Work and demonstrates that the installation is in accordance with the Contract Documents.

B. All motors shall be checked and adjusted for correct direction of rotation.

C. Any work found not to be in compliance with the Contract documents shall be repaired or replaced without incurring additional cost to the Contract price.

D. Provide all instruction to the Owner on maintenance and operation of all systems and equipment provided under this Division.

3.6 WARRANTIES

A. The warranty period for all systems, equipment, components, work, etc. shall be no less than one (1) year, unless specified otherwise hereinafter and shall include at least one (1) full heating season and one (1) full cooling season. The warranty shall include parts and labor.

B. The Contractor shall, without cost to the Owner, remedy any defects within a reasonable time to be specified in notice from the Architect. In default thereof, the Owner may have such work done and charge all costs to the Contractor.

C. The start of the Contractor's warranty period, as defined in the General Conditions, shall commence on the issue of a "Certificate of Substantial Completion", by the Owner or the Owner's Representative for each item of material, equipment or system.

D. The Subcontractor shall confer with the General Contractor prior to the bid date concerning the project schedule and determine if there is a need to operate any items of equipment or systems for temporary heating and/or cooling or other reasons prior to "Substantial Completion". All required extended warranty costs for equipment, materials, and systems shall be included in the Subcontractor's bid.

END OF SECTION

SECTION 22 05 29 HANGERS & SUPPORTS FOR PLUMBING PIPING & EQUIPMENT

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. The Conditions of the Contract and applicable requirements of Division 1, “General Requirements”, and Section 22 01 00 “General Plumbing Requirements”, govern this Section.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide pipe hangers, supports, and required appurtenances as specified and indicated

1.3 QUALITY ASSURANCE

A. MSS Standard Compliance: Provide pipe hangers and supports of materials, design, and manufacture which comply with ANSI/MSS SP-58, SP-59, SP-89, and SP-90.

B. Acceptable Manufacturers: The model numbers listed in the Specification establish a level of quality and material. Subject to compliance with requirements, provide products and materials by the following:
1. ITT Grinnell Corporation,
2. Fee and Mason,
3. Central Iron Manufacturing Company, and
4. F& S Manufacturing Company

PART 2 – PRODUCTS

2.1 PIPE HANGERS AND SUPPORTS:

A. General: Provide pipe hangers and supports as specified. Comply with local codes and standards for pipe and equipment support and anchorage. Pipe supports shall be of material that will prevent electrolytic action.

B. Inserts: Provide Grinnell No. 282 inserts for concrete construction.

C. Piping in Multiple Parallel Runs: Provide Grinnell No. 45 or No. 50 with Grinnell No. 137 U-bolt pipe clamps or structural channels or angles with U-bolt clamps, supported as trapeze hangers where multiple parallel runs of piping are shown. Select and size members for weights to be carried and span dimensions between supports.

D. Piping in Single Runs: Provide Fee and Mason Fig. 239 or Grinnell No. 260 clevis hanger.

E. Hanger Rod: Provide hanger rods of required length. Rod diameters shall be as listed in the following table. Rod diameters may be adjusted after consultation with the Structural Engineer concerning the building framing system, the method of attachment to the structure and the support rod spacing.

Pipe Sizes	Rod Diameter
3/4” - 2”	3/8”
2-1/2” – 3”	1/2”
4” – 5”	5/8”
6”	3/4”
8” – 12”	7/8”
14” – 18”	1”

F. Riser Clamps: Provide Fee and Mason Figure 241 riser clamps. Riser clamps for copper tube shall be copper-plated.

G. Saddles and Shields:
1. Saddles for Horizontal Insulated Piping Without Vapor Barrier: At each hanger or support on horizontal runs, provide Grinnell No. 160 or Fee and Mason Figure 171, 1710, 1712, or 172 saddles, as applicable. Shields as described below may be used instead of the saddles. On heating water systems below 140ºF (60ºC), hangers may be sized for the pipe size and of a material compatible with the pipe. Where dissimilar materials are used, provide dielectric separation. Carry insulation over the hanger and seal where hanger is sized for pipe.
2. Shields for Horizontal Insulated Water Piping With Vapor Barrier: At each hanger or support for water piping, provide a half section of preformed 6 PCF density fiberglass or rigid calcium silicate, with jacket of adjacent insulation brought across unbroken, supported on semicircular 16 gauge shields. Shields for pipe 4” and smaller shall be 12” long; shields for pipe 5” to 8” shall be 18” long; and shields for larger pipe shall be 24” long.

PART 3 – EXECUTION

3.1 INSTALLATION:

A. Independent Support: Support fire sprinkler and standpipe piping independently of other piping in accordance with NFPA-approved methods and local codes and standards.

B. Provisions for Movement:
1. Movement: Install hangers and supports to allow controlled movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate the action of expansion joints, expansion loops, expansion bends, and similar units.
2. Load Distribution: Install hangers and supports so piping live and dead loading stresses from movement will not be transmitted to any pipe or connected equipment. Pipe supports shall properly transmit the weight of the pipe and its contents to the building structure, or to independent posts, piers, or foundations.
3. Pipe Slopes: Install hangers and supports to provide the indicated pipe slopes so maximum pipe deflections allowed by ANSI B31 are not exceeded.

C. Insulated Piping: Comply with the following installation requirements:
1. Clamps: Attach clamps, including spacers (if any), to piping with clamps projecting through the insulation; do not exceed pipe stresses allowed by ANSI B31.

2. Shields: Where low-compressive-strength insulation of vapor barriers are indicated on cold, chilled, or heating water piping, install coated protective shields. For pipe 8” and over, install rigid calcium silicate insulation between saddles and pipe.

D. Spacing: Install hangers and supports in piping systems to remove stress from equipment flanges and rotating equipment. Space hangers and supports as shown in the following table. Rod spacing may be adjusted after consultation with the Structural Engineer concerning the building framing system, the method of attachment to the structure and the support rod diameters.

Trade Pipe Size	Maximum Spacing
1/2"	5'
3/4"	6'
1" and 1-1/4"	7'
1-1/2"	9'
2"	10'
2-1/2"	11'
3"	12'
4"	14'
5"	16'
6"	17'
8"	19'

E. Saddles: Where insulation without vapor barrier is indicated, install protection saddles, or use hangers as indicated in Paragraph 2.0/H.1.

F. Guides: Install pipe guides complying with the manufacturer’s published product literature. Where not otherwise indicated, install pipe guides near expansion loops, expansion joints, and ball joints.

G. Anchors: Install anchors at the proper locations to prevent stresses from exceeding those permitted by ANSI B31 and to prevent the transfer of loading and stresses to connected equipment. Anchors shall include vibration isolation in accordance with the pipe support system specified. Where the piping system is floating, the anchors shall be termed restraints or braces.

1. Where expansion compensators are indicated, install anchors in accordance with the expansion unit manufacturers written instructions, to limit movement of piping and forces to the maximums recommended by the manufacturer of each unit.
2. Where not otherwise indicated, install anchors at the ends of principal pipe runs and at intermediate points in pipe runs between expansion loops and bends. Make provisions for preset of anchors as required accommodating both expansion and contraction of piping.

H. Leveling: Adjust hangers and supports and place grout as required under supports to bring piping to proper levels and elevations.

I. Hangers: Refer to Section 23 05 48, “Vibration Isolation”, for additional information and support requirements. Pipe hangers made of wood, wire, or sheet iron shall not be permitted.

J. Riser Supports: Vertical piping shall be secured at sufficiently close intervals to keep the pipe in alignment and carry the weight of the pipe and contents.

1. Cast iron soil pipe shall be supported at the base and at each story level, but in no case at intervals greater than 10’.
2. Steel pipe shall be supported at the base and at no less than every other story level, but in no case at intervals greater than 25’.
3. Copper tube shall be supported at each story level, but in no case at intervals greater than 10’.
4. Plastic pipe shall be supported at midpoint between floors and at ceiling to prevent movement, but in no case at intervals greater than 8’.

END OF SECTION

SECTION 22 07 00 PLUMBING INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. The General Provisions, Supplemental General Provisions, section 22 01 00, Division 1 Specifications and Special Provisions apply to all Work specified in this Section.

B. This section describes the basic materials and installation methods for the insulation of Plumbing piping and equipment. Comply with other Division 22 sections and drawings as applicable. Refer to other divisions for coordination of work.

C. Furnish and install all components of the insulation system specified herein, as indicated on the drawings, and as required to provide complete and operating systems.

1.2 QUALITY ASSURANCE

A. Manufacturer: Approved manufacturers are Armstrong, Calsite, Cell-U-Foarm Corp, Ceelco, Certainteed Corp, Dow Chemical Company, Forrest Mfg Co, Foster / Chilers, Gemco, Johns Manville, Knauf Fiberglass, Midwest Fastners, Owens Corning Fiberglass, Pittsburg Corning Fiberglass, Rubatex, Trymer, and Venture Tape.

B. All insulation, jacket and adhesive shall have a fire and smoke hazard ratings as tested under ASTM E 84, NFPA 255, and UL 723 not exceeding:

Flame Spread:	25
Fuel Contributed:	50
Smoke Developed:	50

Exceptions: Type B Insulation and PVC Fitting Covers

1.3 SUBMITTALS

A. Per Section 22 01 00.

B. Product Data
1. Type A Insulation
2. Type B Insulation
3. Type C Insulation
4. Type E Insulation
5. Metal Jacket

1.4 DEFINITIONS

A. The word “plenum” shall mean a ceiling space or mechanical room used for the transfer of conditioned return and/or outside air.

PART 2 - PRODUCTS

2.1 PIPING INSULATION

A. Type A – Fiberglass (indoor)

1. One Piece glass fiber, rigid molded sectional pipe covering with factory applied aluminum foil and white craft paper flame retardant vapor barrier jacket, conforming to ASTM C547, Class II, Mineral Fiber Preformed Pipe Insulation.
2. Thermal Conductivity (k) equals approximately 0.23 (BTU/HR., SF., Degree F, IN) at 75 °F.
3. Similar to Johns Manville Corp “Micro Lox 650 AP T”, or approved equal.

B. Type B - Closed Cell (indoor)
1. Closed cell, flexible foamed plastic conforming to ASTM C534, "Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form." Insulation shall be suitable for a temperature range from –40 degrees F to 220 degrees F.
2. Conductivity (k) equals approximately 0.27 (BTUHR., SF., Degree F, IN) at 75 °F.
3. Similar to Armstrong “Armaflex”, or approved equal.

C. Type C – Polyioscyanurate (outdoor)
1. Prefabricated 2 lb./cu.ft. density polyisocyanurate insulation with waterproof mastic and glass fiber jacket finished with an aluminum jacket with waterproof silicone caulk joints.
2. Conductivity (k) equals approximately 0.14 (BTUHR., SF., degrees F, IN) at 75 °F.
3. Insulation shall be applied per manufacturer’s recommendations. Joint sealants and coatings shall be as approved by the insulation manufacturer for the intended application and service temperature range.
4. Jacketing shall be an all service jacket with 1 mm aluminum foil on pipe insulation and FSK jacket on board stock applied by the manufacturer to ASTMC-1136. Jacket shall have integral flap for sealing joint.
5. Similar to Trymer 9501, or approved equal.

2.2 EQUIPMENT INSULATION

A. Type E
1. Calcium silicate block conforming to ASTM C 553, Type I (1200 degrees F. max), asbestos free.
2. Conductivity (k) equals approximately 0.42 (BTU IN/HR., SF., degree F) per inch thickness at 200 °F.
3. Similar to Calsilite, or approved equal.

2.3 METAL JACKET

A. Smooth aluminum jacket 0.016 inch thick.

B. Integral polykraft or poly-surlyn moisture barrier.

C. Banded locking joints with field applied silicone weatherproof sealant.

D. Similar to Johns Manville Corp, or approved equal.

2.4 INSULATION ACCESSORIES

A. The following accessories shall be used in the application of the thermal insulations specified under this Section:
1. PVC Fittings Covers: similar to Johns Manville Corp “Zeston”, or approved equal.

2. Pressure Sensitive polyester film tape to secure pipe insulation up to 12" outside diameter: Similar to 3M 30-80, or approved equal.
3. Vapor Seal Mastic: Similar to Childers CP-35, or approved equal.
4. Lagging Adhesive: Similar to Childers CP-52, or approved equal.
5. Wire: 16 gauge soft stainless steel.
6. Insulation Bonding Adhesive (To Metal): Similar to Childers CP-82, or approved equal.
7. Insulating and Finishing Cement: Similar to Insulco Smooth Kote, or approved equal.
8. Mechanical Fasteners - Welded or adhered pins with speed clip washers: Similar to Gemco Midwest Fasteners, or approved equal.
9. Bands for Equipment:
   a. Outside diameter of insulation is less than 24 inch: 1/2 inch x 0.020-inch (25 ga.) stainless steel.
   b. Where diameter is 36 inches or larger: 3/4 inch x 0.020 inch.
10. Bands for Piping: 1/2 inch x 0.020-inch stainless steel.
11. Wire Mesh: 1 inch by 20-gage stainless steel hexagonal wire netting.

PART 3 - EXECUTION

3.1 INSULATION APPLICABILITY

A. Horizontal waste piping from electric water coolers – Type A insulation required:

Insulation Thickness (in)	Pipe Sizes (in)
1/2	all

B. Domestic Cold Water – Type A insulation required:

Insulation Thickness (in)	Pipe Sizes (in)
1	all

C. Domestic Hot Water and Tempered Water – Type A insulation required:

Insulation Thickness (in)	Pipe Sizes (in)
1	all

D. Domestic Water Heaters shall be factory insulated.

Notes:
   a. The above thicknesses are the minimum required. All local codes and local energy codes shall be complied with.
   b. All piping exposed to outdoors shall be insulated. All piping subject to freezing shall be provided with heat tracing. Coordinate insulation with heat trace cable and controls.
   c. Insulation types and thickness are a minimum standard. Each application shall be carefully considered and insulation product type and thickness shall be appropriate for each specific application. Submit all insulation products with verification of their service intent.

3.2 PIPING INSULATION GENERAL REQUIREMENTS

A. Preparation
   1. Do not apply insulation until piping has been leak tested.

2. All surfaces to be insulated shall be dry and free of loose scale, rust, dirt, oil or water.

B. Application:
1. Insulation shall be installed in a smooth, clean workmanlike manner. Joints shall be tight and finished smooth without fish-mouths.
2. Insulation shall fit tightly against the surface to which it is applied to prevent air circulation between the insulation and the pipe or equipment to which it is applied.
3. Insulation applied to cold piping or equipment shall be completely vapor sealed, free of pinholes or other openings.
4. Do not use wet insulation materials.
5. All longitudinal joints on vertical pipe runs shall be staggered.
6. Apply insulation so as to permit expansion or contraction of pipelines without causing damage to insulation or surface finish.
7. Do not apply mastic or adhesive until all previous applications of mastic and adhesives have thoroughly dried.
8. No bands or staples shall be provided on covering.
9. The adhesive used in connection with all covering work shall contain an approved vermin and rodent proof ingredient.
10. Provide 24-gauge sheet-metal saddle between the pipe hanger/support and the exterior of the insulation. Saddle length shall be the same as insulation inserts.

C. Application at Fittings:
1. Insulation of flanges and flanged fittings shall overlap adjacent pipe covering at least 1 inch. Valves shall be insulated up to the gland only.
2. Pipeline strainers shall be insulated in such a manner as to permit removal of strainer basket without disturbing insulation of the strainer body.
3. Insulation adjacent to un-insulated flanges shall be tapered back and neatly finished so as to allow access to and removal of bolts without injury to covering.

3.3 TYPE A INSTALLATION

A. Tightly butt together sections of insulation on pipe runs sealing longitudinal seams of jacket with a self-sealing adhesive. Seal end joints with 4-inch wide straps of matching vapor barrier tape. Seal off ends of insulation with vapor seal mastic at valves, fittings and flanges. No further finish required. Mastic shall extend onto the bare pipe and over the insulation O.D.

B. PVC fitting jackets shall be used when they are available for the particular application. When molded or routed coverings are not available, the coverings shall be fabricated in the field similar to equipment insulation. Molded or routed fitting covers are highly recommended. Order PVC pre-curled.

C. Cold Piping:
1. Cover valves, fittings and flanges with insulation having the same thickness as adjacent pipe covering, securing in place reforming tape up to 12” O.D. and ½” wide SST bands on larger O.D. Apply a PVC jacket and seal joints with PVC cement (solvent welding).

D. Hot Piping:
1. Covers shall overlap the pipe insulation by the thickness of the insulation or 2” min. Cover valves, fittings and flanges with insulation similar to the adjacent pipe covering, securing in place with reforming tape up to 12” O.D. and ½” wide

SST bands on larger O.D. Apply a PVC jacket and tape end joints to adjacent pipe insulation.

2. Do not use PVC fitting jackets where the surface of the insulation is above 150 degrees F.

3.5 HANGERS

A. Continue insulation through pipe hangers. Provide either rigid insulation inserts or sheet metal inserts at all outside pipe hangers. Provide rigid insulation inserts for piping operating below 60 °F. and sheet metal inserts for piping above 60 °F.

B. Provide rigid insulation (on non-insulated piping) or sheet metal inserts (on insulated piping) between the pipe and pipe hanger - shall be of a thickness equal to the adjoining insulation and shall be provided with vapor barrier where required. Insulation insert shall not be less than the following lengths:

1/2” to 2 1/2" pipe size	10 Inches Long
3” to 6" pipe size	12 Inches Long
8” to 10" pipe size	16 Inches Long
12” and over	22 Inches Long

C. Inserts for cold piping shall have a vapor barrier facing of the same material as the adjacent pipe insulation. Seal inserts into insulation with vapor seal mastic.

D. Sheet metal inserts shall be of steel sheet. Gauge shall conform to manufacturer's recommendation for pipe size. Sheet metal inserts shall have insulation filler of the same material as the adjacent pipe insulation.

3.6 PIPE SLEEVES

A. Pipe insulation and vapor barrier shall be continuous through sleeves in walls and floors.

B. Provide 26 gauge galvanized steel or 0.020 inch aluminum jacket over insulation on pipe passing through sleeves where sealant is required.

C. Where penetrating interior walls, extend the metal jacket 2 inches out either side of the wall and secure each end with a metal band compressing the insulation slightly.

D. Where penetrating floors, extend the metal jacket 2 inches below the floor and 5 inches above the floor. Secure with metal bands.

END OF SECTION

SECTION 22 10 00 PLUMBING PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. The General Provisions, Supplemental General Provisions, section 22 01 00, Division 1 Specifications and Special Provisions apply to all Work specified in this Section.

B. This section describes the basic materials and installation methods for the plumbing piping systems. Comply with other Division 22 sections and drawings as applicable. Refer to other divisions for coordination of work.

C. Furnish and install all components of the plumbing piping systems specified herein, as indicated on the drawings, and as required to provide complete and operating systems.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide complete operating plumbing piping systems including pipe, tube, fittings, and appurtenances as indicated and in compliance with these Specifications.

B. Applications: Applications of piping systems include, but are not limited to, the systems as listed below:

System	Working Pressure	Operating Temperatures
Domestic Cold Water		
High	350 psig	40 to 80°F
Medium	300 psig	40 to 80°F
Low	150 psig	40 to 80°F
Domestic Hot Water		
High	350 psig	90 to 120°F
Medium	300 psig	90 to 120°F
Low	150 psig	90 to 120°F
Condensate Drainage		40 to 60°F
Sanitary Drainage		

1.3 QUALITY ASSURANCE

A. Welding: Qualify welding procedures, welders, and operators in accordance with ANSI B31.1, Paragraph 127.5, for shop and job site welding of piping work. Make welded joints on the piping system with continuous welds, without backing rings and with pipe ends beveled before welding. Gas cuts shall be true and free from burned metal. Before welding, surfaces shall be thoroughly cleaned. The piping shall be carefully aligned and no weld metal shall project inside the pipe.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. General: Provide pipe and tube of type, joint, grade, size, and weight (wall thickness, schedule or class) indicated for each service. Comply with applicable governing regulations and industry standards.

1. Steel Pipe: ASTM A53, ASTM A106, or ASTM A120, black or hot-dipped galvanized as specified.

2. Copper Tube: ASTM B88, Types "K", Type "L", or Type "M" copper water tube as defined by the Copper and Brass Research Association.

3. Ductile Iron Pipe: ANSI A21.51, Class 150 with bell and spigot ends for push-on joints.

4. Cast Iron Soil Pipe: ASTM A74, standard weight, hub and spigot-type.

5. Hubless Cast Iron Pipe: CISPI 301-78, standard weight with spigot bead ends for coupling assembly.

6. Polyvinyl Chloride (PVC) Pipe: Sewer main SDR 41, ASTM D3034 with bell ends and pre-inserted gasket joints.

7. Pre-insulated Steel Pipe: ASTM A53, ASTM A106, ASTM A120, and ANSI B31.1.

8. Polyvinyl Chloride (PVC) Water Pipe: Class 150, thickwall, Schedule 80, AWWA C90 mechanical joint.

9. Copper Drainage Pipe: DWV copper piping.

10. Polyvinyl Chloride (PVC) Drainage Pipe: Schedule 40 PVC.

11. Uponor PEX is not specified for plumbing piping. However, if this is a desired material for consideration, Contractor is advised to submit an RFI or request through the Architect for Owner pre-approval. PEX will not be allowed for any below-grade installations.

2.2 PIPE / TUBE FITTINGS

A. General: Provide factory-fabricated fittings of type, materials, grade, class, and pressure rating indicated for each service and pipe size. Provide sizes and types matching pipe, tube, valve, and equipment connections. Where not otherwise indicated, comply with governing regulations, industry standards, and where applicable, with pipe manufacturer's instructions for selections.

1. Cast Iron Flanged Fittings: ANSI B16.1, Class 125 or Class 250, black or galvanized as specified, including bolting and gasketing.

2. Cast Iron Threaded Fittings: ANSI B16.4 or ASTM A126, Class 125 or Class 250, black or galvanized as specified.

3. Malleable Iron Threaded Fittings: ANSI B16.3, Class 150 or Class 300, black or galvanized as specified.

4. Malleable Iron Threaded Unions: ANSI B16.39, select for proper piping fabrication and service requirements including style, end connections, and metal-to-metal seats (iron, bronze, or brass), plain or galvanized as specified.

5. Threaded Pipe Plugs: ANSI B16.14.

6. Steel Flanges/Fittings: ANSI B16.5, including bolting, gasketing, and butt weld end connections.

7. Forged Steel Socket-welding and Threaded Fittings: ANSI B16.11, rated to match schedule of connected pipe.

8. Wrought Steel Butt-welding Fittings: ANSI B16.9, except ANSI B16.28 for short radius elbows and returns; rated to match connected pipe.

9. Cast Iron Drainage Fittings: ANSI B16.22 galvanized with pitched threaded ends.

10. Pipe Nipples: Fabricated from same pipe as used for connected pipe, except do not use less than Schedule 80 pipe where length remaining unthreaded is less than 1/2". Do not thread nipples full length (no all-thread nipples).

11. Wrought Copper/Bronze Solder-Joint Fittings: ANSI B16.22 suitable for working pressure up to 250 psig.

12. Hub-less Cast Iron Pipe Fittings: CISPI 301-78 and comply with governing regulations.

13. Cast Iron Soil Pipe Fittings: ASTM A74.

14. Compression Gaskets: CISPI HSN-75.

15. Lead/Oakum Joint Materials: Comply with governing regulations for service use indicated.

16. Grooved End Fittings: ASTM A47 or ASTM A536 joined with Victaulic Style 77 couplings and Grade "E" gaskets.

17. Polyvinyl Chloride (PVC) Fittings: ASTM D2665, Carlon, Vylon "Z" high strength sewer fittings.

18. Copper Drainage Fitting: DWV copper drainage fittings.

B. Miscellaneous Piping Materials/Products:

1. Welding Materials: Comply with ASME Boiler and Pressure Vessels Code, Section II, Part C, for welding materials.

2. Brazing Materials: American Welding Society, AWS A5.B, Classification BCup-5.

3. Gaskets for Flanged Joints: 1/8" thick gaskets. Ring-type shall be used between raised face flanges and full face-type between flat face flanges with punched bolt holes and pipe opening. Gaskets shall be Garlock Style 3400 compressed non-asbestos or equal.

4. Insulating (Dielectric) Unions: Provide dielectric unions at all pipe connections between ferrous and nonferrous piping. Unions shall be "Delvin" as made by Pipeline Seal and

Insulator Company or "EPCO" as made by Epco Sales, Inc. and shall have nylon insulation or equal.

5. Gaskets for Cast Iron Soil Pipe: ASTM C 564, neoprene, compression-type.

6. Push-on-Joints: ANSI A21.11, rubber compression-type, "Tyton Joint" as manufactured by US Pipe or equal.

7. Hub-less Cast Iron Joints: CISPI 310, stainless steel corrugated shield and clamp assembly over one piece neoprene sealing sleeve.

PART 3 - EXECUTION

3.1 PIPING INSTALLATION

A. General:

1. Industry Practices: Install pipe, tube, and fittings in accordance with recognized industry practices which will achieve permanently leak-proof piping systems, capable of performing each indicated service without failure or degradation of service. Install each run with a minimum of joints and couplings, but with adequate and accessible unions or flanged connections to permit disassembly for maintenance/ replacement of valves and equipment. Reduce sizes (where indicated) by use of reducing fittings. Align accurately at connections. Coordinate piping locations with other trades to avoid conflict. Give ductwork preference unless directed otherwise by the Engineer.
2. Systems: Install piping parallel or perpendicular to lines of building, true to line and grade, and with sufficient hangers to prevent sags between hangers. Provide fittings at changes in direction. Piping in finished areas shall be concealed, except in mechanical rooms. Where pipes of different sizes join, provide reducing elbows, tees, or couplings. Bushings will not be acceptable.
3. Expansion and Contraction: Install loops, offsets, sizing joints, and expansion joints, as necessary, to avoid strain resulting from expansion and contraction of piping systems on fixtures and equipment. Provide mechanical grooved connections required by the application to reduce vibration at equipment connections. Provide expansion joints in piping systems by mechanical grooved connections where required.

B. Steel Pipe: Ream steel pipe after cutting and before threading. Thread with clean-cut taper threads of length to engage all threads in fittings and leave no full-cut threads exposed after make-up.

C. Copper Pipe: Cut copper pipe square and ream to remove burrs. Clean fitting socket and pipe ends with sand cloth or wire brush.

D. PVC Pipe: Cut PVC pipe square and remove all burrs. Clean fitting and pipe butt prior to installation. Install all PVC piping in accordance with the manufacturer's recommendations.

E. Final Connections to Equipment Furnished by Owner or Under Other Divisions of These Specifications: Where equipment is to be furnished under other Divisions of these Specifications or by the Owner, such equipment will be delivered to the site, uncrated, assembled, and set in-place under those other Divisions of these Specifications or under the separate contracts. Any required automatic control valves shall also be provided under those other Divisions of these Specifications or other separate contracts. Make all final connections of hot water, condenser water, gas, domestic water, waste, and vent as required. Provide valves, unions, strainers, check valves, and traps as required for proper operation of systems and equipment. Equipment not shown on the Architectural Drawings or noted by the Architect and/or Engineer shall not be included in the scope of this requirement.

F. Excavation, Installation, and Backfill for Underground Pipe:

1. Layout: Pipes shall be laid and pipe joints made in presence of the General Contractor and field measurements, layouts, batter board alignment, grade establishments, and similar locations shall be performed by a Professional Engineer in the employ of the Contractor. The Contractor's engineer shall be on the job during all underground work. A "Bench-Mark" reference shall be provided by the General Contractor.
2. Pipe Grading: Lay and maintain all pipes at required lines and grades during the course of the Work.
3. Trench: Excavate the trench to the depth required. Properly brace and de-water the trench and keep it free of water during installation, testing pipe, and backfilling. No water shall be discharged onto the street or freeway without approval by the Owner.
4. Excavation: The trench shall be at least 18" wider than the maximum diameter of the pipe or largest bell and the pipe shall be laid in the center of the trench. The trench shall be excavated to a depth sufficient to provide for pipe cushions or supports as specified. Trench width may be increased as required and piling left in place until sufficient compacted backfill is in place. Properly sheet all open trenches to render them secure and remove all such sheeting and before completing the backfill. Comply with all applicable national, state, and local codes and regulations. The quantity of excavation required to install sheeting and the installation and removal of sheetings will not be regarded as Extra Work. All costs incurred for this excavation and the installation of sheeting shall be included in the Contract Price.
5. Grading: Upon completion of excavation and prior to the laying of the pipe, the trench bottom shall be brought up to the required elevation with a pipe cushion, except where the cushion has been eliminated by the General Contractor. Pipe cushions shall be select material deposited in the trench and shall be compacted, leveled off, and shaped to obtain a smooth compacted bed along the laying length of the pipe. Pipe cushion material shall be as follows:
   a. Domestic Water Pipes: Material for pipe cushion shall comply with local codes and conform with the geo-technical report. In absence of local code requirements and/or geo-technical report, the cushion shall be bank sand or select backfill material approved by the General Contractor. Any material used shall pass a one-inch screen.
   b. Sanitary and Storm Sewers: Material for pipe cushion shall comply with local codes and conform with the geo-technical report. In absence of local code requirements and/or geo-technical report, the cushion shall be bank sand or select backfill material approved by the General Contractor. Any material used shall pass a one-inch screen.
6. Anchors: Cast iron pipes shall have concrete anchors at each change in direction and/or as directed. Any change in direction exceeding 15 degrees shall be anchored. Concrete anchors shall rest against solid (virgin) ground with the required area of bearing on pipe and ground to provide suitable anchoring.
7. Backfill: Backfill trenches only after piping has been inspected, tested, and approved by the General Contractor. Backfill shall be provided as recommended in the geo-technical report included in these Contract Documents, or in the absence of a geo-technical report, as required by site conditions. Refer to Division 2 or elsewhere in the Contract Documents for additional trenching and backfill requirements.
8. Existing Surfaces: Restore existing streets, driveways, and sidewalks damaged during the excavation work to acceptable condition, subject to approval by the Owner.
9. Safety: Provide street and sidewalk excavations with approved barricades, warning lights, and cover plates as required by the local authorities.

3.2 PLUMBING SERVICES

A. Scope:

1. This Contractor shall provide the building sanitary sewer to 5 feet outside the building and shall extend the domestic water service from the main shutoff valve stubbed above floor in the building.

2. Verify locations and conditions.

B. General: Install the various piping systems as described hereinafter, and as required by the local plumbing inspection department.

1. Slope domestic hot and cold water piping to drain and provide with hose valves (drain valves) at low points.

2. Install soil, waste, and vent piping with horizontal lines pitched in accordance with local codes, but in no case less than 1/4" per foot for pipe 2-1/2" and smaller, and 1/8" per foot for pipe 3" and larger. Install soil, waste, and vent piping with hubs of each length of piping in the upstream position.

3. Make-up lead and oakum joints with molten lead run into hubs in one continuous pour, to a minimum depth of one inch.

4. Make-up "Ty-Seal" or "Dual-Tite" gasketed joints using lubrication and joining tools as instructed by the manufacturers. Base of stacks, horizontal runs under pressure, and gasketed pipe 5" and larger shall be made up using "Lubrifast" joining material.

5. Torque "No-Hub" joints in accordance with manufacturer's instructions. Do not install "No-Hub" joints below ground.

6. Provide chrome-plated piping at each fixture installed in a finished space. Install with proper strap wrenches to avoid marking or defacing.

7. Provide proper restraints on riser and stack offsets.

C. Plumbing Connections to Fixtures and Equipment:

1. General: Provide necessary pipe and fittings. Make final connections to provide cold water make-up to mechanical equipment. Locate cold water make-up where shown and connect with suitable stop valves.

D. The domestic water service shall be Class 150 AWWA cement lined C.I. with Class 250 fittings, mechanical joints or push-on rubber ring gaskets, ASTM A377-66 or PVC AWWA C900 with solvent welded fittings. Provide tie rods and thrust blocks as required.

3.3 DOMESTIC HOT AND COLD WATER PIPING SYSTEMS

A. Interior Hot and Cold Water Piping:

1. Piping 3" and smaller, Type "L" copper tubing with wrought copper solder end fittings. At the Contractor's option, this piping may be as specified for piping 4" and larger.

2. Piping 4" and larger, Schedule 40, galvanized steel pipe, ASTM A120 with galvanized malleable iron fittings, or galvanized cast iron flanged fittings.

3. Provide isolation fitting whenever dissimilar materials are used.

4. Option: At the Contractor's option, for piping 3" or larger, Victaulic Style 77 couplings, Victaulic fittings and tees may be used instead of the above, if Victaulic groove depth control tool is used for field grooving. Victaulic flanges and reducing couplings shall not be installed.

5. Piping Run-outs to Fixtures: Provide piping run-outs to fixtures sized to comply with governing regulations. Each fixture shall be provided with a shut-off valve for each supply line. Provide all shutoff valves necessary to isolate mains to each restroom. Exposed lines shall be chromium-plated.

B. Air Chambers: Provide the necessary air chambers, shock absorbers, or water hammer arrestors, specifically sized for the application to prevent water hammer.

1. All water hammer arrestors shall be PDI certified, size A, B, C, D, E, F, as indicated and/or as appropriate for the fixtures served. Josam, Zurn, or Jay R. Smith.

2. Water hammer arrestors shall be installed at the top of each riser, and on each fixture branch, with quick closing valves, in accordance with Plumbing and Drainage Institute Standard WH201.

3.4 UNDERGROUND DOMESTIC WATER SERVICE & FIRE PROTECTION PIPING

A. Piping Two-and-a-half Inches and Smaller: Type "K", copper tubing with wrought copper brazed end fittings.

B. Piping Three Inches and Larger: Ductile iron bell and spigot, push-on joint, pressure water pipe. Joints shall be of the push-on-type employing a molded rubber gasket retained in a ring recessed into the inside of the bell. Pipe and joints shall be manufactured by Tyler Pipe and Foundry Company or equal. Coat pipe and fittings inside and outside with the manufacturer's standard coal tar enamel suitable for domestic water service. PVC AWWA C900 piping with solvent welded fittings can be used where acceptable by the local authorities.

3.5 SANITARY DRAINAGE PIPING SYSTEMS

A. Soil, Waste, and Vent Piping Underground: Service weight cast iron soil pipe and fittings with lead and oakum joints or neoprene gasket joints made up with "Lubrifast" joining material or PVC piping with solvent welded joints. Provide and install code-approved manholes as required.

B. Soil, Waste, and Vent Piping Above Ground: Service weight cast iron soil pipe and fittings with neoprene gasketed joints or Schedule 40, service weight hub-less cast iron soil pipe and fittings with coupling assembly, or Schedule 40 PVC pipe with PVC drainage fittings. NOTE: Use PVC only where allowed by code. No PVC to be used in return air plenums.

C. Cleanouts:

1. General: Care shall be used when locating cleanouts. Wherever possible, do not place cleanouts in "finished" areas. All locations shall be approved by the Architect.

2. Finished Floor: See Plumbing Fixture Schedule in Drawings. Provide clamping collar when installed in floors having waterproof membrane.

3. Unfinished Areas (grade): Jay R. Smith No. 4237 cleanout with adjustable cast iron tractor cover tops with speedi-set outlet.

4. Walls: Jay R. Smith No. 4710, cast iron with nickel bronze, round, smooth, access cover, vandal-proof screws.

5. Locations:

   a. At base of every drainage stack

   b. Maximum distance between cleanouts is 90 feet.

   c. At turns greater than 45 degrees.

   d. Other locations required by local code.

3.7 CLEANING, FLUSHING, TESTING, AND INSPECTING

A. Cleaning: Clean exterior surfaces of installed piping systems and prepare surface for application of any required coatings.

B. Flushing: Flush piping systems with clean water prior to performing any required tests.

C. Piping Tests:

1. General: Blank off equipment during tests. Perform tests before piping is enclosed in walls, floors, partitions or in any other way concealed from view. Tests may be performed in sections. Tests shall be witnessed by the General Contractor and local inspectors and the test results presented to the Engineer for acceptance and approval prior to concealing piping from view. Provide all necessary equipment for testing, including pumps and gauges. Note: All test results are to be submitted to the Engineer as specified in Section 22 01 00.

2. Domestic Water Systems: Test hot and cold water systems hydrostatically to a pressure of 150 psig or 1-1/2 times working pressure, whichever is greater, for a period of 4 hours. Repair all leaks, replacing materials as necessary, and repeat tests until systems are proven tight.

3. Soil, Waste, and Vent Piping System: Test soil, waste, and vent piping by plugging all openings and filling system to height required by City Plumbing Inspector, but not less than 10'. Inspect all joints for leaks, repair all leaks found, and retest until piping is demonstrated to be free from leaks. In addition to water test, apply peppermint or smoke tests, if required by local code. All underground main piping shall be inspected with a camera and the taped test results submitted to the Owner.

4. Disinfecting of Water Systems: Disinfect as required by code. Where code does not dictate tests to be conducted, at a minimum disinfect the hot and cold water systems as follows: Fill systems with water solution containing 50 ppm available chlorine; allow to stand for 4 hours, opening and closing all valves several times during this period; thoroughly flush; refill and place system in service; ensure a chlorine content of 2.5 ppm.

5. Cleaning and Adjusting: Thoroughly clean and disinfect all plumbing fixtures, including all exposed trim. Adjust all flush valves for proper flushing, but without excess use of water.

D. Inspecting: Visually inspect each run of each system for completion of joints, adequate hangers, supports, and inclusion of accessories.

END OF SECTION

SECTION 22 40 00 PLUMBING FIXTURES

PART 1 - GENERAL

1.1 SUMMARY

The General Provisions, Supplemental General Provisions, section 22 01 00, Division 1 Specifications and Special Provisions apply to all Work specified in this Section.

This section describes the basic materials and installation methods for the water source heat pump systems. Comply with other Division 22 sections and drawings as applicable. Refer to other divisions for coordination of work.

1.2 DESCRIPTION OF WORK

A. All fixtures shall be white, unless otherwise indicated.

B. All exposed trim to be heavy polished chrome plated brass, unless otherwise indicated.

C. Electric water coolers shall be ARI Certified. Units shall be UL Listed. Units shall use refrigerant which is approved for use without ozone depleting properties.

D. All sinks and lavatories for use by the handicapped shall have hot supply and P-trap insulated per ADA.

PART 2 – PRODUCTS

A. See PLUMBING FIXTURE SCHEDULE on Drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

A. All wall hung fixtures shall be supported on approved supporting chair carrier furnished complete with special foot piece and all necessary bolts, nuts, washers and gaskets unless noted otherwise. The adjustable nipple between the cast iron fitting and the closet bowl shall be threaded cast iron. Secure all floor pieces to floor slab.

B. All exposed piping in connection with fixtures shall be chromium plated. Where pipes pass through walls, provide chromium plated escutcheons and firmly secure in place.

C. Provide stop valves on inlet supplies to all fixtures.

D. Fixtures, trim and methods of piping and installation shall conform to local plumbing code. Fixtures in a given line shall be the product of one manufacturer.

E. Where wall hangers are used for wall hung fixtures, install at least four (4) $^{3}/_{8}$" lag bolts and expansion shields. Where wall-hung fixtures are secured to masonry walls or partitions, they shall be fastened with through bolts provided with nuts and washers at back. Bolt heads and nuts shall be hexagon, and exposed bolts, nuts, washers and screws shall be chromium plated brass. Where secured to concrete or brickwork walls, they shall be fastened with brass bolts or machine screws in lead sleeve type expansion shields and shall extend at least three (3) inches into solid concrete brickwork.

F. Close coordination is required between plumber and tile Contractor in closet installation. Maintain $^{1}/_{16}$" clearance between finished wall and back of closet and follow manufacturer's details in installing couplings to insure tight seal at closet outlet.

G. Fixtures shall be cleaned, adjusted and left in first class working order before the project is turned over to the Owner.

H. The Contractor shall see that proper foundations are set to form a secure base for all fixtures to provide absolutely rigid settings. Steel backing plates shall be used to rigidly secure fixtures unless carriers are specified. Immediately after fixtures are set, they shall be covered with reinforced heavy Kraft paper. This protection shall not be removed until completion of the work.

I. In addition, furnish and install such guards and boxing as may be required to protect fixtures against damage by normal operations of other trades.

J. Fixtures shall be protected at all times and if the protection is removed by others, the Contractor shall have the protection replaced before any damage is done.

K. Grout base of floor fixtures and behind all wall-hung plumbing fixtures with white, non-shrinking, silicon caulking eliminating all voids and cracks. Provide sufficient plane bearing surface for mounting.

L. Contractor shall caulk the joint between the finished wall surface and all plumbing fixtures. Verify colors with the Architect. Caulking material shall comply with the appropriate section of these Specifications.

M. Setting heights of all fixtures shall be coordinated with the Architect.

N. The Contractor shall obtain from the Builder exact information relative to finish grade of the top of the floor drains. All floor drains shall be set flush with finished floors.

O. Cleanouts shall be provided where indicated on drawings and where required by code.

P. Where test tees are installed at the base of the stack or on the stack, they may be used as a cleanout.

Q. Provide the building with three (3) wrenches for removing flush cleanout plugs, if applicable.

R. Each fixture shall be provided with a shut-off valve for each supply line. All exposed lines shall be chromium-plated.

END OF SECTION

SECTION 23 01 00 GENERAL MECHANICAL REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Division 23 includes Division 23 01 00 of the Specifications and Mechanical Drawings (HVAC). Elements of the Scope of Work include, but are not limited to, labor, materials, equipment, supplies, storage, transportation and all required permits, fees and licenses. Division 23 does not stand alone, but is part of the complete project and its Documents. Requirements of the General Conditions and Division 1 apply to all work in the Division.

B. Provide the necessary interface with other Divisions to provide a complete project. Carefully check the Documents of this Division with those Documents of other Divisions. Determine the requirements of any interfacing materials or equipment being furnished and/or installed by those Sections and Divisions, and provide proper installation and required interface.

C. No deviation from the Contract Documents shall be made without the written consent of the Architect and Engineer.

D. All Specifications and Drawings are to be considered together as the Contract Documents. Any work shown in one and not the other, or is implied by either, shall be provided to make a complete project. Should conflicts exist between the Specifications and Drawings or there is an item shown or noted for which is not clearly defined, immediately submit a request for clarification. Under no circumstance will conflicts between the Specifications and Drawings be grounds for additional cost to the Contract after the Contract is established.

E. The Drawings are schematic and are not intended to show the exact location of duct, piping, equipment, etc.

F. Dimensions and information regarding accurate locations of equipment, and structural limitations and finish shall be coordinated and verified with other Divisions of Work. Be prepared to furnish dimensions and information regarding the Work of this Division to other trades.

G. The right is reserved to relocate any device (receptacle, switch, fire alarm, audio/visual, junction box, outlet, thermostat, diffuser, etc.) a maximum of 10’-0” before it is permanently installed without incurring additional cost to the Contract.

1.2 REFERENCE STANDARDS

A. All work shall comply with the most recently revised versions of all local, state and federal codes, ordinances of the authority having jurisdiction, laws, rules and regulations. Any modifications required by any of the above shall be made without any additional cost to the Owner. Where requirements between governing Codes and Regulations vary, the more restrictive provision shall apply.

B. Nothing contained in the Contract Documents shall be construed as authority or permission to disregard legal requirements and regulations. The Contractor shall thoroughly review the Documents and bring any such conflicts to the attention of the Architect and Engineer prior to Installation.

C. All materials, installation, and workmanship shall comply standards and/or codes of the following:
   1. International Building Code – 2021 edition
   2. International Mechanical Code - 2021 edition
   3. International Plumbing Code - 2021 edition
   4. International Fuel Gas Code - 2021 edition
   5. International Fire Code - 2021 edition
   6. International Commercial Energy Code - 2015 edition
   7. National Electrical Code – 2020 edition
   8. National Fire Protection Association
   9. ANSI - American National Standards Institute – latest edition
   10. ASTM - American Society of Testing and Materials
   11. NEMA - National Electrical Manufacturer's Association
   12. OSHA - Occupational Safety and Health Act
   13. UL - Underwriter's Laboratories
   14. ASHRAE - American Society of Heating and Air Conditioning Engineers
   15. SMACNA - Sheet Metal and Air Conditioning Contractors' Nat'l Assoc.

D. All materials shall be new and shall bear the label of UL if applicable.

1.3 DEFINITIONS

A. Provide: to furnish, install and connect.

B. Furnish: to supply all materials, labor, equipment, testing apparatus, controls, tests, accessories and all other items customarily required for the proper and complete application.

C. Install: to join, unite, fasten, link, attach, set-up or connect together, complete, tested, and ready for normal satisfactory operation.

D. Engineer: the Engineer-of-record.

E. Contract Documents: the complete set of Specifications and Drawings of all Divisions.

F. Work: labor, materials, equipment, accessories, controls and other items required for a complete installation.

G. Concealed: embedded in masonry or other construction, installed in furred spaces, within double partitions or hung ceilings, in trenches, in crawl spaces or in enclosures.

H. Exposed: not installed underground or concealed.

I. Equal: equal in quality, workmanship, materials, weight, size, design and efficiency of the specified product, conforming with listed manufacturers.

J. Supply: to purchase, procure, acquire and deliver complete with related accessories.

K. Authority Having Jurisdiction (AHJ): applicable local, state and federal authorities having jurisdiction over any part of the Scope within this Division <u>and</u> other Divisions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturer's names and catalog numbers specified in the Contract Documents are intended to describe the material and set the standard of quality. All bids shall be based on manufacturers or products specified. Request for approval of manufacturers or products not specified shall be considered if the request is in written form and submitted to the Architect no later than seven (7) days prior to the bid date. All requests shall conform to the provisions of the general and supplementary conditions.

B. When specific names are not stated, only the best available quality of material or equipment shall be submitted for review and used in the installation.

2.2 SHOP DRAWINGS AND PRODUCT DATA

A. Shop drawings and/or product data shall be submitted for the following for review:

1. HVAC duct system layouts, including supply air, return air, exhaust air, and outside air. HVAC piping system layouts. These drawings must include associated equipment, drawn to scale based on submittals for that equipment, must be dimensioned, and must include duct, piping and equipment elevation tags (distance above finished floor to bottom). The Contractor shall develop their own shop drawings, independent of the Engineer's CAD files (as previously stated, the Engineer's drawings are schematic/diagrammatic in nature). Architectural cad files for use as drawing backgrounds shall be secured by the contractor from the architect. Contractor shall coordinate any required cad release forms and payments for cad files with the architect.

2. Equipment, including but not limited to: rooftop units, split systems, fans, heaters, terminal units, air distribution devices (diffusers, etc), ductwork accessories, louvers, roof hoods, insulation, piping specialties, HVAC piping materials, etc.

B. The Contractor shall obtain complete shop drawings, product data and samples from the manufacturers, suppliers, vendors, and all Division 23 Subcontractors, for all materials, products and equipment as specified herein in various Sections of the Specifications, and shall submit data and details of such materials, products and equipment for review by the Architect and Engineer. Prior to submission of the shop drawings, product data and samples to the Architect and Engineer, the Contractor shall thoroughly review the shop drawings, product data and samples and certify they are in compliance with the Contract Drawings. Further, the Contractor shall check all materials, products, and equipment upon their arrival on the Project site and verify their condition and compliance with the Contract Documents. Any Work which proceeds prior to receiving reviewed shop drawings shall be modified as required to comply with the Contract Documents and the shop drawings. A minimum period of fourteen (14) working days, exclusive of transmittal time, will be required in the Design Team's offices each time a shop drawing, product data and/or sample is resubmitted for review. This time period shall be considered by the Contractor when scheduling his Work. The initial shop drawing review for equipment and materials may be expedited through the mutual consent of the Contractor, Architect, Engineer, and Owner providing the Contractor agrees to submit complete, certified, documented, and coordinated shop drawings for review in accordance with the requirements of the Contract Documents.

C. The review of shop drawings, product data, and samples by the Architect and Engineer shall not relieve the Contractor of the responsibility for dimensions or errors that may be contained therein, or for deviations from requirements in the Contract Documents. It shall

be clearly understood that the noting of some errors by the Engineer but overlooking others does not grant the Contractor permission to proceed in error.

D. All shop drawings and product data/submittals shall be submitted in compliance with the requirements of the general and supplementary conditions. Shop drawings and product data submittals shall be submitted via electronic format (e.g. PDF). The responsibility of copying review comments on any additional copies or rescanning returned hard copy prints will rest solely with the Contractor.

E. All product data/submittals shall bear the name of the manufacturer to be used.

F. All shop drawings and submittals shall include a stamped indication signifying that the submittal has been reviewed for compliance with the Contract Documents by the Contractor. This stamped indication also represents the fact that the Contractor has checked this submittal for its interaction with all other Divisions and certifies by his signature or initials that all coordination has taken place. The stamp shall include the date, name of the Contracting Firm, the signature of the Contractor, certification of compliance and approval. This stamp shall be on the submittal before the Design Team will review it.

G. The design team will review an individual submittal not more than twice. If the submittal is rejected again on the second review, the Contractor will bare all responsibility for paying for the Design Team's time for additional reviews.

H. Shop drawings and/or product data shall be submitted for the following for review:
   1. HVAC duct system layouts, including supply air, return air, exhaust air, and outside air. HVAC piping system layouts. These drawings must include associated equipment, drawn to scale based on submittals for that equipment, must be dimensioned, and must include duct, piping and equipment elevation tags (distance above finished floor to bottom).
   2. The Contractor shall develop their own shop drawings, independent of the Engineer's CAD files (as previously stated, the Engineer's drawings are schematic/diagrammatic in nature). Architectural cad files for use as drawing backgrounds shall be secured by the contractor from the architect. Contractor shall coordinate any required cad release forms and payments for cad files with the architect.
   3. Equipment, including but not limited to: split systems, fans, heaters, coils, air distribution devices (diffusers, etc), ductwork accessories, louvers, roof hoods, insulation, piping specialties, HVAC piping materials, etc.

2.3 AS-BUILT DRAWINGS

A. The Contractor shall maintain on a daily basis at the Project site a complete set of "Record Drawings". The "Record Drawings" shall consist of a set of black-line or blue-line prints or AutoCAD files of the Contractor Coordination Drawings for this Division. The prints shall be marked or the AutoCAD file electronically updated to show the precise location of all work and equipment, and all changes and deviations in the work from that shown on the Contract Documents. This requirement shall not be construed as authorization for the Contractor to make changes in the layout or work without definite instructions from the Architect or Engineer. The continuously updated coordination drawings (shop drawings previously described) shall be used to produce the final "Record Drawings" which shall be delivered to the Owner in AutoCAD electronic format (CD) upon Project completion.

B. Record dimensions shall clearly and accurately delineate the work as installed; locations shall be suitably identified by at least two dimensions to permanent structures.

C. All underground and concealed utilities shall be located by dimension to known building elements and invert to project datum at exterior wall of the building.

D. The Contractor and Subcontractor shall mark all “Record Drawings” on the drawings with a rubber stamp impression or an AutoCAD image that states such.

PART 3 - EXECUTION

3.1 INSTALLATION

A. The equipment selections used in the preparation of the Contract Documents will fit into the physical spaces provided and indicated, allowing ample room for access, servicing, removal and replacement of parts, etc. Adequate space shall be allowed for clearance in accordance with the Code requirements and the requirements of the local Authorities having jurisdiction, and the equipment manufacturers’ recommendations.

B. In the preparation of Drawings, a reasonable effort to accommodate acceptable equipment manufacturer’s space requirements has been made. However, since space requirements and equipment arrangement vary according to each manufacturer, the responsibility for initial access, maintenance access, code required access, and proper fit rests with the Contractor.

C. Physical dimensions and arrangements of equipment to be installed shall be subject to the Architect’s and Engineer’s review.

D. The General Contractor and all Subcontractors shall coordinate the installation of ductwork, conduit, busway, piping, cable trays, etc., installation with lighting fixtures, special ceiling construction, air distribution equipment, and the structure.

E. No ductwork, piping, equipment, etc., shall be installed in the eight (8) inch high zone directly above the ceiling in tenant areas to allow for tenant build-out and flexibility unless otherwise specifically shown on the Drawings or prior written authorization is received from the Engineer.

F. Accessibility and Clearance:
   1. Mechanical equipment, ductwork, piping, etc. shall be installed in accessible locations, avoiding obstructions, preserving headroom, and keeping openings and passageways clear.
   2. Minor adjustments in the locations of equipment shall be made where necessary, providing such adjustments do not adversely affect functioning of the equipment.

G. Scaffolds and staging for installation of mechanical work shall be provided under the work of this Division.

3.2 STRUCTURAL FITTINGS

A. Furnish and install the necessary sleeves, inserts, hangers, anchor bolts, and related structural items. Install at the proper time.

B. Openings may have been indicated on the Architectural and Structural drawings. Should any additional openings or holes be required, the same shall be provided at no

additional cost to the Owner. No structural members are to be cut, notched, or drilled for piping.

C. Location: At a time in advance of the work, verify openings shown on the Architectural and Structural drawings, and coordinate any additional openings.

D. If the work of this Section requires modification of the Architectural or Structural drawings, furnish new instructions as to requirements for these openings. Submit for review and coordination to Architect.

E. Sleeves shall be supplied for mechanical piping passing through walls or slabs and shall be placed before concrete is poured.

F. Equipment supports for mechanical work shall be fastened to the structure by inserts, anchor bolts, bolting to drilled and tapped structural members, or be welded to the structure.
   1. Welding shall be done by the electric arc method with fully competent and certified welders. Supporting members shall be shop coated with a suitable primer.
   2. Surfaces damaged by installation of supports shall be touched up with primer to match shop coat. Any drilling of structural members shall be approved by the Architect.

G. Flashing:
   1. Wherever ductwork and/or piping pass through the roof or outer walls, base flashing and counter-flashing shall be provided.
   2. Such flashing shall be properly installed by skilled workmen, and shall include grouting, mastic or tar application, or other means to insure a permanent, waterproof, neat and workmanlike installation.
   3. Insofar as possible, flashing shall comply with and be similar to requirements for flashing in General Construction Work.

H. Anchor bolts and inserts shall be galvanized and of adequate size and strength for installation of electrical work and shall be placed in forms before concrete is poured.
   1. Placement of bolts in bases shall be done under other Division. Furnish detail drawings, templates, and anchor bolts for bases to the General Contractor in time to avoid delaying work schedules.
   2. Expansion shields shall only be used with specific approval of the Architect. Wooden or soft metal plugs shall not be used.

I. Cutting and patching:
   1. All additional cutting, patching and reinforcement of construction of building, subject to review by the Architect, shall be performed under this Section.
   2. Refer to appropriate Division for requirements.

3.3 WEATHERPROOF EQUIPMENT

A. Mechanical devices or equipment located in damp, semi-exposed areas shall be weather-resistant. Enclosures shall comply with NEMA Type 3R requirements.

B. Air distribution devices located in damp areas outside shall be weather-resistant (aluminum, etc.).

3.4 CLEANING

A. Brush and clean work prior to concealing, painting and acceptance. Perform in stages if directed.

B. Painted exposed work soiled or damaged: Clean and repair to match adjoining work before final acceptance.

C. Remove dust and debris from inside and outside of material and equipment.

3.5 TESTS AND DEMONSTRATIONS

A. All systems shall be tested in the presence of the Owner or an Owner designated representative upon completion of the Work and demonstrates that the installation is in accordance with the Contract Documents.

B. All motors shall be checked and adjusted for correct direction of rotation.

C. Any work found not to be in compliance with the Contract documents shall be repaired or replaced without incurring additional cost to the Contract price.

D. Provide all instruction to the Owner on maintenance and operation of all systems and equipment provided under this Division.

3.6 WARRANTIES

A. The warranty period for all systems, equipment, components, work, etc. shall be no less than one (1) year, unless specified otherwise hereinafter and shall include at least one (1) full heating season and one (1) full cooling season. The warranty shall include parts and labor.

B. The Contractor shall, without cost to the Owner, remedy any defects within a reasonable time to be specified in notice from the Architect. In default thereof, the Owner may have such work done and charge all costs to the Contractor.

C. The start of the Contractor's warranty period, as defined in the General Conditions, shall commence on the issue of a "Certificate of Substantial Completion", by the Owner or the Owner's Representative for each item of material, equipment or system.

D. The Subcontractor shall confer with the General Contractor prior to the bid date concerning the project schedule and determine if there is a need to operate any items of equipment or systems for temporary heating and/or cooling or other reasons prior to "Substantial Completion". All required extended warranty costs for equipment, materials, and systems shall be included in the Subcontractor's bid.

E. All compressors shall have a five (5)-year parts warranty.

END OF SECTION

SECTION 23 05 29 HANGERS AND SUPPORTS FOR HVAC PIPING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. The Conditions of the Contract and applicable requirements of Division 1, “General Requirements”, and Section 23 01 00 “General Mechanical Requirements”, govern this Section.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide pipe hangers, supports, and required appurtenances as specified and indicated

1.3 QUALITY ASSURANCE

A. MSS Standard Compliance: Provide pipe hangers and supports of materials, design, and manufacture which comply with ANSI/MSS SP-58, SP-59, SP-89, and SP-90.

B. Acceptable Manufacturers: The model numbers listed in the Specification establish a level of quality and material. Subject to compliance with requirements, provide products and materials by the following:
1. ITT Grinnell Corporation,
2. Fee and Mason,
3. Central Iron Manufacturing Company, and
4. F& S Manufacturing Company

PART 2 – PRODUCTS

2.1 PIPE HANGERS AND SUPPORTS:

A. General: Provide pipe hangers and supports as specified. Comply with local codes and standards for pipe and equipment support and anchorage. Pipe supports shall be of material that will prevent electrolytic action.

B. Inserts: Provide Grinnell No. 282 inserts for concrete construction.

C. Piping in Multiple Parallel Runs: Provide Grinnell No. 45 or No. 50 with Grinnell No. 137 U-bolt pipe clamps or structural channels or angles with U-bolt clamps, supported as trapeze hangers where multiple parallel runs of piping are shown. Select and size members for weights to be carried and span dimensions between supports.

D. Piping in Single Runs: Provide Fee and Mason Fig. 239 or Grinnell No. 260 clevis hanger.

E. Hanger Rod: Provide hanger rods of required length. Rod diameters shall be as listed in the following table. Rod diameters may be adjusted after consultation with the Structural Engineer concerning the building framing system, the method of attachment to the structure and the support rod spacing.

Pipe Sizes	Rod Diameter
3/4” - 2”	3/8”

2-1/2” – 3	1/2”
4” – 5	5/8”
6”	3/4”
8” – 12”	7/8”
14” – 18”	1”

F. Riser Clamps: Provide Fee and Mason Figure 241 riser clamps. Riser clamps for copper tube shall be copper-plated.

G. Saddles and Shields:
1. Saddles for Horizontal Insulated Piping Without Vapor Barrier: At each hanger or support on horizontal runs, provide Grinnell No. 160 or Fee and Mason Figure 171, 1710, 1712, or 172 saddles, as applicable. Shields as described below may be used instead of the saddles. On heating water systems below 140ºF (60ºC), hangers may be sized for the pipe size and of a material compatible with the pipe. Where dissimilar materials are used, provide dielectric separation. Carry insulation over the hanger and seal where hanger is sized for pipe.
2. Shields for Horizontal Insulated Water Piping with Vapor Barrier: At each hanger or support for water piping, provide a half section of preformed 6 PCF density fiberglass or rigid calcium silicate, with jacket of adjacent insulation brought across unbroken, supported on semicircular 16 gauge shields. Shields for pipe 4” and smaller shall be 12” long; shields for pipe 5” to 8” shall be 18” long; and shields for larger pipe shall be 24” long.

PART 3 – EXECUTION

3.1 INSTALLATION:

A. Independent Support: Support fire sprinkler and standpipe piping independently of other piping in accordance with NFPA-approved methods and local codes and standards.

B. Provisions for Movement:
1. Movement: Install hangers and supports to allow controlled movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate the action of expansion joints, expansion loops, expansion bends, and similar units.
2. Load Distribution: Install hangers and supports so piping live and dead loading stresses from movement will not be transmitted to any pipe or connected equipment. Pipe supports shall properly transmit the weight of the pipe and its contents to the building structure, or to independent posts, piers, or foundations.
3. Pipe Slopes: Install hangers and supports to provide the indicated pipe slopes so maximum pipe deflections allowed by ANSI B31 are not exceeded.

C. Insulated Piping: Comply with the following installation requirements:
1. Clamps: Attach clamps, including spacers (if any), to piping with clamps projecting through the insulation; do not exceed pipe stresses allowed by ANSI B31.

D. Spacing: Install hangers and supports in piping systems to remove stress from equipment flanges and rotating equipment. Space hangers and supports as shown in the following table. Rod spacing may be adjusted after consultation with the Structural Engineer concerning the building framing system, the method of attachment to the structure and the support rod diameters.

Trade Pipe Size	Maximum Spacing
1/2"	5'
3/4"	6'
1" and 1-1/4"	7'
1-1/2"	9'
2"	10'
2-1/2"	11'
3"	12'
4"	14'
5"	16'
6"	17'
8"	19'
10"	22'
12"	23'
14"	25'
16"	27'
18"	28'

E. Saddles: Where insulation without vapor barrier is indicated, install protection saddles, or use hangers as indicated in Paragraph 2.0/H.1.

F. Guides: Install pipe guides complying with the manufacturer's published product literature. Where not otherwise indicated, install pipe guides near expansion loops, expansion joints, and ball joints.

G. Anchors: Install anchors at the proper locations to prevent stresses from exceeding those permitted by ANSI B31 and to prevent the transfer of loading and stresses to connected equipment. Anchors shall include vibration isolation in accordance with the pipe support system specified. Where the piping system is floating, the anchors shall be termed restraints or braces.
   1. Where expansion compensators are indicated, install anchors in accordance with the expansion unit manufacturers written instructions, to limit movement of piping and forces to the maximums recommended by the manufacturer of each unit.
   2. Where not otherwise indicated, install anchors at the ends of principal pipe runs and at intermediate points in pipe runs between expansion loops and bends. Make provisions for preset of anchors as required accommodating both expansion and contraction of piping.

H. Leveling: Adjust hangers and supports and place grout as required under supports to bring piping to proper levels and elevations.

I. Hangers: Refer to Section 23 05 48, "Vibration Isolation", for additional information and support requirements. Pipe hangers made of wood, wire, or sheet iron shall not be permitted.

J. Riser Supports: Vertical piping shall be secured at sufficiently close intervals to keep the pipe in alignment and carry the weight of the pipe and contents.
   1. Cast iron soil pipe shall be supported at the base and at each story level, but in no case at intervals greater than 10'.
   2. Steel pipe shall be supported at the base and at no less than every other story level, but in no case at intervals greater than 25'.
   3. Copper tube shall be supported at each story level, but in no case at intervals greater than 10'.

4. Plastic pipe shall be supported at mid-point between floors and at ceiling to prevent movement, but in no case at intervals greater than 8’.

END OF SECTION

SECTION 23 05 48 VIBRATION ISOLATION

PART 1 - GENERAL

1.1 SUMMARY

A. The General Provisions, Supplemental General Provisions, section 23 01 00, Division 1 Specifications and Special Provisions apply to all Work specified in this Section.

B. This section describes the basic materials and installation methods for the vibration isolation systems. Comply with other Division 23 sections and drawings as applicable. Refer to other divisions for coordination of work.

C. Furnish and install all components of the vibration isolation systems specified herein, as indicated on the drawings, and as required to provide complete and operating systems.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide vibration isolation work as specified and indicated, including the following:
   1. Support isolation for motor-driven mechanical equipment
   2. Inertia base frames in conjunction with equipment isolation
   3. Support isolation of air-handling housings
   4. Isolation including support isolation for piping risers
   5. Support isolation of piping
   6. Flexible ductwork connections

1.3 QUALITY ASSURANCE

A. General: Except as otherwise indicated, obtain support isolation units from a single manufacturer.

B. Supervision: Manufacturer shall provide technical supervision of the installation of support isolation units produced by him and of associated inertia bases.

C. Manufacturers: Provide vibration isolation support units manufactured by one of the following: Amber-Booth, Vibrations Mounting and Controls, Inc., Korfund Dynamics Corporation, Consolidated Kinetics Corporation.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Suspended Fans: Isolate with not less than four combination spring and rubber-in-shear vibration isolators.

B. Flexible Ductwork Connections to Equipment: Install flexible connections between sheet metal ductwork and equipment or fan collar. Locate as close to fan as possible. Isolate the duct system from the equipment by at least 1”.

PART 3 - EXECUTION

3.1 ISOLATOR PERFORMANCE

A. General: Comply with the minimum static deflections recommended by the American Society of Heating, Refrigerating and Air Conditioning Engineers, including the definitions of critical and non-critical locations, for the selection and application of vibration isolation materials and units as indicated.

B. Manufacturer's Recommendations: Except as otherwise indicated, comply with manufacturer's instructions for selection and application of vibration isolation materials and units.

3.2 RELATED WORK EXAMINATION

A. Examination and Reporting: Installer of vibration isolation work shall observe the installation of other work related to and connected to vibration isolation work. After completion of other related work (but before equipment start-up), installer shall furnish a written report to the Contractor, with a copy to the Engineer, listing observed inadequacies for proper operation and performance of vibration isolation work.

B. Correction and Start-up: Do not start-up equipment until inadequacies have been corrected in a manner acceptable to the vibration isolation Installer.

3.3 EQUAL LOADING

A. General: Equipment installed on vibration isolating mountings shall be level after load is applied. Further vibration isolating mountings shall be selected and installed to compensate for unequal loading. Spring isolators with coils touching during equipment start-up or operation will not be acceptable.

END OF SECTION

SECTION 23 05 53 HVAC EQUIPMENT AND PIPING IDENTIFICATION

PART 1 - GENERAL

1.1 SUMMARY

A. The General Provisions, Supplemental General Provisions, section 23 01 00, Division 1 Specifications and Special Provisions apply to all Work specified in this Section.

B. This section describes the basic materials and installation methods for the identification of equipment and piping. Comply with other Division 23 sections and drawings as applicable. Refer to other divisions for coordination of work.

C. Furnish and install all components of the identification of equipment and piping specified herein and/or as indicated on the drawings.

1.2 DESCRIPTION OF WORK

A. Work Included: Identification of mechanical equipment shall consist of equipment labeling, pipe marking, and valve tagging as specified hereinafter.
   1. In general, all equipment shall be labeled. This shall include all central plant, air handling or air conditioning equipment, and other similar and miscellaneous equipment.
   2. Pipe markings shall be applied to all piping.
   3. Each valve shall be identified with a stamped tag. Valves and tagging shall be scheduled typewritten on 8 ½" x 11" paper, tabulating valve number, piping system, system abbreviation, location of valve (Room or area), and service (e.g. – Domestic Hot Water). The valve schedule shall be submitted to the Engineer for approval prior to ordering or installing valve tags. See Section 23 01 00, "General Mechanical Requirements" for information and requirements regarding Operation and Maintenance Manuals.
   4. Labels, tags, and markers shall comply with ANSI A13.1 and other applicable state and local standards for lettering size, colors, and length of color field.
   5. Equipment and device identification specified in other sections shall be provided as a part of those requirements.

1.3 ACCEPTABLE MANUFACTURERS

A. Labels, markings, and tags shall be manufactured by W.H. Brady, Seton, Allen, or Industrial Safety Supply.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELING

A. Equipment labeling shall be of the following, unless noted or specified otherwise:
   1. Permanently attached engraved brass or plastic laminated signs with 1" high lettering. Signs on exterior equipment shall be brass.

2.2 PIPE MARKINGS

A. On piping less than 6” diameter, install plastic semi-rigid snap-on type, manufacturer’s standard pre-printed color-coded pipe markers extending fully around the pipe and insulation or pressure-sensitive vinyl pipe markers similar to the above. Pipe markings can also be applied with the stick type backing in lieu of the semi-rigid snap-on-type.

B. On piping and insulation 6” and greater diameter, full band as specified above or strip-type markers fastened to the pipe or insulation with laminated or bonded application or by color-coded plastic tape not less than 1 ½” wide, full circle at both ends of the marker. Pipe markings can also be applied with the stick type backing in lieu of the semi-rigid snap-on-type.

C. Arrows for direction of flow provided integral with the pipe marker or separate at each marker.

2.3 VALVE TAGS

A. Valve tags shall be polished brass or plastic laminate with solid brass S hook and chain. Tags shall be stamped or engraved with the appropriate abbreviation for the type of service (e.g. – CW, HW), as well as the designated valve number.

PART 3 - EXECUTION

3.1 GENERAL

A. Identification labeling, marking, and tagging shall be applied after insulation and painting has been completed.

B. Coordinate names, abbreviations, and other designations used in mechanical identification work with corresponding designations shown, specified, or scheduled on drawings. Prior to ordering any labels, markings, or tags, obtain the approval of the Engineer regarding names, abbreviations, etc.

C. The Plumbing, HVAC, and Fire Protection Contractors shall coordinate labeling, marking, and tagging to ensure consistent and coordinated identification. In existing buildings, utilize similar names, abbreviations, and other designations that are currently in use to remain consistent with existing identification.

D. Equipment labeling shall consist of unit designation as shown on the drawings. Exhaust fan labeling shall also indicate service or the room or area of service.

E. Pipe and ductwork markers shall be placed on piping and ductwork on 25’ centers in mechanical rooms and concealed spaces. In locations where piping and ductwork is exposed, place markers on 50’ centers. Flow directional arrows should be marked on the piping at taps from the main and riser.

F. Valve tags shall be placed on each valve except those intended for isolation of individual heat pumps or terminal units (e.g. - unit heaters, etc.). Valve tag schedules shall be prepared as specified hereinbefore. Copies of one schedule shall be laminated in clear plastic and placed where directed by the Design Professional. Other sets shall be

included in the Operating and Maintenance Manuals.

END OF SECTION

SECTION 23 05 93 BALANCING AND ADJUSTING

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. All work specified herein shall be accomplished in accordance with the applicable requirements of Section 23 01 00 - General Requirements for Heating, Ventilating and Air Conditioning.

B. The work shall consist of furnishing all materials, instruments, labor, and appurtenances to balance and adjust all of the several air and water systems furnished and installed under Division 23 of the specifications. The work consists of setting speed and volume (flow) adjusting facilities provided for systems, recording data, conducting tests, preparing and submitting reports, and recommending modifications to work as required by contract documents. All work shall be in accordance with AABC National Standards for Total System Balance, latest edition, as published by Associated Air Balance Council.

C. Work shall be performed by a firm that specializes in and whose business is limited to testing and balancing of heating, ventilating, and air conditioning systems and is certified by either Associated Air Balance Council (AABC) or National Environmental Balancing Bureau (NEBB) and who is not in any other way associated with work on this project.

D. Prior to commencing work, the Contractor shall submit to the engineer a "National Project Certification Performance Guaranty".

E. Upon award of this section, the Contractor is to be issued two sets of plans and specifications by the Project Manager. The Contractor is required to check the plans and specifications for deficiencies in dampers, valves, etc., and to notify the Architect/Engineer in writing within ten days. The Engineer will then determine if corrections to such deficiencies are required and will arrange to show any he deems necessary by issue of revisions.

F. This Contractor shall monitor the job as it progresses to be certain the installation can be balanced without excessive noise or vibration.

G. The Project Manager shall issue to the Contractor a complete set of approved shop drawings before work begins.

1.2 JOB CONDITIONS

A. Except as otherwise specified, do not proceed with testing, adjusting and balancing of systems until:

1. All work is complete and all systems operating.

2. All cleaning, flushing, lubrication and startup specified in other Sections has been completed.

1.3 SUBMITTAL

A. After completion of the testing, balancing, and adjusting of all systems, the Contractor shall submit for approval of a report showing the final balanced conditions of each system. Report shall be one (1) electronic copy (PDF format) on forms approved by either AABC or

NEBB and shall be signed by a certified Test and Balance Engineer employed by the Contractor. Report shall include the following:

1. Title page with job name, contractor's and sub-contractors' names, addresses, and telephone numbers, and index sheet.

2. Include identification and types of instruments used and their most recent calibration dates, and methods of testing and balancing each system and piece of equipment.

3. Include AABC or NEBB test forms containing installation data, design data, equipment data, and operating data for all systems and equipment.

4. Include copies of readings, with piping layouts and duct layouts showing where readings were taken.

B. Where actual measurements recorded for the final balance show deviations of more than 10% from the design, the Contractor shall note same in the report and submit recommendations for corrective action.

C. In those cases where recorded data can be reasonably misinterpreted, inaccurate, inconsistent and/or erroneous, the Architect/Engineer may request additional testing and balancing at no additional cost.

D. Where, in the opinion of this Contractor, there is excessive vibration, movement or noise from any piece of equipment, ductwork, pipes, etc. The Contractor shall note same and submit recommendations for corrective action.

PART 2 - PRODUCTS

2.1 PATCHING MATERIALS

Except as otherwise indicated, use same products as used by original Contractor for patching holes in insulation, ductwork, and housings which have been cut or drilled for test purposes, including access for test instruments, attaching jigs, and similar purposes.

PART 3 - EXECUTION

3.1 GENERAL

A. Examine installed work and conditions under which testing is to be done to ensure that work has been completed, cleaned and is operable. Do not proceed with testing, adjusting, and balancing work until unsatisfactory conditions have been corrected.

B. Patch holes in insulation, ductwork, and housing, which have been cut or drilled for test purposes, in manner recommended by original Contractor.

3.2 AIR SYSTEMS

A. Systems shall be adjusted and balanced so that air quantities and temperatures at outlets are as scheduled, and so that distribution from supply outlets is free from drafts and uniform over the face of each outlet.

B. Adjustments shall be in such a manner that splitter and volume adjusters close to air

outlets will have the least pressure drop consistent with volume requirements. Primary balancing shall be obtained by adjustment of the dampers at branch duct take-offs. Adjustable fan drives shall be used for making final adjustments of total air quantities. Additional dampers or other air volume adjusters required to accomplish the balancing and adjusting shall be furnished and installed by the installing Contractor.

C. Settings of dampers, splitters, and other volume adjusting devices shall be permanently marked, after completion of balancing and adjusting, so that they can be restored if disturbed at any time. Also, the addition and setting of baffles shall be included where required to get a good air distribution by the installing contractor at the direction of this Contractor.

D. If it is determined that drive changes are required, the purchaser of the equipment must obtain and install all necessary new components. Direct reading velocity meters may be used for comparative adjustment of individual outlets, but air quantities in ducts having velocities of 1000 feet per minute or greater shall be measured by means of pitot tubes and inclined gauge manometers.

E. Adjustment of the temperature controls shall be coordinated by this Contractor and shall be performed coincidental therewith. In conjunction with the Automatic Control Company's Engineer or Electrical Contractor, simulate a complete cycle of operation for each system.

F. The above balancing and adjusting shall be performed for the first season of the year, cooling season or heating season, which occurs at the completion of the building. Additional balancing and adjusting which may be required for the season of the year next following shall be performed as part of the work under this specification.

END OF SECTION

SECTION 23 07 00 HVAC INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. The General Provisions, Supplemental General Provisions, section 23 01 00, Division 1 Specifications and Special Provisions apply to all Work specified in this Section.

B. This section describes the basic materials and installation methods for the insulation of HVAC and Plumbing piping, duct, and equipment. Comply with other Division 23 sections and drawings as applicable. Refer to other divisions for coordination of work.

C. Furnish and install all components of the insulation system specified herein, as indicated on the drawings, and as required to provide complete and operating systems.

1.2 QUALITY ASSURANCE

A. Manufacturer: Approved manufacturers are Armstrong, Calsite, Cell-U-Foarm Corp, Ceelco, Certainteed Corp, Dow Chemical Company, Forrest Mfg Co, Foster / Chilers, Gemco, Johns Manville, Knauf Fiberglass, Midwest Fastners, Owens Corning Fiberglass, Pittsburg Corning Fiberglass, Rubatex, Trymer, and Venture Tape.

B. All insulation, jacket and adhesive shall have a fire and smoke hazard ratings as tested under ASTM E 84, NFPA 255, and UL 723 not exceeding:

Flame Spread:	25
Fuel Contributed:	50
Smoke Developed:	50

Exceptions: Type B Insulation and PVC Fitting Covers

1.3 SUBMITTALS

A. Per Section 23 01 00.

B. Product Data
1. Type A Insulation
2. Type B Insulation
3. Type C Insulation
4. Type D Insulation
5. Type E Insulation
6. Type F Insulation
7. Type G Insulation
8. Vinyl Lacquer Paint for Type B Insulation

1.4 DEFINITIONS

A. The word “plenum” shall mean a ceiling space or mechanical room used for the transfer of conditioned return and/or outside air.

PART 2 - PRODUCTS

2.1 PIPING INSULATION

A. Type A – Fiberglass (indoor)
1. One Piece glass fiber, rigid molded sectional pipe covering with factory applied aluminum foil and white craft paper flame retardant vapor barrier jacket, conforming to ASTM C547, Class II, Mineral Fiber Preformed Pipe Insulation.
2. Thermal Conductivity (k) equals approximately 0.23 (BTU/HR., SF., Degree F, IN) at 75 °F.
3. Similar to Johns Manville Corp “Micro Lox 650 AP T”, or approved equal.

B. Type B - Closed Cell (indoor)
1. Closed cell, flexible foamed plastic conforming to ASTM C534, "Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form." Insulation shall be suitable for a temperature range from –40 degrees F to 220 degrees F.
2. Conductivity (k) equals approximately 0.27 (BTUHR., SF., Degree F, IN) at 75 °F.
3. Similar to Armstrong “Armaflex”, or approved equal.

C. Type C – Polyioscyanurate (outdoor)
1. Prefabricated 2 lb./cu.ft. density polyisocyanurate insulation with waterproof mastic and glass fiber jacket finished with an aluminum jacket with waterproof silicone caulk joints.
2. Conductivity (k) equals approximately 0.14 (BTUHR., SF., degrees F, IN) at 75 °F.
3. Insulation shall be applied per manufacturer’s recommendations. Joint sealants and coatings shall be as approved by the insulation manufacturer for the intended application and service temperature range.
4. Jacketing shall be an all-service jacket with 1 mm aluminum foil on pipe insulation and FSK jacket on board stock applied by the manufacturer to ASTMC-1136. Jacket shall have integral flap for sealing joint.
5. Similar to Trymer 9501, or approved equal.

2.2 EQUIPMENT INSULATION

A. Type Dh - Fiberglass Board (Hot Equipment)
1. Semi-rigid intermediate service fibrous glass board for operating temperatures greater than 850 degrees F.
2. Conductivity (k) equals approximately 0.23 (BTU/HR., SF., degrees F, IN) at 75 °F. Minimum density of 2.75 lb / cu ft.
3. Similar to Johns Manville Corp “1000 series Spin Glass”, or approved equal.

B. Type Dc - Foamed Plastic (Cold Equipment)
1. Foamed plastic sheet suitable for operating temperatures between –40 degrees F and 22- degrees F.
2. Conductivity (k) equals approximately 0.27 (BTU/HR., SF., Degree F, IN) at 75 °F.
3. Similar to Armstrong “Armaflex”, or approved equal.

C. Type E
1. Calcium silicate block conforming to ASTM C 553, Type I (1200 degrees F. max), asbestos free.
2. Conductivity (k) equals approximately 0.42 (BTU IN/HR., SF., degree F) per inch thickness at 200 °F.
3. Similar to Calsilite, or approved equal.

2.2 DUCTWORK INSULATION

A. Type F – Duct Wrap
1. Duct insulation shall be 2" thick, minimum 3/4 lb. density fiberglass with an FSKL aluminum foil jacket, reinforced with fiberglass scrim.
2. Conductivity (k) equals approximately 0.24 (BTUHR., SF., degrees F, IN) at 75 °F.
3. Integral UL rated vapor barrier of:
   a. Aluminum foil reinforced with fiberglass scrim laminated to 30-lb. kraft paper.
   b. Class I white vinyl 0.004 inch thick, where specified.
4. Similar to Johns Manville Corp “Microlite”, or approved equal.

B. Type G - Duct Liner
1. ASTM C1071, Type II, Grade 2, R-6, 1" thickness, 1.5 lb. Density for low pressure ductwork and 3.0 lb density for medium pressure ductwork, bonded mat of glass fiber coated with black fire resistant and microbial resistant coating, complying with TIMS AHC 101. Moisture adsorption shall not be greater than 0.5% moisture by volume when exposed to moisture-laden air at 120°F and 96% RH, per ASTM C553. Insulation shall be Schuller “Permacote Linacoustic” R-300, "Aeroflex Ductliner" as manufactured by Owens Corning Fiberglass Corp. or "Ultralite with Certa Edge" by Certainteed Corp. or equal by Knauf Fiberglass.
2. Duct liner adhesive shall comply with ASTM C916 "Specifications for Adhesives for Duct Thermal Insulation".
3. Liner Fasteners: Mechanical or weld secured fasteners for duct liner where finish of duct is not exposed. For exposed ductwork, except in mechanical rooms, provide adhesively secured fasteners. Position fasteners are recommended by SMACNA.
4. Minimum Sound Absorption coefficients shall be:

	125	250	500	1000	2000	4000
Coefficient	0.34	0.42	0.47	0.64	0.80	0.79
Attenuation*	3	5	12	24	21	17

* Attenuation in dB per 10 lineal feet, per ASTM E477

2.3 INSULATION ACCESSORIES

A. The following accessories shall be used in the application of the thermal insulations specified under this Section:
1. PVC Fittings Covers: similar to Johns Manville Corp “Zeston”, or approved equal.
2. Pressure Sensitive polyester film tape to secure pipe insulation up to 12” outside diameter: Similar to 3M 30-80, or approved equal.
3. Vapor Seal Mastic: Similar to Childers CP-35, or approved equal.
4. Lagging Adhesive: Similar to Childers CP-52, or approved equal.
5. Wire: 16 gauge soft stainless steel.
6. Insulation Bonding Adhesive (To Metal): Similar to Childers CP-82, or approved equal.
7. Insulating and Finishing Cement: Similar to Insulco Smooth Kote, or approved equal.
8. Mechanical Fasteners - Welded or adhered pins with speed clip washers: Similar to Gemco Midwest Fasteners, or approved equal.
9. Bands for Equipment:
   a. Outside diameter of insulation is less than 24 inch: 1/2 inch x 0.020-inch (25 ga.) stainless steel.
   b. Where diameter is 36 inches or larger: 3/4 inch x 0.020 inch.
10. Bands for Piping: 1/2 inch x 0.020-inch stainless steel.
11. Wire Mesh: 1 inch by 20-gage stainless steel hexagonal wire netting.

PART 3 - EXECUTION

3.1 INSULATION APPLICABILITY

A. Condensate Drains – Type B insulation required:

Insulation Thickness (in)	Pipe Sizes (in)
½	all

B. Horizontal waste piping from electric water coolers – Type A insulation required:

Insulation Thickness (in)	Pipe Sizes (in)
1/2	all

C. Low Pressure Supply & Return Ducts – Type F insulation required (see Note G below):

Insulation Thickness (in)	Duct Sizes (in)
2	all

D. Outside Air Ducts – Type F insulation required (see Note G below):

Insulation Thickness (in)	Duct Sizes (in)
2	all

Notes:

a. Insulate necks, bells, and plenums of supply diffusers with Type F insulation. Diffusers located in return air plenums need not be insulated except when within 10 feet of the building exterior (wall, roof, etc.). Factory applied insulation to diffusers and plenums is acceptable.
b. Exhaust ductwork, unless otherwise noted.
c. Exposed supply and return ductwork (if any) will be double wall, internally lined.
d. All duct connected to equipment without compressors must be internally lined with Type G duct liner for a distance not less than 5 feet from the equipment connection.
e. All duct connected to equipment that contains compressors must be internally lined with Type G duct liner for a distance not less than 10 feet from the equipment connection.
f. Supply ductwork insulation may be omitted in return air plenums except duct within 10 feet of any portion of the building exterior (wall, roof, etc.).
g. The above thicknesses are the minimum required. All thicknesses shall comply with local codes and local energy codes.
h. All piping exposed to outdoors shall be insulated. All piping subject to freezing shall be provided with heat tracing. Coordinate insulation with heat trace cable and controls. Coordinate voltage and power requirements with electrical contractor.
i. Insulation types and thickness are a minimum standard. Each application shall be carefully considered and insulation product type and thickness shall be appropriate for each specific application. Submit all insulation products with verification of their service intent.

3.2 PIPING INSULATION GENERAL REQUIREMENTS

A. Preparation
1. Do not apply insulation until piping has been leak tested.
2. All surfaces to be insulated shall be dry and free of loose scale, rust, dirt, oil or water.

B. Application:
1. Insulation shall be installed in a smooth, clean workmanlike manner. Joints shall be tight and finished smooth without fish-mouths.
2. Insulation shall fit tightly against the surface to which it is applied to prevent air circulation between the insulation and the pipe or equipment to which it is applied.
3. Insulation applied to cold piping or equipment shall be completely vapor sealed, free of pinholes or other openings.
4. Do not use wet insulation materials.
5. All longitudinal joints on vertical pipe runs shall be staggered.
6. Apply insulation so as to permit expansion or contraction of pipelines without causing damage to insulation or surface finish.
7. Do not apply mastic or adhesive until all previous applications of mastic and adhesives have thoroughly dried.
8. No bands or staples shall be provided on covering.
9. The adhesive used in connection with all covering work shall contain an approved vermin and rodent proof ingredient.
10. Provide 24-gauge sheet-metal saddle between the pipe hanger/support and the exterior of the insulation. Saddle length shall be the same as insulation inserts.

C. Application at Fittings:
1. Insulation of flanges and flanged fittings shall overlap adjacent pipe covering at least 1 inch. Valves shall be insulated up to the gland only.
2. Pipeline strainers shall be insulated in such a manner as to permit removal of strainer basket without disturbing insulation of the strainer body.
3. Insulation adjacent to un-insulated flanges shall be tapered back and neatly finished so as to allow access to and removal of bolts without injury to covering.

3.3 TYPE A INSTALLATION

A. Tightly butt together sections of insulation on pipe runs sealing longitudinal seams of jacket with a self-sealing adhesive. Seal end joints with 4-inch wide straps of matching vapor barrier tape. Seal off ends of insulation with vapor seal mastic at valves, fittings and flanges. No further finish required. Mastic shall extend onto the bare pipe and over the insulation O.D.

B. PVC fitting jackets shall be used when they are available for the particular application. When molded or routed coverings are not available, the coverings shall be fabricated in the field similar to equipment insulation. Molded or routed fitting covers are highly recommended. Order PVC pre-curled.

C. Cold Piping:
1. Cover valves, fittings and flanges with insulation having the same thickness as adjacent pipe covering, securing in place reforming tape up to 12” O.D. and ½” wide SST bands on larger O.D. Apply a PVC jacket and seal joints with PVC cement (solvent welding).

D. Hot Piping:
1. Covers shall overlap the pipe insulation by the thickness of the insulation or 2” min. Cover valves, fittings and flanges with insulation similar to the adjacent pipe covering, securing in place with reforming tape up to 12” O.D. and ½” wide SST bands on larger O.D. Apply a PVC jacket and tape end joints to adjacent pipe insulation.
2. Do not use PVC fitting jackets where the surface of the insulation is above 150 degrees F.

E. Exterior Piping:
1. Exterior above grade water piping shall be finished with a weatherproof jacket and an aluminum jacket. Lap and seal joints as per manufacturer's instructions. Place laps to shed water.

3.4 TYPE B INSTALLATION

A. Type B insulation shall be slipped on the pipe prior to connection, and the butt joints shall be sealed. Where the slip on technique is not possible, the insulation shall be carefully slit and applied to the pipe.

B. All joints shall be completely butt sealed with the manufacturer's recommended adhesive.

C. Do not apply Type B insulation in multiple layers.

D. Type B insulation shall not be used in plenums nor firewall penetrations.

E. This Contractor shall paint Type B insulation exterior to the building with two coats of a vinyl acrylic paint recommended by the insulation manufacturer for protection against ultraviolet degradation and shall be flexible with no cracking. It is recommended in high humid areas to coat the insulation with a vapor barrier mastic to .037 min. DFT.

3.5 TYPE C INSTALLATION

A. Exterior
1. Butter joints of insulation with non-setting adhesive. Secure with factory applied Self-Seal laps. Installation shall be as per manufacturer’s guidelines.
2. Finish shall be factory applied All Service Jackets. All fittings shall be finished with vapor seal mastic reinforced with white glass mesh. Minimum 0.037 thick DFT of mastic.
3. Piping exposed in machine rooms shall be finished with vapor seal mastic and open weave membrane 10 x 10.
4. Piping exposed to weather shall be finished with all service jacket and additional finish of 0.16 thick aluminum jacket. Aluminum jacket shall be secured with stainless bands located on maximum centers of 12 inches and at the overlap. No screws or pop rivets shall be used.
5. Fittings and valves shall be finished with vapor seal mastic, reinforced with minimum 0.037” DFT of mastic, glass mesh and aluminum preformed fitting covers.

3.6 TYPE D AND E INSTALLATION

A. Equipment Insulation Application:
1. Apply insulation to fit as closely as possible to equipment.
2. Stagger joints where possible.
3. Bevel insulation around nameplates, ASME stamp and access plates.
4. Insulation on equipment that must be opened periodically shall be constructed so insulation can be removed and replaced without damage.
5. Do not install Type E insulation on aluminum surfaces or with aluminum jacket.

B. Hot Equipment:
1. Install 3/4-inch expanded metal over equipment with standing ribs or seams prior to applying insulation to eliminate ribs or seams penetrating through the insulation.
2. Secure the insulation with steel bands spaced on 12-inch centers.

3. Where required, use welded studs, clips or angles as anchors for wire or bands on flat surfaces.
4. Seal joints with insulating cement.
5. Over the insulation stretch 1-inch hexagonal mesh wire and lace the edges together.
6. Apply a 1/4-inch thick coat of finishing cement and trowel smooth.
7. Smooth insulation with lagging adhesive, cover with glass cloth and a final coat of lagging adhesive.
8. On small equipment where it is not practical, omit the wire mesh and finishing cement on Type D insulation.

C. Cold Equipment
1. Cover irregular surfaces with a smoothing coat of insulating cement.
2. Secure insulation with wire or with stainless bands spaced on 12-inch centers.
3. Seal joints with vapor seal mastic.
4. Embed a layer of glass into a 1/16-inch coating of vapor seal mastic. Then coat the outside of the glass cloth with a 1/16-inch coating of vapor seal mastic.

3.7 TYPE F INSTALLATION

A. Ductwork Insulation Application:
1. Apply insulation tightly and smoothly to duct.
2. Secure insulation on the bottom of ducts and plenums and on the sides of plenums and other places where the insulation will sag and max 3” from any corner.
3. Impale insulation over pins or anchors located not more than 18 inches apart and hold in place with washers and clips.
4. Cut off protruding pin after clips are secured and seal with 2-mil. aluminum foil backed pressure sensitive tape.
5. Apply insulation with joints tightly butted.
6. Seal all ductwork joints, punctures and fittings with a mastic type sealant containing a vapor barrier.
7. Cover all breaks, joints, punctures and voids with a vapor seal mastic and cover with a vapor barrier material identical to vapor barrier on the insulation, where gaps exceed 2”.
8. Bevel insulation around nameplates, access plates and doors.
9. Insulation shall be continuous through walls and floors except at fire dampers.
10. Insulation shall be continuous to include the entire air distribution device from above the duct connection to the wall or ceiling to maintain a thermal barrier. This applies to all supply air diffusers/grilles, any exhaust or return grilles where insulation is shown, and all places where required by code.

3.8 TYPE G INSTALLATION

A. Internal Lining Insulation Application:
1. Apply where specified herein.
2. Apply liner in accordance with SMACNA Duct Liner Application Standard, later edition.
3. Provide metal liner for the sound lining. Metal liner to be 24 gauge galvanized sheet metal with perforation of 3/32” diameter holes on 3/16” center. Properly fasten liner to the duct so that liner does not sag or vibrate.

3.9 PIPE SLEEVES

A. Pipe insulation and vapor barrier shall be continuous through sleeves in walls and floors.

B. Provide 26 gauge galvanized steel or 0.020 inch aluminum jacket over insulation on pipe passing through sleeves where sealant is required.

C. Where penetrating interior walls, extend the metal jacket 2 inches out either side of the wall and secure each end with a metal band compressing the insulation slightly.

D. Where penetrating floors, extend the metal jacket 2 inches below the floor and 5 inches above the floor. Secure with metal bands.

END OF SECTION

SECTION 23 21 13 HVAC PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. The General Provisions, Supplemental General Provisions, section 23 01 00, Division 1 Specifications and Special Provisions apply to all Work specified in this Section.

B. This section describes the basic materials and installation methods for the HVAC piping systems. Comply with other Division 23 sections and drawings as applicable. Refer to other divisions for coordination of work.

C. Furnish and install all components of the HVAC piping systems specified herein, as indicated on the drawings, and as required to provide complete and operating systems.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide complete operating mechanical piping systems including pipe, tube, fittings, and appurtenances as indicated and in compliance with these Specifications.

B. Applications: Applications of piping systems include, but are not limited to, the systems as listed below:

System	Working Pressure	Operating Temperatures
Condensate Drainage	--	40 to 60°F

1.3 QUALITY ASSURANCE

A. Welding: Qualify welding procedures, welders, and operators in accordance with ANSI B31.1, Paragraph 127.5, for shop and job site welding of piping work. Make welded joints on the piping system with continuous welds, without backing rings and with pipe ends beveled before welding. Gas cuts shall be true and free from burned metal. Before welding, surfaces shall be thoroughly cleaned. The piping shall be carefully aligned and no weld metal shall project inside the pipe.

PART 2- PRODUCTS

2.1 PIPING MATERIALS

A. General: Provide pipe and tube of type, joint, grade, size, and weight (wall thickness, schedule or class) indicated for each service. Comply with applicable governing regulations and industry standards.
   1. Steel Pipe: ASTM A53, ASTM A106, or ASTM A120, black or hot-dipped galvanized as specified.
   2. Copper Tube: ASTM B88, Types "K", Type "L", or Type "M" copper water tube as defined by the Copper and Brass Research Association.
   3. Polyvinyl Chloride (PVC) Pipe: Sewer main SDR 41, ASTM D3034 with bell ends and pre-inserted gasket joints.

4. Pre-insulated Steel Pipe: ASTM A53, ASTM A106, ASTM A120, and ANSI B31.1.
5. Polyvinyl Chloride (PVC) Water Pipe: Class 150, thick-wall, Schedule 80, AWWA C90 mechanical joint.
6. Copper Drainage Pipe: DWV copper piping.
7. Polyvinyl Chloride (PVC) Drainage Pipe: Schedule 40 PVC.

2.2 PIPING / TUBING FITTINGS

A. General: Provide factory-fabricated fittings of type, materials, grade, class, and pressure rating indicated for each service and pipe size. Provide sizes and types matching pipe, tube, valve, and equipment connections. Where not otherwise indicated, comply with governing regulations, industry standards, and where applicable, with pipe manufacturer's instructions for selections.

B. Cast Iron Flanged Fittings: ANSI B16.1, Class 125 or Class 250, black or galvanized as specified, including bolting and gasketing.

C. Cast Iron Threaded Fittings: ANSI B16.4 or ASTM A126, Class 125 or Class 250, black or galvanized as specified.

D. Malleable Iron Threaded Fittings: ANSI B16.3, Class 150 or Class 300, black or galvanized as specified.

E. Malleable Iron Threaded Unions: ANSI B16.39, select for proper piping fabrication and service requirements including style, end connections, and metal-to-metal seats (iron, bronze, or brass), plain or galvanized as specified.

F. Threaded Pipe Plugs: ANSI B16.14.

G. Steel Flanges/Fittings: ANSI B16.5, including bolting, gasketing, and butt weld end connections.

H. Forged Steel Socket-welding and Threaded Fittings: ANSI B16.11, rated to match schedule of connected pipe.

I. Wrought Steel Butt-welding Fittings: ANSI B16.9, except ANSI B16.28 for short radius elbows and returns; rated to match connected pipe.

J. Pipe Nipples: Fabricated from same pipe as used for connected pipe, except do not use less than Schedule 80 pipe where length remaining unthreaded is less than 1/2". Do not thread nipples full length (no all-thread nipples).

K. Wrought Copper/Bronze Solder-Joint Fittings: ANSI B16.22 suitable for working pressure up to 250 psig.

L. Grooved End Fittings: ASTM A47 or ASTM A536 joined with Victaulic Style 77 couplings and Grade "E" gaskets.

M. Flanged Fittings: Comply with ANSI B16.15 for bolt-hole dimensioning, materials, and flange-thickness.

N. Flange Bolts: Bolts shall be carbon steel ASTM A307 Grade A hexagon head bolts and hexagonal nuts. Where one or both flanges are cast iron, furnish Grade B bolts. Cap screws utilized with flanged butterfly valves shall be ASTM A307 Grade B with hexagon heads.

O. Flange Bolt Thread Lubricant: Lubricant shall be an anti-seize compound designed for temperatures up to 1000°F and shall be Crane Anti-Seize Thread Compound or approved equal.

P. Polyvinyl Chloride (PVC) Fittings: ASTM D2665, Carlon, Vylon "Z" high strength sewer fittings.

Q. Copper Drainage Fitting: DWV copper drainage fittings.

R. Miscellaneous Piping Materials/Products:
1. Welding Materials: Comply with ASME Boiler and Pressure Vessels Code, Section II, Part C, for welding materials.
2. Brazing Materials: American Welding Society, AWS A5.B, Classification BCup-5.
3. Gaskets for Flanged Joints: 1/8" thick gaskets. Ring-type shall be used between raised face flanges and full face-type between flat face flanges with punched bolt holes and pipe opening. Gaskets shall be Garlock Style 3400 compressed non-asbestos or equal.
4. Insulating (Dielectric) Unions: Provide dielectric unions at all pipe connections between ferrous and nonferrous piping. Unions shall be "Delvin" as made by Pipeline Seal and Insulator Company or "EPCO" as made by Epco Sales, Inc. and shall have nylon insulation or equal.
5. Push-on-Joints: ANSI A21.11, rubber compression-type, "Tyton Joint" as manufactured by US Pipe or equal.

PART 3 - EXECUTION

3.1 PIPING INSTALLATION

A. General:
1. Industry Practices: Install pipe, tube, and fittings in accordance with recognized industry practices which will achieve permanently leak-proof piping systems, capable of performing each indicated service without failure or degradation of service. Install each run with a minimum of joints and couplings, but with adequate and accessible unions or flanged connections to permit disassembly for maintenance/ replacement of valves and equipment. Reduce sizes (where indicated) by use of reducing fittings. Align accurately at connections. Coordinate piping locations with other trades to avoid conflict. Give ductwork preference unless directed otherwise by the Engineer.
2. Systems: Install piping parallel or perpendicular to lines of building, true to line and grade, and with sufficient hangers to prevent sags between hangers. Provide fittings at changes in direction. Piping in finished areas shall be concealed, except in mechanical rooms. Where pipes of different sizes join, provide reducing elbows, tees, or couplings. Bushings will not be acceptable.
3. Expansion and Contraction: Install loops, offsets, sizing joints, and expansion joints, as necessary, to avoid strain resulting from expansion and contraction of piping systems on fixtures and equipment. Provide mechanical grooved connections required by the application to reduce vibration at equipment connections. Provide expansion joints in piping systems by mechanical grooved connections where required.
4. Piping in Shafts: Mechanical joints for mechanical piping systems are not to be installed in locations that will not be accessible after construction is complete. (i.e. Victaulic fittings are not to be used on piping systems in shafts. The piping in this area is to be welded.).

B. Steel Pipe: Ream steel pipe after cutting and before threading. Thread with clean-cut taper threads of length to engage all threads in fittings and leave no full-cut threads exposed after make-up.

C. Copper Pipe: Cut copper pipe square and ream to remove burrs. Clean fitting socket and pipe ends with sand cloth or wire brush.

D. PVC Pipe: Cut PVC pipe square and remove all burrs. Clean fitting and pipe butt prior to installation. Install all PVC piping in accordance with the manufacturer's recommendations.

E. Final Connections to Equipment Furnished by others or Under Other Divisions of These Specifications: Where equipment is to be furnished under other Divisions of these Specifications or by the Owner, such equipment will be delivered to the site, uncrated, assembled, and set in-place under those other Divisions of these Specifications or under the separate contracts. Any required automatic control valves shall also be provided under those other Divisions of these Specifications or other separate contracts. Make all final connections of hot water, condenser water, gas, domestic water, waste, and vent as required. Provide valves, unions, strainers, check valves, and traps as required for proper operation of systems and equipment. Equipment not shown on the Architectural Drawings or noted by the Architect or Engineer shall not be included in the scope of this requirement.

F. Excavation, Installation, and Backfill for Underground Pipe:

1. Layout: Pipes shall be laid and pipe joints made in presence of the General Contractor and field measurements, layouts, batter board alignment, grade establishments, and similar locations shall be performed by a Professional Engineer in the employ of the Contractor. The Contractor's engineer shall be on the job during all underground work. A "Bench-Mark" reference shall be provided by the General Contractor.

2. Pipe Grading: Lay and maintain all pipes at required lines and grades during the course of the Work.

3. Trench: Excavate the trench to the depth required.

4. Excavation: The trench shall be at least 18" wider than the maximum diameter of the pipe or largest bell and the pipe shall be laid in the center of the trench. The trench shall be excavated to a depth sufficient to provide for pipe cushions or supports as specified. Trench width may be increased as required and piling left in place until sufficient compacted backfill is in place. Properly sheet all open trenches to render them secure and remove all such sheeting before completing the backfill. Comply with all applicable national, state, and local codes and regulations. The quantity of excavation required to install sheeting and the installation and removal of sheetings will not be regarded as Extra Work. All costs incurred for this excavation and the installation of sheeting shall be included in the Contract Price.

G. Anchors: Cast iron pipes shall have concrete anchors at each change in direction and/or as directed. Any change in direction exceeding 15 degrees shall be anchored. Concrete anchors shall rest against solid (virgin) ground with the required area of bearing on pipe and ground to provide suitable anchoring.

H. Backfill: Backfill trenches only after piping has been inspected, tested, and approved by the General Contractor. Backfill shall be provided as recommended in the geo-technical report included in these Contract Documents, or, in the absence of a geo-technical report, as required by site conditions. Refer to Division 2 or elsewhere in the Contract Documents for additional trenching and backfill requirements.

I. Existing Surfaces: Restore existing streets, driveways, and sidewalks damaged during the excavation work to acceptable condition, subject to approval by the Architect, and/or Engineer.

Safety: provide Street and sidewalk excavations with approved barricades, warning lights, and cover plates as required by the local authorities.

3.2 CONDENSATE DRAINAGE

A. General: Provide a condensate drain pipe to connect each cooling unit drain pan or funnel and to extend to, or manifold and discharge as shown on the Drawings. Provide union or solder joint at connection to heat pumps.

B. Assembly: Use hard drawn Type “M”, DWV copper tubing or Schedule 40 PVC with matching fittings, or Schedule 40, galvanized steel made up with Class 125, galvanized, threaded fittings. Assemble fittings to form a trap with depth equal to or greater than operating pressure of the unit served. Drains shall be of the size not less than the full size of the drain pan connection. Air handling unit drains shall have deep seal traps to permit unit pan drainage. The deep seal trap shall be installed for each blow-through or draw-through air handling unit to maintain the water seal.

3.3 CLEANING, FLUSHING, TESTING, AND INSPECTING

A. Cleaning: Clean exterior surfaces of installed piping systems and prepare surface for application of any required coatings.

B. Flushing: Flush piping systems with clean water prior to performing any required tests. All piping system flushing is to be conducted in a manner not to adversely affect the performance of the equipment connected to the piping system.

1. Flushing of Closed Loop Piping Systems:
   The supply and return run-outs must be disconnected from each heat pump and connected via a by-pass hose to allow circulation to the system, but not through the heat pump units. The system shall be chemically cleaned then flushed by opening the drain valve at the lowest point in the system. While the system is being drained, adequate make-up to the system will be provided to ensure the system remains full. With-in 24 hours after adequate and certification of system cleanliness by the chemical treatment contractor (refer to specification 23 25 00 for additional requirements) the units shall be reconnected and an approved inhibitor shall be introduced to the loop. All strainers shall be cleaned after flushing procedure.

C. Piping Tests:

1. General: Blank off equipment during tests. Perform tests before piping is enclosed in walls, floors, partitions or in any other way concealed from view. Tests may be performed in sections. Tests shall be witnessed by the General Contractor and local inspectors and the test results presented to the Engineer for acceptance and approval prior to concealing piping from view. Provide all

necessary equipment for testing, including pumps and gauges. Note: All test results are to be submitted to the Engineer as specified in Section 23 25 00.

2. Heating Open Loop Condenser, Closed Loop Condenser, and Cooling Water System: Test water systems hydrostatically to a pressure of 150 psig or 1-1/2 times working pressure, whichever is greater, for a period of 4 hours. Repair all leaks, replacing materials as necessary and repeat tests until systems are proven tight.

D. Inspecting: Visually inspect each run of each system for completion of joints, adequate hangers, supports, and inclusion of accessories and appurtenances.

E. Identification: Refer to Section 23 05 53, “HVAC Equipment and Piping Identification” for nameplates and labeling requirements.

End of Section

SECTION 23 21 14 VALVES

PART 1 - GENERAL

1.1 SUMMARY

A. The General Provisions, Supplemental General Provisions, section 23 01 00, Division 1 Specifications and Special Provisions apply to all Work specified in this Section.

B. This section describes the basic materials and installation methods for the valves associated with the piping systems. Comply with other Division 23 sections and drawings as applicable. Refer to other divisions for coordination of work.

C. Furnish and install all components of the valves specified herein, as indicated on the drawings, and as required to provide complete and operating systems.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide valves as specified and indicated.

1.3 QUALITY ASSURANCE

A. Acceptable Manufacturers: The model numbers listed in the Specifications establish a level of quality and material. Subject to compliance with requirements, provide products and materials by the following:
1. General Valves: Jenkins Bros. Valves, Crane Company, Stockham Valves and Fittings, Walworth Company, Kennedy Valve, Kitz, Nibco, or approved equal
2. Ball Valves: Jenkins Bros. Valves, Jamesbury Corporation, Nibco, Stockham Valves and Fittings, Apollo, Kitz, approved equal.
3. Backflow Preventers: Watts Regulator Company, Febco, Hersey Products, Inc., Wilkins, or approved equal.
4. Check Valves: Jenkins Bros. Valves, Crane Company, Muesco, Inc., APCO/Valve & Primer Corporation, Williams-Hager, Clow Pipeline Products, Valve Division, Nibco, Crane, Stockham, Milwaukee, Kitz, or approved equal.
5. Butterfly Valves: Jenkins Bros. Valves, Jamesbury Corporation, Nibco, Stockham Valves and Fittings, Apollo, Keystone, Demco, Grinnell, Centerline, Kitz, or approved equal.

PART 2 - PRODUCTS

1.0 MATERIALS

A. General: All valves shall be similar to numbers listed. All similar type and size valves shall be products of one manufacturer.

B. Butterfly Valves: All butterfly valves shall be full tapped and threaded lug type, manufacturer certified for bubble-tight, dead end shut off from either direction at design working pressure and temperature. Valves 2 1/2 through 5" in size shall have lever type operators. Valves 6" and larger shall have enclosed, self-locking worm gear type operators, waterproof, and factory-lubricated. Gear segment shall be manganese bronze or ductile iron with a steel or ductile iron worm and oil impregnated bronze bushings or worm shaft. Operator shall have built in adjustable mechanical stops and position indicators. Valves used for balancing shall be certified suitable for continuous throttling service.

C. Ball Valves: Valves shall be furnished with blowout-proof stems. All ball valves shall be full-line size to prevent flow restriction through the ball.

D. Gate Valves: All bronze gate valves shall have packing boxes with adequate depth to allow space for sufficient amounts of stem packing. Malleable iron handwheels and gland followers shall be furnished on all bronze gate valves. All gate valves shall have non-asbestos stem packing suitable for pressure and service. OS&Y and IBBM gate valves shall be furnished with a stem lubrication fitting on all sizes. All gate valves shall be designed to permit repacking while the valve is in line.

2..1 VALVES

A. Valves for service at or less than 150 PSIG:

1. Block (Stop) Valves: Ball valves 2" and smaller shall be red brass, cast bronze, or yellow forged bronze with brass, stainless steel, or bronze ball and stem, 150 psig nonshock WOG at 200°F, Jenkins Fig. No. 900T. Valves 2 1/2" and larger shall be butterfly type, 200 psig nonshock WOG at 200°F, ANSI Class 150 with ductile iron lug body. The replaceable resilient elastomer seat shall be Buna N or EPDM. The disc shall be silicon or aluminum bronze and shaft shall be No. 316 or No. 416 stainless steel. Secondary O ring seals shall be provided at the top and bottom of the upper and lower shafts to guarantee zero leakage to the shaft, Jenkins Fig. No. 232EL/EG or No. 632E.
2. Balancing Valves: Valves shall comply with the general requirements specified for block valves. Valves used for balancing shall have adjustable memory stops or position indicators. Valves 2" and smaller shall be Jenkins Fig. No. 900TE. Valves 2 1/2" and larger shall be Jenkins Fig. No. 232EL.
3. Gate Valves: As a general rule, gate valves shall not be used for sizes 2 1/2" and smaller. If necessary, with prior approval from the Construction Manager, valves 2-1/2" and smaller shall be Jenkins Fig. No. 47-U, 200 psig WOG bronze body with screwed bonnet and ends. Valves 3" and larger shall be Jenkins Fig. No. 651-A, 200 psig WOG.
4. Globe Valves: Valves 2" and smaller shall be Jenkins Fig. No. 546-P, bronze body, bronze rising stem, screw in bonnet, renewable seat, and screwed or solder ends. Valves 2 1/2" and larger shall be Jenkins Fig. No. 613, 200 psig WOG, outside screw and yoke (OS&Y), iron body, bronze-trimmed, renewable seat, Pressure Class 125, with ANSI B16.1 flanged ends.

B. Valves for Service Over 150 PSIG:

1. Block Stop Valves: Ball valves 2" and smaller shall be red brass cast bronze or yellow forged bronze with brass, stainless steel, or bronze ball and stem, 300 psig nonshock WOG at 200°F with Teflon packing and gaskets, Jenkins Fig. No. 900T. Valves 2 1/2" and larger shall be 300 psig nonshock WOG, with Class 300 ANSI B16.5 flanges, full tapped and threaded cast steel lug body. Valves shall have 300 pounds body drilling and shall be suitable for service indicated on the Plans. Disc shall be cast steel and the shaft shall be No. 416 stainless steel. Secondary O ring or gland seals at the top and bottom of the upper and lower shafts shall guarantee zero leakage to the shaft. Seals and backing rings shall be TFE or Viton. Seal retainer rings shall be No. 316 stainless steel, Dezurik No. 645.
2. Balancing Valves: Valves shall comply with the general requirements specified for block valves. Valves used for balancing shall have adjustable memory stops or position indicators.
3. Gate Valves: As a general rule, gate valves shall not be used for sizes 2 1/2" and smaller. If necessary, with prior approval from the Construction Manager, valves 2-1/2" and smaller shall be Jenkins Fig. No. 270-U, 300 pounds WOG, bronze body, rising stem, with screwed bonnet and screwed ends. Valves 3" through 12" shall be Jenkins Fig. No. 204, 500 pounds WOG, OS&Y valves with Class 250 ANSI B16.1 flanged ends, cast iron body and bronze trim.

4. Globe Valves: Valves 2" and smaller shall be Jenkins Fig. No. 556-P, 400 pounds WOG, bronze body and trim, rising stem, union bonnet, renewable seat, and screwed ends. Valves 2 1/2" through 8" shall be Jenkins Fig. No. 923, 500 pounds WOG, iron body, bronze trim rising stem, OS&Y Class 250 ANSI B16.1 flanged ends.

C. Check Valves: Domestic water pipes 2 1/2" and larger shall be Williams-Hager Fig. No. 375, spring-loaded, quiet type. Valve non-shock pressure temperature rating shall be as specified for piping in which it is installed. Valve shall be full-threaded, lug body, or flanged body. Valves 2" and smaller shall be Jenkins Fig. No. 92A. Threaded valves installed at pump discharge shall have its shaft perpendicular to the pump shaft. Valves located in pumped sewage pipes and in storm pipes shall be Crane No. 383 outside weight, 200 pounds WOG, iron body, bronze trimmed, with swing check design.

D. Valves for Water Make Up Connections: Valves 2" and smaller shall be Jenkins Fig. No. 900T. Valves 2 1/2" and larger shall be Jenkins Fig. No. 632B or No. 632E, butterfly valve operator furnished per Paragraph 2.01/C.

E. Relief Valve: Temperature and pressure, self-closing, lever operated with thermo-bulb extension, 3/4", ANSI B2.1 taper thread male inlet connection, 210°F (98.8°C) and 125 psig setting, ANSI Z1.22, Type No. 40XL Watts Regulator Company.

F. Combination Pressure Reducing and Relief Valve for Make-up Water: Bell and Gossett Model Number 3, dual unit.

G. Reduced Pressure Backflow Preventer: Backflow preventer shall be Watts Regulator No. 909 Series, 2 1/2" and larger shall be provided with dual "Y" pattern spring-loaded check valves and independent relief valve located between checks. Backflow preventers shall be rated for pressure up to 150 psig working pressure at 140°F (60°C) and sized according to the maximum design flow.

H. Domestic Water Pressure Reducing Valves: Watts 223S or Clayton 90G 01. Pressure and flow schedule per flow test.

2..1 FIRE PROTECTION VALVES

A. Check Valves: Valves 2" and smaller shall be threaded end Jenkins Fig. No. 92A. Valves 2 1/2" and larger shall be Jenkins Fig. No. 729 flanged, iron body, bronze mounted (IBBM) swing check, 175 psig WOG, with renewable composition disc and bronze seat ring, Underwriters' Laboratories, Inc. (UL) and/or Factory Mutual (FM) approved as required. Where ball drip is required, provide Jenkins Fig. No. 624 with Grinnell Fig. 1686 plain discharge.

B. OS&Y Valves: Valves 2" and smaller shall be Jenkins Fig. No. 275U, 175 psig WOG, threaded, all bronze, gate valve, UL approved. Valves 2 1/2" and larger shall be Jenkins Fig. No. 825A, 175 psig WOG, flanged, gate valve, IBBM, solid wedge, UL and FM approved. Provide OS&Y valves with tamper switches installed where indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Except as otherwise indicated, comply with the following requirements.

B. Valve Stems: Install valves with stems pointed up, in the vertical position where possible, but in no case with stems pointed downward from a horizontal plane.

C. Swing Check Valves: Swing check valves shall be installed in horizontal piping only.

D. Unions and Companion Flanges: Provide unions or companion flanges where required to facilitate dismantling of valves and equipment.

E. Access Doors and Panels: Verify the location and quantity of access doors or panels required to provide full valve access.

END OF SECTION

SECTION 23 30 00 DUCTWORK

PART 1 - GENERAL

1.1 SUMMARY

A. The General Provisions, Supplemental General Provisions, section 23 01 00, Division 1 Specifications and Special Provisions apply to all Work specified in this Section.

B. This section describes the basic materials and installation methods for the duct systems. Comply with other Division 23 sections and drawings as applicable. Refer to other divisions for coordination of work.

C. Furnish and install all components of the duct systems specified herein, as indicated on the drawings, and as required to provide complete and operating systems.

1.2 DESCRIPTION OF WORK

A. Work Included:
1. Provide sheet metal ductwork as specified herein.

B. Types: The types of ductwork specified in this Section include, but are not necessarily limited to the following:
1. Air conditioning cooling and/or heating supply and return air systems
2. Outdoor air supply systems
3. Mechanical exhaust systems
4. Air relief systems

C. Supply Air Ductwork: Ductwork shall be sheet metal designed for velocities up to 1,500 fpm or a friction rate of 0.10 inches water column per 100 feet of duct, whichever is most stringent. The ductwork shall meet the latest SMACNA Standards for construction and stiffening based on the maximum pressure in the ductwork. Ductwork shall be 1” W.C. pressure class.

D. Outside Air Ductwork (passive): Ductwork shall be sheet metal ductwork designed for velocities up to 1,000 fpm. The ductwork shall meet the latest SMACNA Standards for construction and stiffening based on the maximum pressure in the ductwork.

E. Restroom and General Exhaust Ductwork: Ductwork shall be sheet metal ductwork designed for velocities up to 1,500 fpm. The ductwork shall meet the latest SMACNA Standards for construction and stiffening based on the maximum pressure in the ductwork. Ductwork shall be 1” W.C. pressure class.

F. Flexible Ductwork: Ductwork connections to HVAC terminal units and air devices shall be made with flexible ductwork connection where shown on the Drawings. Additional connections may be made using flexible ductwork at the Contractors opinion, where approved in writing, in advance, by the Engineer. Flexible ductwork shall NOT be used in inaccessible locations (e.g., above gyp board ceilings, areas that cannot be reached by technician from a ladder).

G. Ductwork Insulation: Refer to section 23 07 00, “HVAC Insulation”, for duct insulation.

H. Ductwork Accessories: Refer to Section 23 33 00, “Ductwork Accessories”, for accessories and specialties related to ductwork systems and installation.

1.3 QUALITY ASSURANCE

A. Design and Installation Standards:
1. SMACNA HVAC Duct Construction Standards, latest edition.
2. ASHRAE Standards: Comply with American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE 70-72) , Method of Testing for Rating the air flow performance of outlets and inlets.
3. ADC Standard 1062R2, Air Diffusing Equipment Test Code.
4. AMCA Standard 210, Test Code for Air Moving Devices.
5. NFPA 90-A, Standard for the Installation of Air Conditioning and Ventilating Systems, 2002 edition.

B. Fire and Smoke Rating Test Standards: ASTM E84, NFPA 255 and UL 723.

1.4 SUBMITTALS

A. Shop Drawings: Submit dimensioned layouts of ductwork showing both the accurately scaled ductwork and its relation to space enclosure. Show modifications of indicated requirements, made to conform to local shop practice and how those modifications ensure that the free area, materials, and weights are not reduced. The shop drawings must be submitted at ¼” = 1’-0” or larger scale and shall include all equipment connected to the duct systems, drawn to scale, based on the equipment submittals. All ductwork and equipment must indicate bottom elevations, referenced to finished floor below (bottom of duct = X’-Y” AFF, e.g.)

PART 2 - PRODUCTS

2.1 DUCTWORK MATERIALS

A. Exposed Ductwork Materials: Where ductwork is indicated to be exposed to view in occupied spaces, provide paintable ductwork. Also provide materials which are free from visual imperfections including pitting, seam marks, roller marks, oil canning, stains, discolorations, and other imperfections, including those which would impair painting.

B. Gauges, Rectangular Ductwork: Fabricate galvanized steel ductwork from the minimum gauges for sizes up to the corresponding maximum long-side dimensions as indicated in SMACNA Duct Construction Standards.

C. Gauges, Round Ductwork: Fabricate lock-form quality galvanized steel ductwork from the minimum gauges for diameters up to the corresponding maximum dimensions as indicated in SMACNA Duct Construction Standards.

D. Fiberglass Duct board: Fiberglass duct board is NOT an acceptable means of air transport.

2.2 MISCELLANEOUS DUCT MATERIALS

A. General: Provide miscellaneous materials and products of the types and sizes indicated and where not otherwise indicated, provide type and size required to comply with ductwork system requirements including proper connection of ductwork and equipment.

B. Duct Sealant: Provide non-hardening, non-migrating mastic or liquid elastic sealant (type applicable for the fabrication/installation detail) as compounded and recommended by the manufacturer specifically for sealing joints and seams in ductwork.

C. Ductwork Support Materials: Except as otherwise indicated, provide hot-dipped galvanized steel fasteners, anchors, rods, straps, trim, and angles for support of ductwork.

D. Duct Liner Adhesive: Comply with ASC-A-7001 by The Adhesive and Sealant Council, Inc. (per SMACNA standards).

E. Duct Liner Fasteners: Comply with SMACNA.

F. Flexible Ductwork: Insulated flexible ductwork shall be Wiremold Type VTCK. Approved equal flexible ductwork by Certainteed Corporation, Flexaust Company, Genflex or Owens-Corning Fiberglass will be acceptable. Provide either 45 degree angle taps with manual volume dampers or "spin-in" taps with manual volume dampers at main duct tap as shown on Drawings.

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

A. Standards: Round and rectangular sheet metal ductwork shall be constructed in accordance with SMACNA "HVAC Duct Constructions Standards", latest Edition, ASHRAE Guide and Data Book, "Handbook of Fundamentals", latest edition, specifically Chapter 25 and NFPA Standard 90-A, "Standard for the Installation of Air Conditioning and Ventilating Systems".

B. All ductwork required for the heating, ventilating and air conditioning systems shall be constructed and erected in a first class workmanlike manner. This work shall be guaranteed for a period of one year from and after the date of acceptance of the job against noise, chatter, whistling, vibration, and free from pulsation under all conditions of operation.

C. The interior surface of all ductwork shall be smooth with no parts projecting into the air stream unless specified to do so. All seams and joints shall be external. The inside of all ductwork shall be thoroughly cleaned and all fans operated to remove any debris prior to connection of air devices.

D. All holes in ducts for damper rods and other necessary devices shall be either drilled or machine punched (not pin punched), and shall not be any larger than necessary. All duct openings shall be provided with sheet metal caps if the openings are to be left unconnected for any length of time.

E. Where ducts, exposed to view (including equipment rooms), pass through walls, floors or ceilings, furnish and install sheet metal collars around the duct.

F. Sheet metal plenums shall be constructed and reinforced in accordance with SMACNA standards. Where plenums are connected to louvers, the plenum bottom shall be sloped to drain to the louver.

G. Ductwork which is exposed to weather shall have soldered joints and seams and shall be painted with a suitable epoxy coating. In lieu of solder joints, the use of duct-mate or TDC manufactured flanges are acceptable.

3.2 COORDINATION

A. Prior to submitting ductwork shop drawings, the Division 23 Contractor shall fully coordinate the routing and height of all ductwork with all other trades and with ceiling heights, lighting fixtures and building construction.

3.3 GENERAL DUCTWORK FABRICATION

A. Duct Gauge and Reinforcing:

1. Rectangular Ductwork: Minimum metal gauges and reinforcement shall be in accordance with SMACNA HVAC Duct Construction Standards (SDCS) Tables 1-3 through 1-13. Minimum aluminum gauges and reinforcement shall be in accordance with SDCS Tables 1-14 through 1-16. Reinforcing shall be installed per SDCS Fig. 1-9 through 1-12.
2. Round Ductwork: Minimum metal gauges for longitudinal and spiral seam round ductwork shall be in accordance with SDCS Table 3-2. Minimum aluminum gauges for longitudinal and spiral seam round ductwork shall be in accordance with SDCS Table 3-3. Longitudinal seam ductwork larger than 12" diameter shall not be permitted unless welded seams are used.
3. Cross-breaking: Cross-break or transverse bead all flat surfaces which are more than 12" wide. Transverse beading shall be on 12" centers and shall be a minimum of 1/8" deep at the center of the bead and 3/8" wide at the base of the bead.
4. Minimum Gauges: The metal gauges listed in the SDCS for round and rectangular ductwork are the minimum recommended. It shall be the Contractor's responsibility to select a metal gauge heavy enough to withstand the physical abuse of installation.

B. Duct Joints and Seams:

1. General: Make all joints airtight. The distance between transverse joints on any size duct shall not exceed 5'.
2. Rectangular Ductwork: Transverse joints and longitudinal seams in ductwork shall be constructed in accordance with SDCS Fig. 1-4 and 1-5. Drive slips may be used on rectangular ductwork on short sides only, up to 18" maximum. Gauge of drive slips shall be at least as heavy as ductwork on which they are installed. Bend drive slips over at least 3/4" at corners. Corner closures shall be in accordance with SDCS Fig. 1-13 through 1-18. All longitudinal seams shall be "Pittsburgh Lock" or button punch snap lock at corner seams and grooved seam or seam welded in sides between corners, in accordance with SDCS Fig. 1-5. At the Contractor's option, transverse joints may be transverse duct flange joints or Ductmate EP12/11 prefabricated galvanized "Ductmate" sections. The proposed gasket material, flange, corner piece and Ductmate details shall be submitted for approval.
3. Round Ductwork: Transverse joints for round ductwork shall be beaded sleeve type constructed in accordance with SDCS Fig. 3-2, properly secured and sealed. Draw bands shall not be used on round ductwork. Longitudinal and spiral seams shall be constructed in accordance with SDCS Fig. 3-1.
4. Ductwork Sealing: Seal all longitudinal and transverse ductwork joints and seams using SMACNA ductwork sealant and 3" wide open weave tape to provide positive seal. Sufficient sealant shall be used to completely imbed the cloth.

C. Connections and Take-offs:

1. Rectangular Ductwork: Parallel flow branches shall be constructed using radius elbow take-offs in accordance with SDCS Fig. 2-7. Branch duct connections shall be 45 degree entry expanded taps constructed in accordance with SDCS Fig. 2-8. Duct-mounted coil connections shall be constructed in accordance with SDCS Fig. 2-11.
2. Round Ductwork: Connections and takeoffs shall be made using 90 degree conical taps, 45 degree lateral taps or wye fittings constructed in accordance with SDCS Fig. 3-4 and 3-5. Use of 90 degree tees shall not be allowed.
3. Spin-in Fittings: Spin-in fittings may be used for duct taps to air supply and exhaust devices and shall include quadrant dampers even though a volume damper may be specified for the air device. Spin-in fittings shall be sealed at the duct tap with a gasket and compression fit or sealed with duct sealant. The location of spin-in fittings in the ducts shall be determined after terminal units are hung and the location of the light fixtures is known so as to minimize flexible duct lengths and sharp bends. Spin-ins shall be installed with their damper axis parallel to airflow. A minimum of 18” must be provided between fittings.
4. Flexible Joints In Ductwork: Provide flexible connections where ductwork connects to air-handling units, fans, and similar powered equipment items and where required for expansion and contraction of the ductwork or the building structure. A minimum of one inch (1") slack shall be provided in all flexible connection to insure vibration isolation. Flexible joints are not required where equipment is connected with flexible duct. Flexible connections shall be rigidly connected to metal work on each side and shall be airtight. Bond flanges of flexible duct connectors to ducts and housings to provide airtight connections. Seal seams and penetrations to prevent air leakage.

D. Elbows and Tees:

1. Rectangular Ductwork: Provide radius or square elbows in ductwork, where shown on the Drawings. Where radius elbows are shown, radius elbows must be provided. Where square elbows are shown, square or radius elbows may be provided, at the Contractor's option. Elbows shall be constructed in accordance with SDCS Fig. 2-2. Turning vanes are required in all square elbows of 46 degrees or greater angle. Turning vanes are not required in radius elbows. Turning vanes shall be single vane type without a trailing edge and shall be constructed and installed in accordance with SDCS Fig. 2-3 and 2-4.
2. Round Ductwork: Provide radius elbows of the stamped or segmented type constructed in accordance with SDCS Fig. 3-3. Segmented elbows shall have a minimum of three segments for 45 degree elbows and five segments for 90 degree elbows.

E. Offsets and Transitions: Where duct width increases, maximum angle of slope shall be 20 degrees (one inch (1") in 2.7"). Where duct width decreases, maximum angle of slope shall be 30 degrees (one inch (1") in 1.7"). Offsets and transitions shall be constructed in accordance with SDCS Fig. 2-9 and 2-10.

F. Air Device Connections: Make connections to air devices and fabricate air device plenums as detailed on the Drawings and in accordance with SDCS Fig. 2-16 through 2-18.

3.4 DUCTLINER

A. General: The liner shall be applied to the inside of the duct with heavy density side to the air stream and shall be secured in the duct with adhesive, completely coating the clean sheet metal. All joints in the insulation shall be "buttered" and firmly butted tightly to the adjoining liner using fireproof adhesive. Where a cut is made for duct taps, etc., the raw edge shall be accurately and evenly cut and shall be thoroughly coated with fireproof adhesive. On ducts over 24" in width or depth, the liner shall be further secured with mechanical fasteners. The fasteners shall be A.J. Gerrard Company pronged straps, or approved equal, secured to the ducts by fireproof adhesive. The clips shall be 18" maximum spacing and shall be pointed up with fireproof adhesive. Liner shall be accurately cut and ends thoroughly coated with fireproof adhesive so that when the duct section is installed, the liner shall make a firmly butted and tightly sealed joint. Where ducts are lined exterior insulation will not be needed unless otherwise noted, except that the two insulations shall lap not less than 24". Ductliner for velocities over 2,000 fpm shall be as specified except a perforated metal liner shall be used over ductliner for securement, in lieu of fasteners. Ductliner installation and fasteners shall comply with SDCS Fig. 2-22 through 2-25.

3.5 DUCTWORK INSTALLATION

A. General: Assemble and install ductwork in accordance with recognized industry practices which will achieve airtight and noiseless systems, capable of performing each indicated service. Install each run with a minimum of joints. Align ductwork accurately at connections, within 1/8" misalignment tolerance and with internal surfaces smooth. Support ducts rigidly with suitable ties, braces, hangers, and anchors of the type which will hold ducts true-to-shape and prevent buckling.

B. Inserts: Install concrete inserts for support of ductwork in coordination with formwork, as required to avoid delays in the work.

C. Completion: Complete fabrication of work at the project as necessary to match shop-fabricated work and accommodate installation requirements.

D. Run Location: Locate ductwork runs, except as otherwise indicated, vertically and horizontally and avoid diagonal runs wherever possible. Locate runs as indicated by diagrams, grams, details, and notations or, if not otherwise indicated, run ductwork in the shortest route which does not obstruct usable space or block access for servicing the building and its equipment.

Hold ducts close to walls, overhead construction, columns, and other structural and permanent-enclosure elements of the building. Limit clearance to 0.5" where furring is shown for enclosure or concealment of ducts, but allow for insulation thickness, if any. Where possible, locate insulated ductwork to assure 1.0" clearance of insulation. Wherever possible in finished and occupied spaces, conceal ductwork from view, by locating in mechanical shafts, hollow wall construction or above suspended ceilings. Do not encase horizontal runs in solid partitions, except as specifically shown. Coordinate the layout with suspended ceiling and lighting layouts and similar finished work.

E. Coordination: Coordinate duct installation with installation of accessories, dampers, coil frames, equipment, controls, and other associated work of the ductwork system.

F. Hangers and Supports:
1. General: All ductwork supports shall be per Section IV of the SMACNA "HVAC Duct Construction Standards - First Edition" with all supports directly anchored to the building structure. Supports shall be on maximum 8'-0" centers with additional supports as required to prevent sagging.

2. Attachment to Structure: Provide hanger attachment to the building structure as specified in Section 15100, "Basic Materials and Methods", and in accordance with SDCS Fig. 4-1 through 4-3.
3. Hangers: Hangers shall be strap or rod sized in accordance with SDCS Table 4-1 and 4-2. Strap hanger attachment to rectangular duct shall consist of a turning strap under the duct a minimum of one inch (1") and securing the strap with one screw into the bottom of the duct and one screw to the side of the duct. Rectangular duct supported on trapeze hangers shall be attached to the trapeze. Round duct attachments shall be constructed in accordance with SDCS Fig. 4-4.
4. Horizontal Ducts: Ducts larger than 50" in their greatest dimension shall be supported by means of hanger rods bolted to angle iron or half round trapeze hangers. Duct shall have at least one pair of supports 8'-0" on centers according to the following:

Angle Length Diameter	Angle	Rod
4'-0"	1-1/2" x 1-1/2" x 1/8"	1/4"
6'-0"	1-1/2" x 1-1/2" x 1/8"	1/4"
8'-0"	2" x 2" x 1/8"	5/16"
10'-0"	3" x 3" x 1/8"	3/8"

5. Vertical Ducts: Ducts shall be supported where they pass through the floor lines with 1-1/2" x 1-1/2" x 1/4" angles for ducts up to 60". Above 60", the angles must be increased in strength and sized on an individual basis considering space requirements.

G. Flexible Ductwork:
1. General: Flexible ductwork shall be provided as shown on Drawings. Flexible ducts shall be installed in a fully extended condition free of sags and kinks, using only the minimum length required to make the connection, subject to the maximum lengths herein and below. Bends in any length of flexible duct shall not exceed 45 degrees for HVAC terminal unit connections or 135 degrees for air device connections and shall not exceed that recommended by the flexible ductwork manufacturer. Unless otherwise shown on the Drawings, the length of any one run of flexible ductwork shall not exceed 2 feet to terminal units or 8 feet to air devices.
2. Supports: Where flexible duct extension exceeds 48", horizontally, a support shall be provided. Duct shall be suspended on 48" centers with a minimum two inch (2") wide flat banding material. Refer to SDCS Fig. 3-9 and 3-10 and Page 3-17 for additional requirements.
4. Air Device Flexible Duct Connections: All joints and connections shall be made by turning back the insulation and securing the inner liner with self-locking nylon straps and sealing with two wraps of duct tape. The insulation shall then be placed over the joint, attached with a self-locking nylon strap and sealed on the exterior with an approved foil duct tape. Refer to SDCS Page 3-13 and 3-15 for additional requirements.

H. Duct-Mounted Devices:
1. Install duct mounted sensors and control devices furnished under Section 23 09 00, "Automatic Controls". Provide access doors at each duct mounted control device. Coordinate location of devices and installation requirements with the Section 23 09 00 Contractor.
2. Install duct type smoke detectors (if any) furnished under Division 26. Provide access doors at each sampling tube assembly. Coordinate location of detectors and installation requirements with Division 26.

3. Provide duct test ports in ductwork as required to properly balance all air systems. Test ports shall be located per ANSI/ASHRAE Standard III to allow accurate pitot-tube traverse measurements in ductwork.

3.6 CLEANING AND PROTECTION

A. General: Clean ductwork internally, section-by-section of dust and debris as it is installed. Clean external surfaces of foreign substances which might cause corrosive deterioration of the metal or, where ductwork is to be painted, might interfere with painting or cause paint damage.

B. Repairs: Strip protective paper from stainless ductwork surfaces and repair finish or replace ductwork portion wherever it has been damaged.

C. Temporary Closure: At ends of ducts which are not connected to equipment or air distribution devices at the time of ductwork installation, provide temporary closure of polyethylene film or other covering which will prevent the entrance of dust and debris until such time that connections are to be completed.

END OF SECTION

SECTION 23 33 00 DUCTWORK ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. The General Provisions, Supplemental General Provisions, section 23 01 00, General Specifications and Special Provisions apply to all Work specified in this Section.

B. This section describes the basic materials and installation methods for the registers, grilles, and diffusers. Comply with other Division 23 sections and drawings as applicable. Refer to other divisions for coordination of work.

C. Furnish and install all components of the duct systems specified herein, as indicated on the drawings, and as required to provide complete and operating systems.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide ductwork accessories as required for the project including the following:
1. Extractors,
2. Turning vanes are prohibited (see Mechanical Drawings), unless conditions make it impractical to install smooth radius fittings.
3. Splitter dampers (generally not allowed)
4. Access doors,
5. Straightening grids

1.3 QUALITY ASSURANCE

A. SMACNA Compliance: Comply with applicable portions of Sheet Metal and Air Conditioning Contractors' National Association (SMACNA) Duct Construction Standards (latest edition).

B. ASHRAE Standards: Comply with American Society of Heating, Refrigerating, and Air Conditioning Engineers, Inc. (ASHRAE) recommendations pertaining to construction of ductwork accessories.

1.4 SUBMITTALS

A. Shop Drawings: Show modifications of indicated requirements, if applicable, made to conform to local shop practice and show how these modifications ensure that the materials and weights are not reduced and that the fabricated units are equivalent to the specified requirements in every significant way.

PART 2 - PRODUCTS

2.1 DUCTWORK ACCESSORIES, FABRICATION AND MATERIALS

A. General: Provide ductwork accessories that comply with the Section 15891, "Ductwork", and other applicable product requirements of ductwork materials noted in this Section.

2.2 FLEXIBLE CONNECTIONS

A. General: Flexible connections shall be UL-labeled, 30 ounces glass fabric-lined with insulation and coated on both sides with neoprene, complete with attachment accessories, "Vent-Glass" by Vent-Fabrics, Inc. or approved equal.

2.3 DIRECTIONAL & VOLUME CONTROL DAMPERS

A. General: Provide all direction and volume control dampers required (all takeoffs, branches and major trunk splits) for a thorough test & balance effort and to efficiently deliver all air flows scheduled/shown. Drawings do not necessarily indicate all manual volume control dampers required. Also refer to HVAC details in the Drawings. All damper control devices shall be installed so as to be fully concealed in finished rooms and spaces.

B. Control Dampers:
1. Splitter Dampers: Splitter dampers shall be not less than 16 gauge. Splitter dampers shall be 1-1/2 times the width of narrowest duct leaving split, except not less than 12" long and shall have not more than 1/4" less height than duct in which it is installed. Splitter dampers having area less than 2.25 square feet shall be adjusted by means of a locking quadrant mounted on end of shaft. Splitter dampers having larger area shall be adjusted by means of one or more push rods in accordance with Figure 2-5, SMACNA "Low Velocity Duct Construction Standards".
2. Extractors: Provide extractors of the size and type required, with hex-key operated adjustable blades, and with gang operated galvanized steel blades on one-inch centers.
3. Pressure Taps: Where rectangular take-offs of branches from main ducts are used with 45 degree entry, provide manual volume regulators with lockable operators.
4. Round Taps: Where taps to main ducts or their branches are made, provide 45 degree angle taps or 90 degree spin-in taps with manual volume dampers.
5. Multi-leaf Dampers: Where multi-leaf dampers are required, provide opposed blade-type in accordance with Figure 2-12, SMACNA "Low Velocity Duct Construction Standards".

2.4 FLASHING AND COUNTER-FLASHING

A. General: Flashing and counter-flashing shall be as specified in other Divisions of these Specifications.

2.5 DUCT ACCESS DOORS

A. General: Provide hinged duct access doors, gasketed and with insulation where ductwork is indicated to be insulated. Provide construction per SMACNA Standards. Access doors shall be at least 15" x 15".

B. Inspection Plates: Provide inspection plates as required. Provide a minimum opening of 4" x 4" with a 6" x 6" cover plate. The cover plate shall be one gauge heavier than the ductwork, gasketed and secured with a minimum of eight sheet metal screws.

2.6 MISCELLANEOUS DUCTWORK MATERIALS

A. General: Provide miscellaneous materials for ductwork accessories, including hinges, refrigerator latches, sash locks, bolts and wing nuts, gaskets and pitot tubes as recommended by the ductwork accessories manufacturer for the application indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Access Doors: Install access doors so that the doors open against the system air pressure wherever feasible and that their latches are operable from either side, except where the duct is too small to be entered.

B. Inspection Plates: Install plates at each primary zone damper and where otherwise required for inspection of operable mechanisms within the duct systems.

C. Multi-leaf Dampers: Install multi-leaf volume dampers in each zone duct of multizone units and as otherwise required for balancing.

D. Splitter Dampers: Install splitter dampers at all divisions of ductwork for proper air pattern control.

E. Turning Vanes:
   1. Provide radius elbows instead of mitered elbows whenever possible. When mitered elbows are required, only provide turning vanes in SUPPY elbows. No turning vanes shall be supplied in return or exhaust elbows.
   2. Install turning vanes for all rectangular mitered elbows. Install turning vanes in accordance with SMACNA Standards.
   3. Turning vanes for Ducts with air velocity less than 2500 FPM: Use single wall type vanes for ducts having width equal to or less than 12 inches.
   4. Use double wall type vanes for (2” radius, 2–1/8” spacing) for ducts having widths greater than 12 inches.
   5. If duct sizes change in a mitered elbow, use single wall type vanes with a trailing edge extension.
   6. Turing vanes for Ducts with air velocity greater than 2500 FPM: Use double wall type vanes (4-1/2” radius, 3-1/4” spacing).

3.2 TESTING

A. General: Check installed ductwork accessories for required operation and leak-proof performance during the system's operational test. Repair or replace faulty accessories, as required to obtain proper operation and leak-proof performance.

END OF SECTION

SECTION 23 34 00 FANS AND HOODS

PART 1 - GENERAL

1.1 SUMMARY

A. The General Provisions, Supplemental General Provisions, section 23 01 00, Division 1 Specifications and Special Provisions apply to all Work specified in this Section.

B. This section describes the basic materials and installation methods for the fan and hood systems. Comply with other Division 23 sections and drawings as applicable. Refer to other divisions for coordination of work.

C. Furnish and install all components of the fan and hood systems specified herein, as indicated on the drawings, and as required to provide complete and operating systems.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide U.L. listed fans and ventilators as required by code and as specified.

B. Related Work: Curbs at roof-mounted equipment shall be in accordance with the requirements of Division 7.

1.3 QUALITY ASSURANCE

A. Acceptable Manufacturers: The model numbers listed in the Specification establish a level of quality and material. Subject to compliance with requirements, provide products and materials by the following:
   1. Carnes
   2. Greenheck
   3. Cook

PART 2 - PRODUCTS

2.1 PRODUCT REQUIREMENTS

A. Ratings: Fans shall be licensed to bear the AMCA certified ratings seal. Ratings of fans shall be based on 70°F and 29.92" of Hg atmospheric pressure. Air handling equipment shall be sized in conformance with applicable codes and good engineering practice. Roof-mounted units shall be located in coordination with the Architect to ensure proper sight lines.

B. Construction: Fan construction shall be in accordance with AMCA classes of construction for the intended duty. Fan wheels, shafts, and drives shall be statically and dynamically balanced at the factory as a unit. Balance reports shall be factory-certified to the Construction Manager.

C. Drives: Provide drives with a minimum belt horsepower capacity of 120% of the motor nameplate horsepower.

D. Motor Sheaves: Motor sheaves shall be Browning Type, MVP, or approved equal, adjustable type with double-locking feature. Motor sheaves shall be selected for the rated fan rpm and shall be adjustable to as close as 10% above and below the rated fan speed.

E. Fan Sheaves: Provide adjustable or nonadjustable sheaves with removable machined bushings. Sheaves shall be machined on surfaces. Sheaves with over three grooves shall be dynamically balanced and the manufacturer shall so designate on each sheave. Fan sheaves with three grooves or less shall be statically balanced and weights required for balancing shall be welded to the sheaves. Manufacturers shall be Browning, Eaton, Yale, Towne, Dodge Manufacturing Company, or Fort Worth Steel and Machinery Company.

F. Belts: Provide standard "V-groove" belts suitable for the service intended with the required capacities. The belts shall be closely matched and tagged prior to delivery to the job site. If the belts do not appear to be properly matched during operation, they shall be rechecked and, if necessary, replaced. Belts shall be as manufactured by Gates, Durkee-Atwood, Goodyear, Browning, or Uniroyal.

G. Bearings: Provide SKF, Sealmaster, Timken, or Fafnir externally or internally-mounted, grease-lubricated, self-aligning ball bearings. Bearings shall have grease type zerk fittings.

H. Motor Mount: Motors shall be mounted on an adjustable base rigidly supported on the fan and shall have extended shaft to accommodate the adjustable pitch sheave.

2.1 CEILING EXHAUST FANS

A. General: Provide direct driven ceiling exhaust fans as scheduled on Drawings. Fan shall be acoustically insulated and have a maximum sound level rating as scheduled.

B. Motor: Motor shall be suitably grounded and mounted on rubber-in-shear vibration isolators and speeds shall not exceed that scheduled.

C. Accessories:
1. Provide totally noise-free, integral back draft damper, with no metal-to-metal contact.
2. Inlet grille shall be white molded plastic with egg-crate or perforated shape and provide 85% free open area. See also FAN SCHEDULE on Drawings.
3. Provide terminal box on the housing with cord, plug, and receptacle inside the housing.

2.2 IN-LINE CENTRIFUGAL FANS

A. These fans are both belt driven and direct driven, usually with spun-aluminum housings, and are used for small ventilation requirements.

B. Description: In-line, belt-driven centrifugal fans consisting of housing, wheel, outlet guide vanes, fan shaft, bearings, motor and disconnect switch, drive assembly, mounting brackets, and accessories.

C. Housing: Split, spun aluminum with aluminum straightening vanes, inlet and outlet flanges, and support bracket adaptable to floor, side wall, or ceiling mounting.

D. Direct-Driven Units: Motor encased in housing outside of airstream, factory wired to disconnect switch located on outside of fan housing.

E. Belt-Driven Units: Motor mounted on adjustable base, with adjustable sheaves, enclosure around belts within fan housing, and lubricating tubes from fan bearings extended to outside of fan housing.

F. Fan Wheels: Aluminum, airfoil blades welded to aluminum hub.

G. Accessories:
   1. Gravity Shutters: Aluminum blades in aluminum frame; interlocked blades with nylon bearings.
   1. Volume-Control Damper: Manually operated with quadrant lock, located in fan outlet.
   2. Companion Flanges: For inlet and outlet duct connections.
   3. Fan Guards: 1/2- by 1-inch (13- by 25-mm) mesh of galvanized steel in removable frame. Provide guard for inlet or outlet for units not connected to ductwork.
   4. Motor and Drive Cover (Belt Guard): Epoxy-coated steel.

PART 3 - EXECUTION

3.1 VENTILATION AND EXHAUST FANS

A. General: Ventilating and exhaust fans not having integral vibration isolation shall be mounted on or suspended by vibration isolators as specified under Section 23 05 48. Where ductwork is connected to fans, Contractor shall provide UL labeled flexible duct connections.

B. Curbs: Factory-fabricated roof curbs, caps, and similar items, shall be supplied and installed by Mechanical Contractor. Coordinate installation with Roofing Contractor.

3.2 SYSTEMS

A. Refer to Section 23 05 53, “HVAC Equipment and Piping Identification” for applicable painting, nameplate, and labeling requirements.

B. Placement of fans and noise levels generated by the fans shall be taken into consideration. Fans shall be located and installed to minimize noise levels in occupied spaces.

END OF SECTION

SECTION 23 37 00 REGISTERS, GRILLES, AND DIFFUSERS

PART 1 - GENERAL

1.1 SUMMARY

A. The General Provisions, Supplemental General Provisions, section 23 01 00, Division 1 Specifications and Special Provisions apply to all Work specified in this Section.

B. This section describes the basic materials and installation methods for the registers, grilles, and diffusers. Comply with other Division 23 sections and drawings as applicable. Refer to other divisions for coordination of work.

C. Furnish and install all components of the registers, grilles, and diffusers specified herein, as indicated on the drawings, and as required to provide complete and operating systems.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide air outlets and inlets as required for the finished or non-tenant areas of the project including the following:
1. Ceiling air registers, grilles, diffusers
2. Wall-mounted registers and grilles

1.3 QUALITY ASSURANCE

A. Acceptable Manufacturers: The model numbers listed in the Specification establish a level of quality and material. Subject to compliance with requirements, provide products and materials by the following:
1. Titus
2. Krueger
3. Anemostat
4. Nailor
5. Metal Aire
6. Price
7. Tuttle & Bailey

B. NFPA Compliance: Comply with NFPA 90, as applicable to air diffuser construction and installation.

C. Air Distribution Equipment: Maximum space temperature variation shall not exceed 2°F through the conditioned area from 2’ above the floor to 7’ above the floor. The air outlets shall be selected as scheduled or by the manufacturer to suit the volume, throw, and noise level criteria described in these Specifications, and maintain maximum terminal velocities of 50 fpm, unless otherwise indicated.

PART 2 - PRODUCTS

2.1 AIR OUTLETS AND INLETS

A. General: Provide air outlets and inlets of the size, shape, and type, constructed of materials and components, and with finishes as required. Apply corrosion resistant treatment to surfaces prior to applying prime coat.

B. Ceiling Diffusers: Provide diffusers with corrosion resistant treated surfaces and finished in baked enamel unless otherwise required. Where applicable, provide adapters with diffusers to permit connection to round supply duct.

C. Registers and Grilles:
1. General: Provide registers that contain a key-operated multi-louvered opposed blade damper operable from the face side.
2. Supply Air Register: Provide supply air registers of the double deflection type.
3. Return Air Grilles and Return Air Registers: Provide grilles and registers as required.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install air outlets and inlets in accordance with manufacturer's written instructions and recognized industry practices to ensure that products serve intended functions.

B. Coordination: Coordinate with other trades, including ductwork, and ductwork accessories, as necessary to interface air outlets and inlets properly with other work.

3.2 FIELD CONTROL QUALITY CONTROL

A. Test installed devices to demonstrate satisfactory compliance with specified and indicated requirements.

END OF SECTION

23 74 16.11 PACKAGED, SMALL-CAPACITY, ROOFTOP AIR-CONDITIONING UNITS

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. All work specified herein shall be accomplished in accordance with the applicable requirements of Section 23 01 00 - General Requirements for Heating, Ventilating and Air Conditioning.

1.2 WORK INCLUDED

A. Receipt, unloading, handling, proper storage and protection from damage of all materials.

B. Layout and coordination of work with other trades.

C. The work under this Section shall include all labor, materials, accessories, services and equipment necessary to furnish and install the Packaged Rooftop Cooling/Heating Units complete as indicated on the drawings and specified here in.

PART 2 - PRODUCTS

2.1 ROOFTOP COOLING/HEATING UNITS

A. Each unit shall be of the single-zone type, completely factory assembled, piped, wired, tested and shipped in one piece with a single power point connection. Outside air system, filters, refrigeration system, supply air system, switches, and all standard operating and safety controls shall be furnished and factory installed. The size, type and capacity shall be as indicated on the drawings. Units shall be Carrier, Trane, Carrier, Lennox or pre-approved equivalent.

B. Units shall be certified in accordance with ARI current standards.

C. Electric heat/electric cool units shall be tested and certified in accordance with AGA safety requirements as a total package.

D. Gas heat/electric cool units shall be tested and certified in accordance with AGA safety requirements as a total package.

E. Unit shall be designed for outdoor installation and suitable for mounting on either a roof curb or steel grillage as indicated on the drawings.

2.2 CABINET CASING

A. The unit cabinet shall be constructed of no less than 18 gauge galvanized steel, bonderized and coated with a baked enamel finish. Cabinet interior shall be completely insulated with not less than one-inch thick neoprene coated fiberglass secured to sides, top and end panels with adhesive and mechanical fasteners. Screws or bolts are not

acceptable. Cabinet panels shall be easily removable for service access to all operating components. Permanently attached lifting lugs shall be provided for rigging purposes.

2.3 COILS

A. Condenser and evaporator coils shall be fabricated from seamless copper tubing mechanical bonded to rippled aluminum fins.

B. Coils shall be factory leak tested.

2.4 COMPRESSORS

A. Compressors shall be fully hermetic. Each compressor shall have vibration isolators, motor thermal overload protection, motor contactors, crankcase heater, pressure cutouts and its own refrigerant circuit with condenser, sight glass and filter drier.

B. Compressors shall be furnished with a 5-year written warranty covering the compressor and motor.

C. Serviceable semi-hermetic compressors shall be furnished with suction and discharge line service valves, oil pump, oil filter and oil level sight glass.

D. Standard units shall be capable of operating down to 55 degrees F outdoor air temperature without additional head pressure control. Each circuit shall have a low ambient temperature sensor to prevent operation below 55 degrees F.

E. The units shall be shipped with full operating charges of refrigerant and oil. The units shall include all necessary safety and operating controls.

2.5 FANS AND MOTORS

A. Supply air fan shall be double width, double inlet centrifugal type statically and dynamically balanced.

B. Fan motors shall be heavy duty 1800 rpm, open drip proof type with ball bearings. The motor shall have a variable pitch sheave and an adjustable base for proper alignment and belt tensioning. The entire fan assembly shall be completely isolated from the unit bulkhead with neoprene gasketing and mounted on double deflection rubber in shear or spring isolators.

C. Condenser fans shall be propeller type, direct drive with permanently lubricated bearings, and overload protection.

2.6 FILTER SECTION

A. The filter section shall be supplied complete with galvanized steel filter racks as an integral part of the unit. Unless otherwise specified on the drawings, the filter section shall be provided with two complete sets of pleated filters, 2-inch thick throwaway type equal to Camfill-Farr 30/30 filters.

2.7 ECONOMIZER SECTION

A. Unless otherwise specified on the drawings, units shall have an economizer section complete with outside air damper, return air damper, damper operator and barometric relief damper.

B. Economizer cycle shall provide unit capacity of 0 to 100% outside air.

C. Economizer cycle shall have solid state enthalpy control operating through the room thermostat to function automatically when outdoor air temperature and humidity are at acceptable levels. An adjustable minimum position switch shall be provided for outside air damper. On unit shut down, outside air damper shall close.

2.8 GAS-FIRED HEATING UNITS

A. Units with gas heating shall have a completely assembled, wired heating system integral with unit. System shall include heat exchanger, burners, gas valves, spark ignition system, limit switches and fan switch.

B. Unit shall be furnished with (FM/I.R.I.) controls.

C. Gas fired units shall be designed for use with natural gas having a heating value of 1000 BTU per cubic foot at an inlet pressure of 0.5 PSIG.

2.9 TEMPERATURE CONTROLS

A. Units shall be complete with self-contained control system, and unit staging shall be a minimum of 2 cooling stages and 2 heating stages where possible.

B. Thermostats shall be programmable electronic night setback stats, shall have dual setpoint for heating and cooling, and tamperproof. Setpoints must have adjustable dead band between heating and cooling.

2.10 ROOF CURBS

A. Provide minimum 12" high (coordinate with schedule) factory prefabricated self-flashing insulated roof curbs for all rooftop units. Coordinate the height of the roof curb with the roofing system so that the top of the roof curb is 12" (minimum) above roof surface. The curbs shall be designed to mate with the units and provide total support and complete weathertight installation when properly installed. Units and curbs shall be installed level, even if roofs are sloping.

B. NOTE: It is very important to the scheduling of the project that the roof curbs for the rooftop units arrive at the job site as early as possible. The HVAC Subcontractor shall submit shop drawings on the curbs as soon as possible.

2.11 CONDENSATE DRAIN PIPING

A. Provide condensate drain piping and trap as shown for each unit. The drain piping shall be constructed of Type M copper with soldered joints or PVC with solvent welded joints. Provide fiberglass splash block under each drain on roof.

PART 3 - EXECUTION

3.1 INSTALLATION

A. The unit shall be installed in accordance with the manufacturer's recommendations. An adoption of another unit must be submitted for approval and any expenses will be borne by the HVAC Subcontractor.

B. Natural gas pressure reducing valves for reducing the 2 PSIG gas to inlet manifold pressure to the units will be furnished and installed by the Plumbing Subcontractor.

END OF SECTION

SECTION 23 82 39.19 WALL AND CEILING UNIT HEATERS

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

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

1.2. SUMMARY

1. Section includes wall and ceiling heaters with propeller fans and electric-resistance heating coils.

1.3. SUBMITTALS

A. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.

B. Manufacturer's installation instructions shall be provided along with product data.

C. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).

D. Product Data: For each type of product.
1. Include rated capacities, operating characteristics, furnished specialties, and accessories.

E. Shop Drawings:
1. Include plans, elevations, sections, and details.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include details of anchorages and attachments to structure and to supported equipment.
4. Include equipment schedules to indicate rated capacities, operating characteristics, furnished specialties, and accessories.
5. Wiring Diagrams: Power, signal, and control wiring.

1.4. CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For wall and ceiling unit heaters to include in emergency, operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1. MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
1. INDEECO.
2. Markel Products; TPI Corporation.
3. Marley Engineered Products.
4. Trane.
5. Approved equivalent.

2.2. DESCRIPTION

A. Assembly including chassis, electric heating coil, fan, motor, and controls. Comply with UL 2021.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.3. CABINET

A. Front Panel: Extruded-aluminum bar grille, with removable panels fastened with tamperproof fasteners.

B. Finish: Baked enamel over baked-on primer with manufacturer's standard color selected by Director’s Representative, applied to factory-assembled and -tested wall and ceiling heaters before shipping.

C. Surface-Mounted Cabinet Enclosure: Steel with finish to match cabinet.

2.4. COIL

A. Electric-Resistance Heating Coil: Nickel-chromium heating wire, free from expansion noise and 60-Hz hum, embedded in magnesium oxide refractory and sealed in corrosion-resistant metallic sheath. Terminate elements in stainless-steel, machine-staked terminals secured with stainless-steel hardware, and limit controls for high-temperature protection. Provide integral circuit breaker for overcurrent protection.

2.5. FAN AND MOTOR

A. Fan: Aluminum propeller directly connected to motor.

B. Motor: Permanently lubricated. Comply with requirements in Section 230513 "Common Motor Requirements for HVAC Equipment."

2.6. CONTROLS

A. Controls: Unit-mounted thermostat. Low-voltage relay with transformer kit, if required.

B. Electrical Connection: Factory wire motors and controls for a single field connection with disconnect switch.

PART 3 - EXECUTION

3.1. EXAMINATION

A. Examine areas to receive wall and ceiling unit heaters for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for electrical connections to verify actual locations before unit-heater installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2. INSTALLATION

A. Install wall and ceiling unit heaters to comply with NFPA 90A.

B. Install wall and ceiling unit heaters level and plumb.

C. Install wall-mounted thermostats and switch controls in electrical outlet boxes at heights to match lighting controls. Verify location of thermostats and other exposed control sensors with Drawings and room details before installation.

D. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

E. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

END OF SECTION

SECTION 26 01 00

GENERAL ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. The Drawings are schematic and are not intended to show the exact location of outlets, devices, etc. or the routing of conduit. Review architectural elevations and details for exact placement of outlets and devices. Conditions indicated on architectural plans shall govern for this work.

B. Dimensions and information regarding accurate locations of equipment, and structural limitations and finish shall be coordinated and verified with other Divisions of Work. Be prepared to provide dimensions and information regarding the Work of this Division to other trades.

C. The right is reserved to relocate any device (receptacle, switch, fire alarm, audio/visual, junction box, outlet, etc.) a maximum of 10’-0” before it is permanently provided without incurring additional cost to the Contract.

1.2 REFERENCE STANDARDS

A. All work shall comply with the most recently revised versions of all local, state and federal codes, ordinances of the authority having jurisdiction, laws, rules and regulations. Any modifications required by any of the above shall be made without any additional cost. Where requirements between governing Codes and Regulations vary, the more restrictive provision shall apply.

B. Nothing contained in the Contract Documents shall be construed as authority or permission to disregard legal requirements and regulations. The Contractor shall thoroughly review the Documents and bring any such conflicts to the attention of the Architect and Engineer prior to installation.

C. All materials shall be new and shall bear the label of UL (Underwriters Laboratory) and shall be listed for the purpose.

1.3 EXISTING CONDITIONS

A. Where work is to be performed in an existing facility, the contractor shall visit the site prior to bid and be familiar with all existing conditions. Special attention shall be given to work to be performed above an existing ceiling.

B. Where existing slabs are to be cut or core drilled, the contractor shall x-ray the existing slabs to avoid cutting or disrupting existing conduits, cables, plumbing, or structural members.

C. The electrical service to the building shall not be interrupted without written consent of the building owner.

D. No allowance will be made for lack of knowledge of existing conditions.

E. At the completion of the project, all work under this Division shall be completely integrated with the existing systems and left in perfect operating condition.

F. Where work under this Division disrupts the continuity of any existing to remain circuit or feeder, the Contractor shall repair/replace as necessary to return to a perfectly functional and safe operating condition.

G. Prior to any demolition or construction the Contractor shall have the existing conditions inspected by an EPA, OSHA certified asbestos abatement agency to identify the presence of asbestos. Should any asbestos be found it shall be brought to the immediate attention of the Architect and Owner and specifically identified in writing.

1.4 DEFINITIONS

H. Provide: to furnish, install and connect.

I. Furnish: to supply all materials, labor, equipment, testing apparatus, controls, tests, accessories and all other items customarily required for the proper and complete application.

J. Install: to join, unite, fasten, link, attach, set-up or connect together, complete, tested, and ready for normal satisfactory operation.

K. Engineer: the Engineer of record.

L. Contract Documents: the complete set of Specifications and Drawings of all Divisions.

M. Work: labor, materials, equipment, accessories, controls and other items required for a complete installation.

N. Concealed: embedded in masonry or other construction, installed in furred spaces, within double partitions or hung ceilings, in trenches, in crawl spaces or in enclosures.

O. Conduit: rigid steel; intermediate metal conduit (IMC), plastic conduit (PVC), electrical metallic tubing (EMT), or flexible steel conduit.

P. Manufactured Cable: pre-wired metal clad manufactured cable bearing a UL label; metal clad cable (MC), health care (HCF).

Q. Wiring/Wired: all wire installed in conduit to equipment, device, junction box, light fixture, etc. from panel board or switchgear with all required boxes, connectors, couplings, etc.

R. Exposed: not installed underground or concealed.

S. Equal: equal in quality, workmanship, materials, weight, size, design and efficiency of the specified product, conforming to manufacturers.

T. Supply: to purchase, procure, acquire and deliver complete with related accessories.

U. Authority Having Jurisdiction (AHJ): applicable local, state and federal authorities having jurisdiction over any part of the Scope within this Division <u>and</u> other Divisions.

1.5 SHOP DRAWINGS AND PRODUCT DATA

A. The Contractor shall obtain complete shop drawings, product data and samples from the manufacturers, suppliers, vendors for all materials and equipment as specified herein in various Sections of the Specifications, and shall submit data and details of such materials and equipment for review via electronic format (e.g. PDF).

B. Shop drawings and/or product data shall be submitted for the following (as applicable to project) for review:
   1. Switchboards, panelboards, transformers, busway, motor control centers, ground fault system and other applicable equipment associated with the main distribution.
   2. Disconnect switches, fuses, motor starters.
   3. Lighting fixtures, lighting control system, dimming system, emergency batteries and other equipment associated with lighting.
   4. Surge Protection Devices.
   5. Devices, receptacles, switches, cover plates, occupancy sensors. The product data shall include the manufacturers name, model number, size and color.
   6. Conduit, wire, boxes, fittings.
   7. Fire Alarm System Components.

1.6 AS-BUILT DRAWINGS

A. The Contractor shall maintain on a daily basis at the Project site a complete set of "Record Drawings". Project Record Documents shall be maintained as specified in Division 01.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturer's names and catalog numbers specified in the Contract Documents are intended to describe the material and set the standard of quality. <u>All bids shall be based on material specified</u>. Request for approval of material not specified may be considered if the request is in written form and submitted to the Architect no later than fourteen (14) days prior to the bid date. All requests shall conform to the provisions of the general and supplementary conditions.

B. When specific names are not stated, only the best available quality of material or equipment shall be submitted for review and used in the installation.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Adequate space shall be allowed for clearance in accordance with the Code requirements and the requirements of the local Authorities having jurisdiction, and the equipment manufacturer's recommendations.

B. In the preparation of Drawings, a reasonable effort to accommodate acceptable equipment manufacturer's space requirements has been made. However, since space requirements and equipment arrangement vary according to each manufacturer, the responsibility for initial access, maintenance access, code required access, and proper fit rests with the Contractor.

C. Physical dimensions and arrangements of equipment to be installed shall be subject to the Architect's and Engineer's review.

D. The General Contractor and all Subcontractors shall coordinate the installation of ductwork, conduit, busway, piping, cable trays, etc., installation with lighting fixtures,

special ceiling construction, air distribution equipment, and the structure. Provide additional rises, drops and offsets as required. If after installed, new ductwork, conduit, busway, piping or cable is found to be in conflict with the architecture, structure, or other trade Work which is either existing or shown on the Contract Documents, the ductwork, conduit, busway, piping or cable shall be relocated without additional cost.

E. Accessibility and Clearance:
   1. Electrical equipment, outlets, junction and pull boxes shall be installed in accessible locations, avoiding obstructions, preserving headroom, and keeping openings and passageways clear.
   2. Minor adjustments in the locations of equipment shall be made where necessary, providing such adjustments do not adversely affect functionality of the equipment.

3.2 STRUCTURAL FITTINGS

A. Provide the necessary sleeves, inserts, hangers, anchor bolts, and related structural items. Provide at the proper time.

B. Location: At a time in advance of the work, verify openings shown on the Architectural and Structural drawings, and coordinate any additional openings.

C. If the work of this Section requires modification of the Architectural or Structural drawings, provide new instructions as to requirements for these openings. Submit for review and coordination to Architect.

D. Sleeves shall be supplied for electrical conduits passing through walls or slabs and shall be placed before concrete is poured.

E. Equipment supports for electrical work shall be fastened to the structure by inserts, anchor bolts, bolting to drilled and tapped structural members, or be welded to the structure.
   1. Welding shall be done with the electric arc method by certified welders. Supporting members shall be shop coated with a suitable primer.
   2. Surfaces damaged by installation of supports shall be touched up with primer to match shop coat. Any drilling of structural members shall be approved by the Architect.

F. Flashing:
   1. Wherever conduits pass through the roof or outer walls, base flashing and counter flashing shall be provided.
   2. Such flashing shall be properly installed by skilled workmen, and shall include grouting, mastic or tar application, or other means to insure a permanent, waterproof, neat and workmanlike installation.
   3. Insofar as possible, flashing shall comply with and be similar to requirements for flashing in General Construction Work.

G. Anchor bolts and inserts shall be galvanized and of adequate size and strength for installation of electrical work and shall be placed in forms before concrete is poured.
   1. Placement of bolts in bases shall be done under other Division. Provide detail drawings, templates, and anchor bolts for bases to the General Contractor in time to avoid delaying work schedules.
   2. Expansion shields shall only be used with specific approval of the Architect. Wooden or soft metal plugs shall not be used.

H. Cutting and patching:

1. All additional cutting, patching and reinforcement of construction of building, subject to review by the Architect, shall be performed under this Section.
2. Refer to appropriate Division for requirements.

3.3 WEATHERPROOF EQUIPMENT

A. Electrical devices or equipment located in damp, semi-exposed areas shall be weather-resistant. Enclosures shall comply with NEMA Type 3R requirements.

B. Surface mounted outlet boxes shall be cast metal with threaded bolts. Pull or junction boxes shall be cast metal with bolted and gasketed covers.

C. Outlet box covers shall be of a suitable weatherproof type with gaskets, packing glands, weatherproof doors, or other required means to prevent entry of moisture.

D. Lighting fixtures shall be provided with suitable gasket, and UL labeled for location.

3.4 CLEANING

A. Brush and clean work prior to concealing, painting and acceptance. Perform in stages if directed.

B. Painted exposed work soiled or damaged: Clean and repair to match adjoining work before final acceptance.

C. Remove dust and debris from inside and outside of material and equipment.

3.5 IDENTIFICATION OF CIRCUITS AND EQUIPMENT

A. Numbered adhesive strip tags shall be attached to branch circuit wiring in conduits at every point where runs are broken or terminated. Also tag pull wires in empty conduits.

B. Junction and Pull boxes shall have covers stenciled with box number when shown on the drawings, or circuit numbers according to panel schedules. Data shall be lettered in a conspicuous manner with a color contrasting to finish.

3.6 TESTS AND DEMONSTRATIONS

A. All systems shall be tested in the presence of the maintenance personnel upon completion of the Work and demonstrates that the installation is in accordance with the Contract Documents.

B. All motors shall be checked and adjusted for correct direction of rotation.

C. Loading of circuits and feeders in panelboards shall be checked and balanced.

D. Any work found not to be in compliance with the Contract documents shall be repaired or replaced without incurring additional cost to the Contract price.

E. Provide all instruction on maintenance and operation of all systems and equipment provided under this Division.

3.7 WARRANTIES

A. The warranty period for all systems, equipment, components, work, etc. shall be no less than one (1) year, unless specified otherwise hereinafter and shall include at least one (1) full heating season and one (1) full cooling season.

B. The Contractor shall, without additional cost, remedy any defects within a reasonable time to be specified in notice from the Architect. In default thereof, the Owner/Agency may have such work done and charge all costs to the Contractor.

C. The start of the Contractor's warranty period, as defined in the General Conditions, shall commence on the issue of a "Certificate of Substantial Completion", by the Owner/Agency or the Owner's/Agency's Representative for each item of material, equipment or system.

End of Section

SECTION 26 05 00

RACEWAYS AND WIRING

PART 1 - GENERAL

1.1 SUMMARY

A. Provide all raceways and wiring specified herein and as required to provide a complete system throughout the project as indicated on the Drawings.

PART 2 - PRODUCTS

2.1 CONDUIT

A. Galvanized Rigid Steel Conduit (GRC): Rigid steel conduit shall be galvanized, constructed of high-grade raw steel piping, galvanized inside and outside with threaded joints.

B. Intermediate Metal Conduit (IMC): IMC shall be constructed of high-grade steel tubing, galvanized inside and outside with threaded joints. Zinc coating shall be applied by the hot-dip, galvanized process.

C. Electrical Metallic Tubing (EMT): EMT shall be constructed of high-grade steel, zinc coated and galvanized inside and outside.

D. Rigid Plastic Conduit (PVC): PVC conduit shall be polyvinyl chloride rigid scheduled to heavy wall type. PVC conduit shall be joined with PVC couplings of the solvent cement type to provide complete watertight joints. Conduit systems shall be UL listed for direct burial and exposed use.

E. Flexible Metal Conduit: Shall be flexible steel conduit tubing spirally wound having a hot-dip galvanized coating and meeting requirements of UL for flexible metal conduit.

F. Liquid tight Flexible Metal Conduit: Shall be flexible steel conduit spirally wound and shall have a copper grounding strand and factory-applied neoprene jacket. Liquid tight flexible conduit shall meet the requirements of UL.

2.2 CONDUIT FITTINGS

A. GRC and IMC: Shall be factory-made taper threaded and of the same material as the conduit. Provide with molded nylon insulating bushing or throat at all boxes and cabinets with locknuts inside and outside. Provide watertight hubs in wet locations for terminations into enclosures. Provide insulated grounding bushing where required.

B. EMT: Shall be of the same material as the conduit and shall be hexnut compression or steel setscrew. Provide with molded nylon insulating bushing or throat at all boxes and cabinets. Provide insulated grounding bushing where required.

C. PVC: Shall be Schedule 40 and of the same manufacturer as the conduit.

D. Flexible Metal Conduit and Liquidtight Flexible Metal Conduit: Provide couplings at connections between flexible and rigid conduit suitable for that application. Provide with nylon-insulated busing or throat at all boxes and cabinets with locknuts.

E. Expansion Joints: Provide O.Z./Gedney, Type AX expansion joint fittings for all conduit which crosses an expansion joint. Provide with internal ground and external bonding jumper.

F. Wire Support Bushings: Provide for vertical runs as required by the NEC.

2.3 PRE-WIRED MANUFACTURED CABLE

A. Pre-wired manufactured cable is **ONLY** acceptable for branch circuit wiring for receptacle and lighting circuits when ran box to box and concealed in walls or in millwork. All other branch circuit electrical wiring shall be ran in EMT conduit. All homeruns shall be in ¾" EMT conduit ran from the first device or light fixture box to the panel.

B. Where allowed (indicated above), Pre-wired manufactured cable shall be type "MC" or type "HCF" only (type "AC" cable not allowed) consisting of one (1), two (2), three (3) or four (4) copper "THW", "THHN" or "THHN/THWN" insulated phase, neutral and ground conductors. Ground shall be of minimum size required by NEC, as specified in other Sections and as noted on the Drawings.

C. Pre-wired manufactured cables shall NOT be used for:
1. Mechanical equipment branch circuits
2. Feeders
3. Homeruns
4. Exposed
5. Life Safety Circuits
6. Critical Branch Circuits

D. Cable shall not pass through a fire rated wall or assembly.

E. Acceptable cable manufactures are AFC, Alflex and Southwire.

F. Cable termination fittings shall be O. Z. Gedney C5, T&B #253, Steel City Series XC-400 or approved equal clamp-type, malleable iron fittings. Die-cast fittings are not acceptable.

2.4 JUNCTION BOXES AND PULL BOXES

A. Junction boxes and Pull boxes shall be galvanized steel with mode size and gauge as required by the NEC in accordance with voltage parameters. Covers shall be of the same gauge as the box as shall be screw fastened. Boxes shall be sized as required but shall be no smaller than 4 inches square and 1-1/2 inches deep.

B. Covers shall be accessible.

C. Provide galvanized cast iron or aluminum with threaded hubs and gaskets for outdoor and damp locations.

D. Boxes in grade or underwater shall be cast brass or bronze.

2.5 OUTLET BOXES

A. Outlet boxes shall be UL listed, and of sizes and types required for the application.

B. Boxes Recessed in Construction: Sheet steel boxes, unless noted or required otherwise. Boxes shall be no lighter than 14 gauge and shall be galvanized after fabrication. Set so face of box will finish flush with building surface.
   1. For Lighting Fixture Outlets: 4-inch square with raided fixture ring.
   2. For Wall Switches, Receptacles, and Communication Use: 4 inch square, one-piece; no sectional boxes permitted. Use boxes with plaster rings in all plastered walls where wall thickness permits. Use boxes less than 1-1/2 inch deep only in locations where deep boxes cannot be accommodated by construction.

C. Boxes Used Outdoors or in Damp/Wet Locations: Cast metal boxes (iron and alloy) with gasketed covers and threaded hubs.

D. Boxes in Hazardous Areas: Approved cast metal boxes with appropriate sealing fittings.

E. Provide blank cover for boxes without fixture or device.

F. Boxes in grade or underwater shall be cast brass or bronze.

2.6 WIREWAYS AND AUXILLARY GUTTERS

A. Wireways shall be constructed in accordance with UL 870. Every component including lengths, connectors, and fittings shall be UL listed and labeled. Provision shall be included in the construction to allow screwing the hinged cover closed without the use of parts other than the standard lengths, fittings, and connectors. It shall also be possible to seal the cover in the closed position with a sealing wire.

B. Wireways shall be constructed with/without knockouts, as required. Enclosure type shall be as required by conditions encountered.

C. Gutters and Wireways shall be suitable for “lay-in” conductors. Connector covers shall be permanently attached so that removal is not necessary to utilize the lay-in feature.

D. All sheet metal parts shall be provided with a rust-inhibiting phosphatizing coating and gray baked enamel finish. All hardware shall be plated to prevent corrosion. All screws installed toward the inside shall be protected by spring nuts or otherwise guarded to prevent wire insulation damage.

E. All connectors shall be slip-in type with self-retaining mounting screws. All hangers shall be two-piece with hook-together feature to permit pre-assembly of wireway and hanger bottom plate before hanging on pre-installed upper bracket.

2.7 SURFACE METAL RACEWAY

A. Surface metal raceway shall be UL listed and labeled and be installed ONLY where required; shall be used together with couplings, clips, bushings, straps, connectors, connection covers, elbows, extension boxes, fixture boxes, extension adapters, blank covers and all other required fittings; shall be of the proper size to accommodate the conductors to be installed therein in each case.

2.8 CONDUCTORS – 600 VOLTS OR LESS

A. Provide conductors of stranded copper, 98% conductivity, new building wire, insulated in accordance with the requirements of the NEC. Insulation shall be rated no less than 600-volt. Conductors for sizes No. 10 and smaller shall be Type “THWN” or “THHN/THWN”. Conductors for sizes No. 8 and larger shall be type “XHHW”. Solid conductors terminating in a breaker or device shall be utilized for wire size No. 10 and

below. Sizes specified are AWG gauge for No. 4/0 and smaller and circular mils (kcmil) for sizes larger than No. 4/0. Minimum wire size shall be No. 12.

B. Connectors: Make spices and connections in conductors using UL connectors.
   1. Stranded Conductors: UL listed, solderless, bolted pressure or compression connectors. Connectors shall be of proper sizes to match conductor sizes.
   2. Solid Conductors: UL listed, bolted pressure or spring connectors. Connectors shall be of proper sizes to match conductor sizes.
   3. Motor Lead Pigtails: UL listed, crimp lugs with through-bolt fasteners between lugs. Lugs shall be of proper sizes to match conductors. Proper sized dies and tools shall be provided to apply connectors.
   4. Lighting Fixture Taps: Electrical spring connectors as specified for solid conductors.
   5. Ground connections: Burndy ground clamps or connectors of a type suitable for and having a UL listing for grounding applications.

C. All conductor sizes shown on the Drawings are Copper unless specifically noted otherwise. All ground conductors shall be Copper.

2.9 MANUFACTURERS

A. Conduit (GRC, IMC, EMT)
   1. Allied
   2. Republic
   3. Triangle
   4. Wheatland

B. Conduit Fittings (GRC, IMC, EMT)
   1. Appleton
   2. O.Z. Gedney
   3. Steel City
   4. Thomas and Betts
   5. Raco

C. Flexible Metal Conduit
   1. AFC
   2. Alflex
   3. Anaconda
   4. International Metal Hose

D. Liquidtight Flexible Metal Conduit
   1. American Brass Company
   2. Anaconda
   3. Electri-Flex Company

E. PVC Conduit and Fittings
   1. Thomas and Betts
   2. Prime Conduit
   3. Cantex
   4. Carlon
   5. Certainteed
   6. Triangle

F. Conductors, Copper, 600 Volts or less
   1. American Insulated Wire
   2. Cablec

3. General Cable
4. Pirelli
5. Triangle
6. Colonial Wire and Cable Co.
7. Prismia
8. Southwire

G. Conductors, Aluminum, 600 volt or less (where specified)
1. Alcan Cable
2. Cablec
3. Southwire

H. Outlets and Boxes
1. Appleton
2. Raco
3. Steel City
4. Midland

PART 3 - EXECUTION

3.1 CONDUIT

A. PVC Schedule 80 (encased in 4” concrete on all sides) or Galvanized Rigid Steel (GRC) meeting corrosion resistant protection of NEC 300.6 shall be used for underground service entrance and underground feeders. When PVC is used, a transition to metal conduit shall be made below grade using GRC 90 degree fitting such that only metal conduit exits concrete or ground.

B. GRC or Intermediate Metal Conduit (IMC) shall be used where exposed and subject to physical damage, or installed in damp or wet locations.

C. Rigid Plastic Conduit (PVC) shall be used for underground branch circuits, underground feeders where run below the slab on grade, 1” maximum in the slab on grade, 1” maximum in the slabs above grade, in concrete columns and concrete wall and in masonry walls.

D. PVC Schedule 80 shall be used for all branch circuit conduit installations direct buried in earth. When PVC is used, a transition to metal conduit shall be made below grade using GRC 90 degree fitting such that only metal conduit exits concrete or ground.

E. All underground conduit shall be installed with a metal tracer wire for locating purposes.

F. Electrical Metallic Tubing (EMT) shall be used for branch circuits concealed in walls and ceilings. EMT may be used for feeders where not exposed to damage and/or not installed in wet or damp locations.

G. Flexible Metal Conduit shall be used for connections to rotating or vibrating equipment. The lengths shall be as short as possible, in no case longer than 6’ or shorter than 12”.

H. Liquidtight Flexible Metal Conduit shall be used for connections to rotating or vibrating equipment where located outdoors or in damp or wet locations. The lengths shall be as short as possible but in no case longer than 6’ or shorter than 12”. Liquidtight Flexible

Metal Conduit shall NOT be located above a ceiling, in an air shaft or in a mechanical room utilized as a return air plenum.

I. Raceways shall be installed as a complete and total wiring enclosure system from outlet to outlet, to junction box, pull box, panel or cabinet prior to the installation of the conductors.

J. All conduit shall be run concealed (except in electrical, mechanical and similar area) unless shown otherwise. Where conduit is run exposed it shall be run in a neat and orderly manner. All conduit shall be run parallel and perpendicular to the building structure.

K. Conduits shall be secured to all boxes, cabinets, panels and equipment with locknuts and bushings and shall be securely fastened in place on intervals required by the Code and local codes; hangers, supports or fastenings shall be provided at each elbow and at the end of each straight run within 3’ of a termination to a box or cabinet. All supports shall be independent and shall not use ceiling supporting system wires.

L. Use threaded rods and hangers for supporting single conduit. Multiple conduits shall be supported using a trapeze of Unistrut (or Kindorf) channels and threaded rods with double nut/washer.

M. Provide pullboxes as shown and/or as required by Code and where necessary in the raceway system to avoid excessive runs or too many bends. Boxes shall have removable hinged or screw covers and shall be accessible.

N. The minimum size conduit shall be ½” diameter. Homeruns shall extend from the first outlet or device to the panel designated and shall be a minimum ¾” diameter.

O. Provide non-hardening elastic type duct seal compound for each conduit entering the building from the outside and from one space to another having a normal operating temperature differential greater or less than 10 degrees F.

P. Provide seals around all conduit and sleeves penetrating through walls, partition or ceilings. Provide UL approved fire resistant seal around all penetrations through fire rated barriers to maintain the barrier rating.

Q. Provide pull wire or nylon rope in all empty conduits.

R. Fire alarm system conduit, fittings, junction boxes, and covers shall be painted red.

S. Sleeves shall be rigid GRC with bushings.

T. Provide cable trays or hooks/rings above suspended accessible ceilings for data cabling as required.

3.2 CONDUIT PROTECTION

A. Provide underground conduit with a top cover at least 30” below finished grade and no more than 48”.

3.3 CONDUCTORS – 600 VOLTS OR LESS

A. No conductor shall be smaller than No. 12 except for signal or control circuits.

B. All conductors shall be installed in conduit unless noted otherwise on plans and/or specs.

C. Where a connection is made to any terminal of 40 amperes or more and/or conductors No. 8 or larger, copper terminal lugs shall be bolted to the conductors. Where multiple terminal lugs are made, individual lugs for each conductor shall be used. Where aluminum conductors are accepted in this Section or noted on the drawings, the terminations shall be made with high compression lugs as manufactured by Ideal or MAC.

D. A maximum of six (6) current carrying conductors shall be run in a conduit. The neutral shall be considered a current carrying conductor.

E. For homeruns of 120 Volt, 20 amp circuits, where the length of run from the panelboard to the center of the load exceeds 100'-0" the conductors shall be No. 10 minimum. If that length exceeds 200'-0" the conductors shall be No. 8 minimum.

F. Provide an equipment grounding conductor in all feeder and branch circuit conduits. Size per code unless shown otherwise.

G. Conductors shall have color coded jackets for sizes No. 8 and smaller and color coded marking tape (where allowed) or solid color jackets for sizes larger than No. 8 as follows:

<u>120/208V System</u>
Phase A – Black
Phase B – Red
Phase C – Blue
Neutral – White
Ground – Green

H. Where phase marking tape is used it shall be wrapped 2" wide and located at two (2) locations 6" and 18" from the termination.

I. Before pulling any wire into conduit, thoroughly swab the conduit and clean the boxes of debris.

J. Run feeders in continuous lengths, without joints or splices. Joints shall occur in branch circuits only in locations where they divide.

K. Run conductors for emergency power in conduits separate from all other wiring.

L. Bundle conductors in switchboards and panelboard cabinets and similar using nylon straps made for the purpose. Conductors No. 8 and larger shall be bundled in individual circuits.

3.4 JUNCTION BOXES, PULL BOXES, AND OUTLET BOXES

A. All junction boxes and pullboxes shall be sized in accordance with the Code.

B. All boxes shall be rigidly secured in position to building structure. Boxes larger than 4" shall be secured at two points.

C. Outlet boxes shall be flush with the finished wall or ceiling, or not more than ¼" back, unless specifically shown as surface mounted or its purpose is to be above the ceiling.

D. Provide galvanized steel or cast type outlet boxes. Where exposed GRC or IMC terminates in a box, provide cast box with threaded hubs.

E. All boxes shall be provided with a cover plate.

F. All outlet boxes shall be mounted vertically unless noted otherwise or shown horizontally mounted on architectural plans.

G. Where outlets are shown at the same location but at different heights, they shall be mounted one above the other along the same centerline.

H. The exact mounting height of an outlet may be adjusted slightly to align with masonry joint where approved by the Architect.

I. Verify outlet locations in finished spaces with Drawings of interior details and finishes.

J. Outlets shall NOT be located back to back. Where outlets are shown on opposite sides of a wall, they shall be located in separate stud spaces.

K. Protect floor boxes from entering debris during construction using temporary covers approved by the floor box manufacturer.

L. Boxes shall not be supported from a suspended ceiling.

End of Section

SECTION 26 05 26

GROUNDING SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Provide all equipment, materials, tools, and labor to provide a complete grounding system.

B. Ground all metallic parts of the electrical system which are not intended to carry current such as conduit, busduct, switchgear, panelboards, cabinets and enclosures, motor frames, device boxes, etc., in accordance with the NEC and applicable codes.

C. In non-metallic conduits, maintain continuity of equipment grounding by installing an insulated grounding conductor and connected by an acceptable method.

PART 2 - PRODUCTS

2.1 GENERAL

A. All equipment and materials provided under this Section of the Specifications shall be new, UL listed, and bear the UL label.

B. All switchboards, panelboards, motor control centers, transformers, busway, etc. shall be provided with a copper equipment ground bar bolted, brazed, or riveted to the associated enclosure or cabinet. All receptacles, switches, disconnects, individual motor controllers, etc. shall be provided with a grounding terminal connected to the device frame or enclosure.

C. All conduit, cable tray, manufactured wiring systems, raceways, junction boxes, pull boxes, etc. shall be made electrically continuous by means of grounding conductors, bonding jumpers, grounding bushings, etc. as required by the NEC and the authorities having jurisdiction.

D. Refer to other Sections for additional grounding requirements.

2.2 GROUNDING CONDUCTORS

A. All grounding electrode conductors shall be bare or green insulated copper conductors sized per the NEC, unless noted on the Drawings. Where the authority having jurisdiction or local code requires grounding electrode conductor sizing in excess of that shown on the Drawings or specified herein, the larger size conductor shall be installed.

B. All equipment grounding conductors shall be green insulated copper conductors sized as indicated on the Drawings. Where the authorities having jurisdiction or local code requires equipment grounding conductor sizing in excess of that shown on the Drawings or specified herein, the larger size conductor shall be installed.

C. All bonding conductors shall be flexible copper bonding jumpers sized in accordance with the NEC for grounding electrode conductors.

2.3 GROUND RODS

A. All ground rods, where indicated, shall be a minimum of ¾" x 10'-0" copper clad steel unless otherwise indicated on the Drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Provide adequate and permanent service neutral and equipment grounding in accordance with the NEC and as follows (as applicable to the scope of this project).

B. Each system of electrically continuous metallic piping and ductwork shall be electrically grounded in accordance with the requirements of the NEC for "bonding" as they apply to the "bonding of piping systems". Isolated metallic piping and duct systems shall be bonded to the building equipment grounding system.

C. Bonding and grounding conductors shall be sized, shall be run in conduit, and shall be connected to various services in accordance with the requirements of the authorities having jurisdiction and the NEC.

D. Grounding terminals for receptacles (other than isolated ground receptacles), metal outlet boxes, metal device boxes, metal enclosures, and all non-current carrying conductive surfaces of fixed electrical equipment likely to become energized that are subject to personal contact, operating at over 100 volts within **Patient Care Areas** shall be directly connect to an insulated copper equipment grounding conductor.

E. Grounding Electrode System
   1. Provide a made electrode consisting of three (3) ground rods spaced 10' apart in the form of an equilateral triangle. Each rod shall be installed a minimum of 12" below finished grade and a minimum of 36" clear of the foundation with No. 3/0 bare stranded copper conductors bonded together 24" below finished grade to form a loop (grounding triad).
   2. Extend from the made electrode a No. 3/0 insulated stranded copper conductor in a 1" conduit to each main service disconnect (or single ground point where applicable) and connect to the neutral bar, housing and frame.
   3. The following electrodes shall be bonded together with a No. 3/0 insulated stranded copper conductor in 1" conduit to form a grounding electrode system:
      a. Made electrode described above.
      b. Underground main metallic water pipe. Connect ahead of the first valve and provide a bonding jumper across the water meter.
      c. Structured steel building frame.
      d. Where the above electrodes are not available or feasible, provide suitable grounding electrodes per NEC.
   4. Where nonmetallic insulating coupling, dielectric flanges or similar are used in metallic water piping, provide a No. 3/0 insulated stranded copper conductor across the couplings with the conductor attached to the water line with clamps on each side of the coupling.
   5. Provide exothermic type chemical welded type connectors (Cadweld or approved equal) for the joining of conductors to ground rods, grounding plates and

splicing. Provide compression and bolted type connectors for the joining of grounding electrode conductors to the ground bars.

6. Provide a separate green-insulated equipment grounding conductor, with insulation of the same rating as the phase conductors, for all feeders and branch circuits. Install the grounding conductors in the raceway with related phase and neutral conductors. Where parallel conductors in separate raceways occur, provide a grounding conductor in each raceway. Connect all grounding conductors to ground terminals at each end of the run so that there will be no uninterrupted grounding circuit from the point of ground fault back to a point of connection of the equipment ground and system neutral.
7. Provide grounding bushings on all raceways terminating within all electrical enclosures. Provide grounding conductors from such bushings to the frame of the enclosure, ground bus and equipment grounding strap where one occurs.
8. Connect the unit substation neutrals where applicable and equipment ground to a common point within the metallic enclosure containing the main service disconnecting means. Equipment grounds and the identified neutral of the wiring system shall not be interconnected beyond this point in the interior wiring system.
9. Assure the electrical continuity of all metallic raceway systems, pulling up all conduits and/or locknuts wrench-tight. Where expansion joints or telescoping joints occur, provide bonding jumpers. Wherever flexible metallic conduit is employed, provide a green insulated ground jumper installed in the flexible conduit.
10. Provide an insulated green bonding jumper from the grounding screw in the outlet box. Do not install behind the device mounting screws.
11. Provide a No. 6 copper ground to the telephone company main distribution frame and to each telephone backboard.

3.2 TESTS

A. Provide ground continuity tests at all new switchboards, transformers, panelboards, distribution panels, motor control centers, main disconnects, and transfer switch equipment.

B. After completion of the grounding system measure the system ground resistance. If the resistance to ground exceeds 5 ohms, additional ground rods, or other method approved by the Engineer, shall be provided until a reading of 5 ohms or less is achieved.

C. Perform tests in dry weather and not less than 48 hours after rainfall.

D. Test instruments: Null balance type, Biddle Meggar Earth Tester or approved equal.

E. Provide a report with all resistance readings, calculations and performed corrections and submit two (2) copies to the Architect.

End of Section

SECTION 26 05 50

ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.1 SUMMARY

A. Provide all equipment, materials, tools and labor to properly identify electrical equipment and related accessories.

B. Provide identification for the following:
1. Switchgear, switchboards, distribution panels, panelboards, disconnect switches, circuit breakers, motor starters, motor control switches, start/stop buttons, and other electrical equipment.
2. Junction boxes and pull boxes.
3. Wiring devices.
4. Wire tags for wiring.
5. Raceways.
6. Outlets and Switches.
7. Emergency Light Fixtures.

C. Related Sections
1. Division 26 – Section “Service and Distribution”.
2. Division 26 – Section “Devices”.

PART 2 - PRODUCTS

2.1 IDENTIFICATION

A. Nameplates
1. Nameplates shall have the surface color and core color for engraved letters as follows:
   a. Normal distribution
      1) 120/208V equipment – black surface with white core
2. Provide a nameplate for each switchgear, switchboard, panelboard, distribution panel, motor starter, disconnect switches, motor control center and similar distribution equipment clearly identifying the equipment’s’ name to match that indicated in the Drawings.
3. Provide a nameplate for each feeder protective device in each switchgear, switchboard, distribution panel, motor control center and any other similar equipment. Identify the specific load it serves.
4. Nameplates shall be bakelite, 1/16” thick minimum with 3/8” high letters.

B. Junction Boxes and Pull boxes
1. Provide identification with permanent ink marking pen on the cover of junction boxes noting the branch circuits and systems within the conduit.
2. Pull boxes shall be marked using stenciled paint noting the voltage and systems served. Letters shall be appropriate height so that they can be read from the floor.

C. Disconnect switches and motor starters
1. Provide nameplates as described above for all disconnect switches and motor starters located 8’-0” above finished floor or less. Identify equipment served.

2. Provide identification with permanent ink marking pen on all disconnect switches and motor starters mounted over 8'-0" above finished floor. Write marking clearly and in a location that can be read from the floor when the area is finished (e.g. marking for disconnects serving mechanical equipment that will be above the ceiling when the area is finished shall be located on the bottom or bottom front of the disconnect so it can be read when a ceiling tile is removed).

D. Push button switches
1. Provide nameplates as described above for all push button switches. Letters shall be ¼" high.

F. Outlets and Switches
1. Provide clear adhesive labels indicating panel and circuit numbers on the cover plate and matching label on the inside of the box for all outlets and switches. The lettering shall be 1/4" high.

G. Emergency Light Fixtures
1. Provide clear adhesive labels indicating "EB" or "EM" on all emergency light fixtures. The lettering shall be 1/4" high.

H. Wire markers
1. Wire markers for identification of wiring shall be self-adhesive type having letters and numerals indicating feeder or branch circuit number. Locate markings on wiring where visible near the terminations and taps in all junction boxes, outlet boxes, panelboards, distribution panel boards, switchboards and motor control centers.

PART 3 - EXECUTION

A. Nameplates shall be applied to a cleaned surface and shall be plumb and level.

End of Section

SECTION 26 24 00

SERVICE AND DISTRIBUTION

PART 1 - GENERAL

1.1 SUMMARY

A. Provide all distribution switchgear as specified herein, as indicated on the Drawings and as required to provide a complete and operating system. All distribution equipment shall be of the same manufacturer including, but not limited to, switchboards, panelboards, transformers, disconnects, and busway.

B. The distribution equipment shall be designed, manufactured and tested in accordance with the latest version of the following standards:
   1. NFPA 70
   2. NEMA AB1
   3. NEMA KS1
   4. NEMA PB2
   5. NEMA PB1
   6. NEMA PB1
   7. NEMA PB2.1
   8. NEMA PB1.1
   9. NEMA 250
   10. NEMA TP-1-2002
   11. ANSI/IEEE C12.1
   12. ANSI C39.1
   13. ANSI C57.13
   14. UL 50, 67, 89, 98, 489
   15. ASTM

C. Provide nameplates for all distribution equipment as specified herein and per Division 26 - Section “Electrical Identification”.

1.2 SUBMITTALS

A. The following data shall be submitted according to and Division 26 - Section “General Electrical Requirements” and shall include but not be limited to:
   1. Physical dimensions, nameplate data, voltage, amperage, plan views, elevations, schematic wiring diagrams, bus capacities, circuit schedule, short circuit ratings, etc.

1.3 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, protect, and handle products in conformance with manufacturer’s recommended practices as outlined in application installation and Maintenance Manuals.

B. Inspect and report concealed damage to carrier within their required time period for repair or replacement.

C. Store in a clean, dry space. Maintain factory protection and/or provide an additional heavy canvas or heavy plastic cover to protect structure from dirt, water, construction

debris, and traffic. Where applicable, provide adequate heating within enclosures to prevent condensation.

D. Handle in accordance with NEMA PB 2.1 and manufacturer's written instructions. Lift only by lifting means provided for this express purpose.

1.4 ELECTRICAL SERVICE

A. Provide and install the building electrical service from the Power Company transformer(s) to the main service distribution equipment as shown on the Drawings. Any charges required by the Power Company for permanent power shall be included in this Contract.

B. Coordinate all installation requirements with the Power Company prior to bid and include all trenching, conduits, vaults, equipment pads, current transformers, potential transformers, potential taps as required. Coordinate all Work with the Power Company.

C. Provide conduit, C.T. enclosures, switchgear metering compartments, etc. as required by the Power Company for metering. Contractor shall coordinate all meter requirements with the Power Company prior to proceeding with this Work.

D. The secondary service to the building is 120/208 volts, 3 phase, 4 wire, 60 Hertz AC.

PART 2 - PRODUCTS

2.1 PANELBOARDS

A. System Description
1. Short circuit rating of panelboards shall be the interrupting rating of lowest rated device in the panel or application UL series for proper main and branch device combinations.
2. Panelboards shall have a maximum of 54 protective devices per panel, including sub-feeders and excluding main overcurrent protective devices. For more than 54 devices, 2 or more panelboards are required.
3. With 2 or more panelboards, sub-feed lug or thru-feed lugs shall be used in all by 1 section of each panelboard. Lugs shall have same capacity as incoming mains.
4. Protective devices shall be molded case circuit breakers.

B. Enclosure
1. Boxes shall be a nominal 20 inches wide and 6 inches deep with wire bending space per the National Electric Code.
2. Fronts shall be reinforced steel with concealed hinges and concealed trim adjusting screws. Trim clamps are unacceptable.
3. All door locks shall be corrosion proof Valox (or equal) with retractable latches. All door locks shall be keyed for a single key.
4. Clean Lexan (or equal) directory card holders shall be permanently mounted on front door.
5. All panelboard series ratings shall be prominently displayed on dead front shield.
6. Interiors shall permit top or bottom incoming cables.

C. Bus bars
1. Bus bars shall be Copper, phase sequenced, fully insulated and supported by high impact Noryl (or equal) interior base assemblies.

2. Bus bars shall be mechanically supported by zinc finished galvanneal steel frames to prevent vibration and damage from short circuits.
3. Terminations shall be UL tested and listed and suitable for UL copper.
4. Provide 1 continuous bus bar per phase. Each bus bar shall have sequentially phased branch circuit connectors for bolt-on branch circuit breakers. Bus bars shall be rated as indicated in Drawings.
5. Split solid neutral bus shall be plated and located in main compartment for all incoming neutral cables to be same length. 200% rated solid neutral shall be provided as indicated on the Drawings and shall be plated copper for non-linear load applications subject to harmonics. 200% rated solid neutral shall be self-certified by Manufacturer.
6. Lugs shall be rated for 75 degree C terminations.
7. Interiors shall be field convertible for top or bottom incoming feed. Main and sub-feed circuit breakers shall be vertically mounted. Main lug interiors up to 400 amperes shall be field convertible to main breaker. Interior leveling provisions shall be provided for flush mounted applications.
8. Log bodies shall bolt in place.

D. Circuit Breakers
1. Molded case circuit breakers shall be bolt-in devices for 120/208V panels.
2. All circuit breakers shall have thermal and magnetic trip elements in each pole.
3. Multiple pole breakers shall have internal common trip crossbars for simultaneous tripping of each pole.
4. Circuit breakers shall not be restricted to any mounting location due to physical size.
5. All branch breakers 15 to 100 amperes shall be able to be mounted in any panel position for twin or double mounting without space penalty. Sum of ratings for 2 such twin mounted devices shall not exceed 180 amperes.
6. Main and sub-feed circuit breakers may be vertically or horizontally mounted.
7. Branch breaker panelboard connections shall be copper to copper.
8. All panelboard terminations shall be rated as indicated in Drawings.
9. All breakers shall have an over center mechanism and be quick make and quick break.
10. All breakers shall have handle trip indication and a trip indicator in window of circuit breaker housing.
11. Breaker handle and faceplate shall indicate rated ampacity.
12. Circuit breaker escutcheon shall have standard ON/OFF markings.
13. Main breakers shall be UL listed for use with: Shunt, Under Voltage, and Ground Fault Shunt Trips; Auxiliary and Alarm Switches; and Mechanical Lug Kits.
14. Branch breakers shall be UL listed for use with: Shunt Trips, Auxiliary and Alarm Switches.

E. Finish
1. Boxes shall be corrosion resistant, zinc finish galvanneal.
2. Fronts shall be powder finish painted ANSI 61 gray.

F. Panels shall be manufactured by ABB-General Electric, Square D, Eaton, or Siemens.

2.3 DISCONNECT SWITCHES

A. Switches shall be heavy-duty type. The switch blades shall be visible when the switch is OFF and the cover is open. Lugs shall be front removable and UL listed for 75 degrees C conductor. Provide removable arc suppressor to facilitate easy access to line side up.

B. Switches shall have provisions for a field installable electrical interlock.

C. The switch operating mechanism shall be quick-make, quick-break.

D. Provide padlock provisions for locking in the OFF position.

E. Provide NEMA type enclosure suitable for the application (indoor, outdoor, wet or damp, corrosive, etc.). Type 3R enclosure shall contain no knockouts (supply watertight hubs).

F. Enclosure shall have ON and OFF markings stamped on the enclosure.

G. Switches shall be horsepower rated.

H. Fused disconnect switches shall have rejection type fuse clips with dual element current limiting fuses of rating shown or required by the Manufacturer's nameplate of the equipment being supplied. The UL short circuit rating shall be 200,000 amps RMS SYM when used with Class R or J fuses.

2.4 FUSES

A. Fuses shall have 200,000 Amp RMS SYS rating.

B. Fuses for circuits 1 to 600 amperes shall be dual element, current limiting time delay (500% of rated current for minimum of 10 seconds) with separate overload and short circuit clearing chamber. Bussman "Low Peak" or equal by Littlefuse or Ferraz Shawmut. UL Class J.

C. Fuses for circuits above 600 amperes shall be current limiting, time delay (500% of rated current for minimum of 4 seconds, clear 20 times rated current in 0/1 seconds or less). Bussman, "Hi-Cap" or equal by Littlefuse or Ferraz Shawmut. UL Class L.

D. Provide one (1) set of spare fuses for each set of three (3). A maximum of three (3) sets of fuses is required to be provided for the same type and rating.

E. Provide a cabinet to store the fuses. The cabinet shall be of heavy duty construction, interior and exterior painted gray, have a positive latching handle with cylinder lock and two keys, have an inventory and dedicated for the storage of fuses. Coordinate the location of the cabinet with the Owner.

PART 3 - EXECUTION

1.1 GENERAL

A. Clean all enclosures free of all foreign matter and dust.

B. Remove all rust marks and repaint to new condition.

C. Provide all necessary hardware to level and secure all switchgear.

D. Provide engraved nameplates on all switchgear per Section 26 05 50 including but not limited to, switchboards, switchboard overcurrent protection devices, panelboards, distributor panelboards, disconnects, contactors, busway, busplugs.

E. Provide a typewritten directory for all panelboards. Make spares in pencil.

End of Section

SECTION 26 27 00

DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. Provide all devices specified herein, as indicated on the Drawings and as required to provide complete and operating systems.

B. The wiring devices shall be designed, manufactured and tested in accordance with the latest version of the following standards:
1. NEMA WD-1
2. NEMA WD-5
3. Underwriters Laboratories
4. NEC

PART 2 - PRODUCTS

2.1 GENERAL

A. The color of all devices, wall plates and cover plates shall be White unless noted otherwise. All devices in patient care areas shall be tamper resistant.

2.2 SWITCHES

A. Wall switches, unless noted otherwise, shall be flush mounted, commercial grade 120/277 volt, 20 amp, Decora style switches (number of poles and types as indicated on the Drawings) by Leviton or equal.

B. Dimmer switches shall be as noted in the Drawings. Provide wattage and type as required by the load.

C. Motor rated switches and switches indicated as pilot switches, unless noted otherwise, shall be flush mounted industrial grade, red pilot light “on” with overload protection as follows (note: wire per manufacturers recommendation):
a. 120V, 20 amp Circuits – Hubbell HBL1221PL
b. 120V, 30 amp Circuits – Hubbell HBL3031PL

D. Key switches, unless noted otherwise, shall be flush mounted, commercial grade, 120/277V, 20 amp:
1. Single Pole: Leviton No. 1221-2L
2. Double Pole: Leviton No. 1222-2L
3. 3-Way: Leviton No. 1223-2L Series
4. 4-Way: Leviton No. 1224-2L Series

E. Timer switches, unless noted otherwise, shall be 24VAC to 277VAC, toggle style timer with timed interval setting of 1 minute to 18 hours, flicker time out warning, and shall fit a standard wall box. Adjust interval to 2 hours at project completion unless noted otherwise. Manufacturer shall be as noted on the Drawings.

F. Wall mounted occupancy sensors, unless noted otherwise on plans, shall be as noted on the Drawings. Color shall be White. Coordinate delay interval setting with owner prior to project completion.

G. Ceiling mounted occupancy sensors, unless noted otherwise on plans, shall be as noted on the Drawings and provided with appropriate power pack(s) to accommodate circuiting shown on plans. Color shall be White. Coordinate delay interval setting with owner prior to project completion.

2.3 RECEPTACLES

A. Receptacles (size and types as indicated on the Drawings) shall be plastic, 2P, 3W, grounded, 125 volt, 20 amp, Decora style receptacles by Leviton or equal.

B. Ground Fault Interrupter Receptacles (GFCI) shall be plastic, 2P, 3W, 125 volt, 20 amp, self-protecting type Leviton 7899 series or equal.

C. Weather receptacles shall have a duplex GFCI receptacle as specified above and shall comply with NEC Article 406.

D. Dedicated receptacle outlets shall be Gray in color with white cover plates where indicated on plans.

E. Receptacle outlets connected to critical branch circuits shall be Red in color with red cover plates where indicated on plans.

2.4 COVER PLATES

A. Cover plates for all devices shall be by Leviton or equal and shall have a White finish unless noted otherwise.

B. Provide multi-gang plates for devices shown at the same location. Coordinate gang configuration with the Architect where more than 3 devices are shown at one location.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Provide appropriate outlet box for each device or multi-ganged devices.

B. Provide plaster ring reducer for boxes larger than the device plate.

C. Provide dimmer switch type and size to match load.

D. Coordinate locations of all devices with the Architect and the interior detail Drawings.

E. Coordinate cutting; obtain pre-cut openings from manufacturer for door switches, metal partitions and furniture mounted devices.

F. In general, devices in finished spaces shall be flush mounted. Verify the requirements of all spaces with the Architect.

G. Each device shall have a cover plate as is appropriate for the application. Cover plates shall be installed true and plumb with building lines, mortar joints and architectural features.

H. Mount receptacles and special systems outlets vertical and 18” above the finished floor to the device centerline, unless noted or required otherwise.

I. Mount switches vertical and 48” above the finished floor to the device centerline and 6” from a door strike, unless noted or required otherwise.

J. All exterior devices shall be provided with a weatherproof cover/enclosure. Exterior receptacles shall be GFCI type.

K. Coordinate mounting heights for devices indicated to be mounted over counter with the Architect.

L. Provide a green insulated bonding jumper for all grounded devices and bond to the outlet box.

M. Each outlet used as a junction box, or for future device or fixture, shall be fitted with a blank cover plate to match other device cover plates.

N. Floor boxes shall be as specified on the Drawings.

End of Section

SECTION 26 50 00

LIGHTING

PART 1 - GENERAL

1.1 SUMMARY

A. Provide lighting fixtures complete with all lamps as specified on the Electrical Drawings. Provide all supports, brackets, connectors, materials, tools, wiring, controls and labor to provide a complete and operating lighting system.

B. All blemished, damaged or unsatisfactory fixtures shall be replaced in a satisfactory manner as directed by the Architect.

C. Where a fixture type designated has been omitted, cannot be determined or is in conflict with other Drawings or Specifications, request a clarification from the Architect, prior to bid, and provide suitable fixture type as directed.

D. All lamps shall be operating at project completion and for a period of six (6) months after the final acceptance.

E. Confirm exact locations and lengths of lighting fixtures with the Architectural Reflected Ceiling Plan and mechanical equipment above or on the ceiling.

F. All recessed lighting fixtures shall match the ceiling type and be tested and certified by the fixture manufacturer for the type of mounting.

1.2 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Handle lighting fixtures carefully to prevent breakage, denting and scoring the fixture finish. Do not install damaged lighting fixtures; replace and return damaged units to equipment Manufacturer.

B. Store lighting fixtures in clean, dry space. Store in original cartons and protect from dirt, physical damage, weather and construction traffic.

1.3 SUBMITTALS

A. The following submittal data shall be furnished according to Section 26 01 00 and shall include but not be limited to:
   1. Lighting fixtures complete with physical dimensions, materials, connector details, voltage, current, installation details, air handling capability, etc.
   2. Lamps complete with base or pin configuration, lumen rating, life expectancy, color temperature, starting characteristics, etc.

PART 2 - PRODUCTS

2.1 LIGHTING FIXTURES

A. Bid shall be based on the light fixture manufacturers and descriptions listed in lighting fixture schedule(s). Alternate fixture manufacturers not specified and proposed by the Contractor shall be submitted for approval prior to base bid.

B. Fixtures are designated on the Drawings by “type” as indicated by letters that corresponds to a lighting fixture description and specification on the lighting fixture schedules.

C. Each lighting fixture shall comply with NEC Article 410, Energy Independence & Security Act, local codes and the authority having jurisdiction as applicable.

D. Provide a lighting fixture complete with lamps, drivers and required accessories for each lighting fixture shown. Provide all mounting and trim hardware to suit the specific installation and location.

E. All lighting fixtures shall bear a UL label.

F. Where fixtures are specified with acrylic lens, provide virgin acrylic with 0.125 inch thickness.

G. Exit lighting fixtures shall meet the requirements of all federal, state and local codes.

H. All devices in patient care areas shall be tamper resistant.

2.2 EMERGENCY BATTERY LIGHTING

A. Lighting fixtures indicated on the drawings to be provided with an emergency battery pack shall provide emergency lighting by using standard LED lamp and an emergency battery pack. The battery pack shall consist of a field replaceable high temperature, maintenance free nickel cadmium battery, charger and electronic circuitry contained in one metal case. Provide a solid state charging indicator light to monitor the charger and battery, double pole test switch and installation hardware. The battery pack shall provide power to the LED lamp upon failure of the normal supply to the fixture.

B. The test button and indicator light shall be integral in the fixture reflector and shall be positioned within or on the surface of the fixture so as to be accessible and identifiable, unless noted otherwise.

C. Under normal mode the battery pack shall keep the batteries at full charge. Upon loss of normal power the battery pack shall operate the LED fixture for 90 minutes.

D. Battery recharge time shall not exceed 16 hours to fully recharge and shall not exceed 225 milliamperes charging current.

E. The battery pack shall meet or exceed all the requirements set forth in UL924 “Emergency Lighting and Power Equipment” and shall be UL listed for installation on top of or remote from the fixture. Emergency illumination shall meet or exceed the requirements set forth in the National Electric Code, Life Safety Code and UL 90-Minute Requirements.

PART 3 - EXECUTION

3.1 GENERAL

A. Locations on the Drawings are diagrammatic. Verify exact locations with Architectural Reflected Ceiling Plans and coordinate space conditions with other trades.

B. Modify locations in mechanical equipment rooms to suit the conditions of the mechanical equipment while maintaining a sufficient and uniform lighting level equal to that provided by the layout shown on the Drawings.

C. Fixtures of the same type and in the same ceiling shall have lamps, socket assembling and door hinges oriented in the same direction.

D. Reflector cones, baffles, aperture plates, light controlling element for air handling fixtures and decorative elements shall be installed after completion of ceiling tiles, painting and general cleanup.

E. Target and focus adjustable lighting fixtures after regular working hours and before building acceptance. Permanently indicate targeting on fixture and provide positive locking devices to preclude mis-focus when relamping. Target and focus in the presence of the Architect and Owner.

F. Clean all fixture reflectors, lenses, louver, decorative accessories and lamps immediately prior to Owner's acceptance of building. Destaticize plastic lenses and diffusers after cleaning.

G. Lighting fixtures mounted within, under, on or integral with millwork shall be given special consideration. Fixture counting and sizes shall be coordinated with the applicable space and adjusted accordingly. This coordination shall occur prior to ordering fixtures. Refer to Architectural Drawings for details.

3.2 SUPPORT OF LIGHT FIXTURES

A. Support directly from building structure, any lighting fixture which weighs in excess of the capacity of the suspended ceiling on which it is installed. Support each such fixture with the quantity of threaded rods or fixture support wires required to prevent fixture warping; however provide no less than two rods or wire per fixture.

B. Outlets, which are recessed in a suspended ceiling and support the weight of surface-mounted or suspended fixtures, shall be supported from a channel spanning and secured to the ceiling support system. Support each end of the channel with a fixture support wire attached to structure.

C. Installation in grid-type suspended ceiling:
   1. Support each corner of a grid opening, in which a lay-in fixture is located, with a fixture support wire attached to structure. Provide a support clip, securely fastened to the ceiling grid, at or near each corner of each lay-in fixture.
   2. Support fixtures, which are smaller than the ceiling grid opening and which are recessed in the acoustical panel, with at least two metal channels spanning, and secured to, the ceiling grid. Support each end of each channel or each corner of the grid opening with a fixture support wire attached to structure. Do not support fixtures by ceiling acoustical panels.

D. Provide additional supports as required by local codes and seismic zone.

End of Section

SECTION 31 10 00

SITE CLEARING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

B. Alabama Department of Transportation (ALDOT) Standard Specifications for Highway Construction (latest edition).

C. Alabama Handbook for Erosion & Sediment Control and Stormwater Management on Construction Sites and Urban Areas.

1.02 SUMMARY

A. Section Includes:

1. Protecting existing vegetation to remain.
2. Removing existing vegetation.
3. Clearing and grubbing.
4. Stripping and stockpiling topsoil.
5. Removing above- and below-grade site improvements.
6. Disconnecting, capping or sealing, and removing site utilities.
7. Temporary erosion- and sedimentation-control measures.

B. Related Sections include the following:

1. Division 01 Section "Sustainable Design Requirements" for additional LEED requirements.
2. Division 01 Section "Temporary Facilities and Controls" for temporary utilities, temporary construction and support facilities, temporary security and protection facilities.
3. Division 01 Section "Execution" for verifying utility locations and for recording field measurements.
4. Division 31 Section "Earth Moving" for soil materials, excavating, backfilling, and site grading.

1.03 DEFINITIONS

A. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.

B. Surface Soil: Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil; but in disturbed areas such as urban environments, the surface soil can be subsoil.

C. Topsoil: Natural or cultivated surface-soil layer containing organic matter and sand, silt, and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than

2 inches in diameter; and free of subsoil and weeds, roots, toxic materials, or other nonsoil materials.

D. Plant-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction, and indicated on Drawings.

E. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction, and defined by a circle concentric with each tree with a radius 1.5 times the diameter of the drip line unless otherwise indicated.

F. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.04 MATERIAL OWNERSHIP

A. Except for stripped topsoil and other materials indicated to be stockpiled or otherwise remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.05 SUBMITTALS

A. Existing Conditions: Documentation of existing trees and plantings, adjoining construction, and site improvements that establishes preconstruction conditions that might be misconstrued as damage caused by site clearing.

1. Use sufficiently detailed photographs or videotape.
2. Include plans and notations to indicate specific wounds and damage conditions of each tree or other plants designated to remain.

B. Record Drawings: Identifying and accurately showing locations of capped utilities and other subsurface structural, electrical, and mechanical conditions.

1.06 PROJECT CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.

B. Utility Locator Service: Notify utility locator service for area where Project is located before site clearing.

C. Do not commence site clearing operations until temporary erosion- and sedimentation-control and plant-protection measures are in place.

D. The following practices are prohibited within protection zones:

1. Storage of construction materials, debris, or excavated material.
2. Parking vehicles or equipment.
3. Foot traffic.
4. Erection of sheds or structures.
5. Impoundment of water.
6. Excavation or other digging unless otherwise indicated.

7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.

E. Do not direct vehicle or equipment exhaust towards protection zones.

F. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones.

G. Soil Stripping, Handling, and Stockpiling: Perform only when the topsoil is dry or slightly moist.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Satisfactory Soil Material: Requirements for satisfactory soil material are specified in Division 31 Section "Earth Moving."

1. Obtain approved borrow soil material off-site when satisfactory soil material is not available on-site.

PART 3 - EXECUTION

3.01 PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

B. Locate and clearly identify clearing limits.

C. Protect existing site improvements to remain from damage during construction.

1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.02 TEMPORARY EROSION AND SEDIMENTATION CONTROL

A. Provide temporary erosion- and sedimentation-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to a sediment and erosion control plan, specific to the site that complies with EPA 832/R-92-005 or requirements of authorities having jurisdiction, whichever is more stringent.

B. General: Employ erosion control management practices as required by the General Permit for Storm Water Discharges. The Contractor is responsible for transferring the NPDES Permit for construction activity. The current permit is held by the Owner. The Contractor will be responsible for application and maintenance of all conditions required by the Permit. Submit name of the Professional Engineer and/or Engineering firm to the Architect that is to be responsible for oversight of all requirements of the NPDES Permit until acceptance of all work under this Contract. The Owner or others working under the direction of the Owner may be working on this site during this Contract. Work by others will not relieve the Contractor of complying with all requirements of the NPDES Permit.

C. Control and abate water pollution and erosion at its potential source; employ downstream sediment entrapment measures as a backup to primary control at the source.

D. Take all reasonable precautions to prevent and suppress fires and other detrimental occurrences which may be caused by construction operations.

E. The site is currently under Corps of Engineers (COE) permit JPN# SAM-2014-00260-JSC. The Contractor, his employees and subcontractors shall minimize adverse impacts to State waters by incorporating the following as special conditions of the Corps Permit:

1. During project implementation, the applicant shall ensure compliance with applicable requirements of ADEM. Admin. Code Chapter 335-6-6 [National Pollutant Discharge Elimination System (NPDES)], Chapter 335-6-10 (Water Quality Criteria), and Chapter 335-6-11 (Water Use Classifications for Interstate and Intrastate Waters).
2. Please be advised that ADEM permit coverage may be required prior to commencing and/or continuing certain activities/operations relating to or resulting from the project. If you have any questions regarding ADEM regulated activity or the need for NPDES permit coverage, please contact ADEM's Water Division at h2omail@adem.state.al.us or 334-271-7823. If you have any questions regarding ADEM regulated activity of the need for air permit coverage, please contact ADEM's Air Division at airmail@adem.state.al.us or 334-271-7861. If you have any questions regarding ADEM regulated activity of the need for hazardous, toxic, and/or solid waste permit coverage, please contact ADEM's Land Division at landmail.adem.state.al.us or 334-271-7730.
3. Upon the loss or failure of any treatment facility, best management practice (BMP), or other control, the applicant shall, where necessary to maintain compliance with this certification, suspend cease, reduce or otherwise control work/activity and all discharges until effective treatment is restored. It shall not be a defense for the applicant in a compliance action that it would have been necessary to halt or reduce work or other activities in order to maintain compliance with the conditions of this certification.
4. The applicant shall retain records adequate to document activities authorized by this certification including but not limited to, inspection reports, monitoring information, copies of any reports and all data used to complete the above reports or the application for this certification, for a period of at least three years after completion of work/activity authorized by the certification. Upon written request, the applicant shall provide ADEM with a copy of any record/information required to be retained by this paragraph. The applicant shall notify ADEM in writing upon completion of the proposed project that the pollution control measures specified in the Corps permit and any special conditions specified by ADEM have been properly implemented.
5. The applicant shall prepare a detailed Best Management Practices (BMP) Plan. Effective BMPs shall be implemented and continually maintained for the prevention and control of nonpoint and other sources of pollutants, including measures to ensure permanent re-vegetation or cover of all disturbed areas, during and after project implementation.
6. The applicant shall implement a Spill Prevention Control and Countermeasures (SPCC) Plan for all temporary and permanent onsite fuel or chemical storage tanks or facilities consistent with the requirements of ADEM Admin. Code R. 335-6-6-.12(r), Section 311 of the Federal Water Pollution Control Act, and 40 CFR Part 112. The applicant shall maintain onsite or have readily available sufficient oil & grease absorbing material and flotation booms to contain and clean-up fuel or chemical spills and leaks. The applicant shall immediately notify ADEM after becoming aware of a significant visible oil sheen in the vicinity of proposed activity. In the event of a spill with the potential to impact groundwater or other waters of the State, the applicant should immediately call the National Response Center at 1-800-424-8802 and the Alabama Emergency Management Agency at 1-800-843-0699. The caller should be prepared to report the name, address and telephone number of the person reporting the spill, the exact location of the spill, the company name and location, the material spilled, the estimated quantity, the source of the spill, the cause of the spill, the nearest downstream water

with the potential to receive the spill, and the actions taken for containment and cleanup.

7. The applicant shall conduct, at a minimum, weekly comprehensive site inspections to ensure that effective BMPs are properly designed, implemented, and regularly maintained (i.e. repair, replace, add to, improve, implement more effective practice, etc.) utilizing good engineering practices to prevent/minimize to the maximum extent practicable discharges of pollutants in order to provide for the protection of water quality. The inspections shall be conducted by a qualified credential professional (QCP), qualified personnel under direct supervision of a QCP, or an ADEM recognized qualified credential inspector (QCI), until completion of the proposed activity.
8. Additional, effective BMPs shall be fully implemented and maintained on a daily basis as needed to prevent to the maximum extent possible potential discharges of pollutants from activities authorized by this certification, directly to or to a tributary or other stream segment, that have the potential to impact State water currently considered impaired [waterbody is identified on the Alabama 303(d) list, a total maximum daily load (TMDL) has been finalized for the waterbody, and/or the waterbody is otherwise considered a Tier 1 water pursuant to ADEM Admin. Code Ch. 335-6-10]. The applicant shall inspect all BMPs as often as is necessary (daily if needed) for effectiveness, need for maintenance, and the need to implement additional effective BMPs. Additional, effective BMPs shall immediately be implemented as needed and may include but are not limited to sediment retention basins, greater capacity in sediment retention structures, hydro-seeding with application of non-toxic tackifiers, grass sodding, non-toxic chemical treatment, erosion control blankets, other effective, innovative/alternative technologies, etc. to ensure full compliance with ADEM requirements and the protection of water quality in the impaired waterbody.
9. All construction and worker debris (e.g. trash, garbage, etc.) must be immediately removed and disposed in an approved manner. If acceptable offsite options are unavailable, effective onsite provisions for collection and control of onsite worker toilet wastes or gray waste waters (i.e. port-o-let, shower washdown, etc.) must be implemented and maintained. Soil contaminated by paint or chemical spills, oil spills, etc. must be immediately cleaned up or be removed and disposed in an approved manner. Also, the applicant shall manage and dispose of any trash, debris, and solid waste according to applicable state and federal requirements.
10. All materials used as fill, or materials used for construction of structures in a waterbody, must be non-toxic, non-leaching, non-acid forming, and free of solid waste or other debris.
11. The applicant shall implement appropriate measures to minimize the potential for a decrease of instream dissolved oxygen concentrations as a result of project implementation. In addition, the applicant shall ensure that the activities authorized by this certification do not significantly contribute to or cause a violation of applicable water quality standards for instream dissolved oxygen.
12. The applicant shall implement appropriate, effective BMPs, including installation of floating turbidity screens as necessary. To minimize downstream turbidity to the maximum extent practicable. The applicant shall visually monitor or measure background turbidity. The applicant must suspend operations should turbidity resulting from project implementation exceed background turbidity by more than 50 NTUs. Operations may resume when the turbidity decreased to within acceptable levels.

F. Straw wattles shall be anchored by use of stakes.

G. Once installed, maintain silt fence until its capacity has been reached or erosion activity in the areas has been stabilized. When a silt fence has reached its capacity to function and need for a backup fence becomes evident, provide an additional line of silt fences. Repair of a damaged silt fence shall be accomplished by utilizing same type of materials used in original construction.

H. Remove erosion and sedimentation controls once areas have been stabilized. Restore and stabilize areas disturbed during removal.

3.03 TREE AND PLANT PROTECTION

A. General: Protect trees and plants remaining on-site against damage during construction by installation of orange construction fence around tree save areas where applicable.

B. Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations, in a manner approved by Architect.

3.04 EXISTING UTILITIES

A. Locate, identify, disconnect, and seal or cap utilities indicated to be removed.

1. Arrange with utility companies to shut off indicated utilities.

B. Interrupting Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Program Manager not less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Program Manager's written permission.

C. Excavate for and remove underground utilities indicated to be removed.

3.05 CLEARING AND GRUBBING

A. Remove obstructions, trees, shrubs, and other vegetation to permit installation of new construction.

1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
2. Remove roots, stumps, obstructions, and debris to a depth of 24" below exposed subgrade.
3. Use only hand methods for grubbing within protection zones.

B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.

1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches, and compact each layer to a 98% density according to ASTM D 698.

3.06 TOPSOIL STRIPPING

A. Remove sod and grass before stripping topsoil.

B. Strip topsoil in a manner to prevent intermingling with underlying subsoil or other waste materials.

1. Remove subsoil and non-soil materials from topsoil, including clay lumps, gravel, and other objects more than 2 inches in diameter; trash, debris, weeds, roots, and other waste materials.

C. Stockpile topsoil away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust and erosion by water.

1. Limit slope of topsoil stockpiles to 3 horizontal and 1 vertical.
2. Do not stockpile topsoil within protection zones.

3.07 SITE IMPROVEMENTS

A. Remove existing above- and below-grade improvements as indicated and necessary to facilitate new construction.

B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.

1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut along line of existing pavement to remain before removing adjacent existing pavement. Saw-cut faces vertically.
2. Paint cut ends of steel reinforcement in concrete to remain with two coats of antirust coating, following coating manufacturer's written instructions. Keep paint off surfaces that will remain exposed.

3.08 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property. Any remaining foundations, slabs or piping shall be disposed of in accordance with Section 01 74 19 Construction Waste Management and Disposal.

B. Separate recyclable materials produced during site clearing from other non-recyclable materials. Store or stockpile without intermixing with other materials and transport them to recycling facilities. Do not interfere with other Project work.

END OF SECTION

SECTION 31 20 00

EARTH MOVING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Reports of Subsurface Exploration and Geotechnical Evaluation, by Building and Earth, project no. AU230162, and provided as supplement to the Project Manual

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

1.02 SUMMARY

A. Section Includes:

1. Preparing subgrades for slabs-on-grade, walks, pavements, turf and grasses and plants.
2. Excavating and backfilling for buildings and structures.
3. Drainage course for concrete slabs-on-grade.
4. Subbase course for concrete walks, pavements.
5. Subbase course and base course for asphalt paving.
6. Subsurface drainage backfill for walls and trenches.
7. Excavating and backfilling trenches for utilities and pits for buried utility structures.

B. Related Sections:

1. Division 01 Section "Construction Progress Documentation" for recording pre-excavation and earth moving progress.
2. Division 01 Sections “Allowances” and “Unit Prices”
3. Division 01 Section "Temporary Facilities and Controls" for temporary controls, utilities, and support facilities; also for temporary site fencing if not in another Section.
4. Divisions 22, 26, and 33 Sections for installing underground mechanical and electrical utilities and buried mechanical and electrical structures.
5. Division 31 Section "Site Clearing" for site stripping, grubbing, stripping and stockpiling topsoil, and removal of above- and below-grade improvements and utilities.

1.03 UNIT PRICES

A. All excavation to be unclassified. This shall include, but not limit to the following:

1. Balancing the earthwork with on-site material
2. Striping of topsoil, re-plating slopes, and stockpiling for future use in locations shown on drawings.
3. Grubbing
4. Mass excavations – soil and rock
5. Utility trench excavations – soil and rock
6. Undercutting of loose soils, moisture conditioning & recompacting.

7. Over excavation of rock within the building pad, parking lots, roadways, ballfield areas, and trenches and replaced with compacted engineered fill from an on-site source.
8. Overfilling and cutting back fill slopes
9. Moisture conditioning & re-compacting the on-site soils for suitable placement as engineered fill
10. Re-conditioning of previously compacted areas when soils get wet prior to acceptance and/or turning over of area to the owner.
11. Subsurface drainage in drainage swales.
12. Installation and monitoring of settlement monitoring plates.
13. Keying in/benching fill slopes into existing grade.

B. However, all undercut of loose soils, moisture conditioning & replacement below the "cut line" will be handled with a quantity allowance with unit price being provided on the bid proposal form to be included in the base bid. The bid proposal form will have unit prices for the undercutting of loose soils, moisture conditioning and replacing with compaction per the specifications. The quantity allowance breakdown is as follows:

Undercut loose soils and moisture conditioning and replacing w/compaction: 25,000 CY

The unit price for "undercutting" shall include all cost associated with removing loose soil from below the established subgrade elevation (note that when working with soils the upper 24 inches of existing grade shall be included in the base bid for topsoil stripping and grubbing, moisture conditioning, and removal and replacement and is not a part of this allowance), moisture conditioning and replacing the loose soil material conforming to the project specifications and compacted to project requirements. Note the unit prices are being provided for the addition to and deletion from the contract base bid as required by changing field conditions during construction.

C. However, all french drains trenches will be handled with a quantity allowance with a unit price being provided on the bid proposal form to be included in the base bid and applicable alternates. The bid proposal form will have unit prices for the installation of a 36" wide by 36" deep trench of ALDOT no. 57 stone wrapped in a geotextile fabric. The quantity allowance breakdown is as follows:

Finger drains – 1,000 LF

The unit price for "french drain trenches" shall include all cost associated with the installation of the french drain trenches as shown on the detail. Springs (both wet weather and perennial) are expected to be encountered in areas where perched groundwater is encountered. Note the unit prices are being provided for the addition to and deletion from the contract base bid as required by changing field conditions during construction. Furthermore, the 1,500 LF of french drain trenches noted in the plans are not a part of this allowance.

D. The measurement process for all quantity allowance amounts shall be the initial responsibility of the contractor. The basis for measurement will be based on a before and after cross section survey of the area in question. No truck counts will be allowed. Measurements will be verified by the Owner's on-site Geotechnical Engineer.

1.04 DEFINITIONS

A. Backfill: Soil material or controlled low-strength material used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Base Course: Aggregate layer placed between the subbase course and hot-mix asphalt paving.

C. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.

D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

E. Drainage Course: Aggregate layer supporting the slab-on-grade that also minimizes upward capillary flow of pore water.

F. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.

1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Architect. Authorized additional excavation and replacement material will be paid for according to Contract provisions for unit prices.
2. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be without additional compensation.

G. Fill: Soil materials used to raise existing grades.

H. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

I. Subbase Course: Aggregate layer placed between the subgrade and base course for hot-mix asphalt pavement, or aggregate layer placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.

J. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.

K. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

L. Cut Line: In a cut section, the cut line shall be defined as subgrade elevation or elevation required by other specified hold down, over excavation, trench excavation, etc. In a fill section, the cut line shall be defined as the elevation achieved upon completion of all topsoil stripping, grubbing operations, etc. as approved by the owner's onsite geotechnical engineer prior to placing fill material.

1.05 SUBMITTALS

A. Product Data: For each type of the following manufactured products required:

1. Geotextiles.
2. Controlled low-strength material, including design mixture.

B. Material Test Reports: For each on-site and borrow soil material proposed for fill and backfill as follows:

1. Classification according to ASTM D 2487.
2. Laboratory compaction curve according to ASTM D 698.

C. Blasting Plan: For record purposes; approved by authorities having jurisdiction.

D. Seismic Survey Report: For record purposes; from seismic survey agency (i.e., pre-blast survey).

E. Pre-excavation Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by earth moving operations. Submit before earth moving begins.

F. Rock management plan.

G. As-built topographic survey on a foot contour interval with spot elevations at breakpoints and at structures in Autocad DWG format shall be submitted to the Architect prior to acceptance of areas.

H. Settlement plate monitoring data for vertical movement of deep fill slopes.

1.06 QUALITY ASSURANCE

A. Blasting: Comply with all applicable requirements in NFPA 495, “Explosive Materials Code,” and prepare a blasting plan reporting the following:

1. Types of explosive and sizes of charge to be used in each area of rock removal, types of blasting mats, sequence of blasting operations, and procedures that will prevent damage to site improvements and structures on Project site and adjacent properties.
2. Seismographic monitoring during blasting operations.

B. Seismic Survey Agency: An independent testing agency, acceptable to authorities having jurisdiction, experienced in seismic surveys and blasting procedures to perform the following services:

1. Report types of explosive and sizes of charge to be used in each area of rock removal, types of blasting mats, sequence of blasting operations, and procedures that will prevent damage to site improvements and structures on Project site and adjacent properties.
2. Seismographic monitoring during blasting operations.

C. Geotechnical Testing Agency Qualifications: An independent testing agency qualified according to ASTM E 329 and ASTM D 3740 for testing indicated. The independent testing agency shall be provided by the owner.

1.07 PROJECT CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth moving operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.

2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.

B. Utility Locator Service: Notify utility locator service for area where Project is located before beginning earth moving operations to locate all existing utilities.

C. Do not commence earth moving operations until temporary erosion- and sedimentation-control measures, specified in Division 31 Section "Site Clearing," are in place.

D. Do not commence earth moving operations until plant-protection measures are in place.

E. The following practices are prohibited within protection zones:

1. Storage of construction materials, debris, or excavated material.
2. Parking vehicles or equipment.
3. Foot traffic.
4. Erection of sheds or structures.
5. Impoundment of water.
6. Excavation or other digging unless otherwise indicated.
7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.

F. Do not direct vehicle or equipment exhaust towards protection zones.

G. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones.

PART 2 - PRODUCTS

2.01 SOIL MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

B. Satisfactory Soils: Soil Classification Groups GW, GP, GC, GM, MH (below 3 feet of structures and 1 foot of pavement or ballfields), ML, CL, SC, SW, SP, and SM according to ASTM D 2487, or a combination of these groups; free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.

1. Liquid Limit: Less than 50.
2. Plasticity Index: Less than 25.
3. Maximum dry density: > 100 pcf.

C. Unsatisfactory or Unsuitable Soils: Soil Classification Groups OL, CH, MH (within upper 3 feet of structures or 1 foot of pavements or ballfields), OH, and PT according to ASTM D 2487, or a combination of these groups.

1. Unsatisfactory soils also include satisfactory soils not maintained within 3 percent of optimum moisture content at time of compaction.

D. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.

E. Base Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 95 percent passing a 1-1/2-inch sieve and not more than 8 percent passing a No. 200 sieve.

F. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.

G. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve.

H. Drainage Course: Narrowly graded mixture of washed crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch sieve and 0 to 5 percent passing a No. 8 sieve.

I. Filter Material: Narrowly graded mixture of natural or crushed gravel, or crushed stone and natural sand; ASTM D 448; coarse-aggregate grading Size 67; with 100 percent passing a 1-inch sieve and 0 to 5 percent passing a No. 4 sieve.

J. Sand: ASTM C 33; fine aggregate.

K. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.

2.02 GEOTEXTILES

A. Subsurface Drainage Geotextile: Nonwoven needle-punched geotextile, manufactured for subsurface drainage applications, made from polyolefins or polyesters; with elongation greater than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:

1. Survivability: Class 2; AASHTO M 288.
2. Grab Tensile Strength: 157 lbf; ASTM D 4632.
3. Sewn Seam Strength: 142 lbf; ASTM D 4632.
4. Tear Strength: 56 lbf; ASTM D 4533.
5. Puncture Strength: 56 lbf; ASTM D 4833.
6. Apparent Opening Size: No. 60 sieve, maximum; ASTM D 4751.
7. Permittivity: 0.2 per second, minimum; ASTM D 4491.
8. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.

B. Separation Geotextile: Woven geotextile fabric, manufactured for separation applications, made from polyolefins or polyesters; with elongation less than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:

1. Survivability: Class 2; AASHTO M 288.
2. Grab Tensile Strength: 247 lbf; ASTM D 4632.
3. Sewn Seam Strength: 222 lbf; ASTM D 4632.
4. Tear Strength: 90 lbf; ASTM D 4533.
5. Puncture Strength: 90 lbf; ASTM D 4833.
6. Apparent Opening Size: No. 60 sieve, maximum; ASTM D 4751.
7. Permittivity: 0.02 per second, minimum; ASTM D 4491.
8. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.

2.03 ACCESSORIES

A. Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility; colored as follows:

1. Red: Electric.
2. Yellow: Gas, oil, steam, and dangerous materials.
3. Orange: Telephone and other communications.
4. Blue: Water systems.
5. Green: Sewer systems.

B. Detectable Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored as follows:

1. Red: Electric.
2. Yellow: Gas, oil, steam, and dangerous materials.
3. Orange: Telephone and other communications.
4. Blue: Water systems.
5. Green: Sewer systems.

PART 3 - EXECUTION

3.01 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth moving operations.

B. Protect and maintain erosion and sedimentation controls during earth moving operations.

C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

3.02 DEWATERING

A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.

B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.

1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.

3.03 EXPLOSIVES

A. Comply with all laws, rules, and regulations of Federal, State and local municipalities and insurer governing keeping, storage, use, manufacture, safe handing transportation, or other disposition of explosives. Conduct all operations involving handling, storage, and use of

explosives under supervision of properly licensed individual. Take special precautions for proper use of explosives in order to prevent harm to human life and damage to surface structures, all utility lines, or other subsurfaces structures. Do not use explosives until all persons in vicinity are notified and have reached safety.

B. Hold a pre-blast meeting at the jobsite prior to commencement of any drilling and blasting operations with the Contractor, the Blaster and representatives of the Owner. Discuss the Blasting Plan and visit such specific sites as are necessary to familiarize the participants with the details of the blasting operations.

C. Submit a Safety Plan that includes descriptions of road closures, warning signals, and plans for notification of affected local, state and federal agencies. Discuss the Safety Plan methods for protection of life and health, public and private property, new work or existing work on the project, nearby structures, wetlands, waters and wildlife. Hold a safety meeting prior to commencement of blasting operations to address safety issues. The contractor is totally and solely responsible for jobsite safety and for correction of any damage due to construction and blasting activities.

D. Contractor must hold a license with the State of Alabama to perform blasting. Provide Owner and Architect with a copy of the Contractor's current State of Alabama Blasting License.

E. Indemnify and hold harmless the Owner, Architect, Engineer, Owner's representatives, and their agents and employees from any claim growing out of use, transportation and storage of explosives. Removal of any items of material of any nature by blasting should be done in such a manner and such time as to avoid damage affecting integrity of the design and to avoid damage to any new or existing structure included in or adjacent to the work. It is the Contractor's responsibility to determine method of operation to ensure desired results and integrity of completed work.

F. Notify and coordinate with existing utility companies before blasting.

G. Submit a general blasting plan for review by the Civil and Geotechnical Engineer a minimum of two weeks before drilling. Include the items described in Section 107.11 ALDOT Standard Specifications. Prior to commencement of drilling, submit a Blasting Plan prepared by a qualified Blaster. Include the details of test blasting, controlled blasting and production blasting. Include station limits, estimated time of each blast, layout details of each blast, trade names, types and sizes of explosives and accessories, delay sequences of the blast holes, and powder factors. Submit a revised Blasting Plan any time there is a change in the drilling or blasting methods. Provide a pre-blast survey of the surrounding properties prepared by a qualified agency prior to conducting any blasting operations. Review of Blasting Plan by the Owner or his representative is for information review purposes only and does not relieve the contractor of his sole responsibility of satisfactory performance of this work and protect the surrounding property and persons' safety. Have the blaster on site during all the loading and blasting operations. Require the Blaster to take responsible charge for safety procedures and to maintain a detailed record for each day of blasting work.

H. Submit request to the Architect and Geotechnical Engineer for blasting within 800' of green concrete. This request will be reviewed and approved on a case-by-case basis.

I. Use suitable mats or methods to smother blasts and eliminate projectile "fly" rock. If flyrock occurs, suspend all blasting operations and resubmit a revised plan to the Owner, Architect and Geotechnical Engineer for approval to eliminate any future occurrence of flyrock. Flyrock is defined as any projectile material and is not limited to but includes soil, rock, or debris (organic or inorganic) that extends more than 15' from the blast pattern. Controlled blasting holes are closely spaced, lightly loaded holes drilled along the plane of the final design slope.

Controlled blasting is either preshear blasting with holes detonated before the production blasting or cushion (trim) blasting with holes detonated after the production blasting. Use controlled blasting techniques for all rock slopes higher than 10 feet to produce a stable cut face sheared along the designed neat excavation line. If at any time during the progress of the work blasting and drilling fail to produce the desired result of a smooth, stable backslope, modify the blasting method to achieve the desired result.

J. The Owner may also employ an independent consultant to monitor all blasts with seismograph and/or overpressure devices. This does not relieve the contractor from providing blasting monitoring and pre-blast surveys. Employment of an independent consultant does not relieve the Contractor from obligations, duties and responsibilities required by the governing authorities and this specification.

K. Contractor will record a log of each blast daily. Log is to comply with the requirements and format of the State of Alabama. Submit logs to the Owner, Architect, Civil Engineer and Geotechnical Engineer weekly.

L. Cover all shots with heavy blasting mats or a minimum of 36" of soil overburden or both.

1. Do not blast within 25' of pipe already laid in the trench. Protect pipe already laid using earth backfill.

M. Control blasting so as not to unduly disturb or loosen materials outside the lines of excavation.

1. Scale rock surfaces and remove any loose, fractured, or broken rock immediately after blasting. Eliminate hazards to personnel and construction operations. After initial scaling of permanent rock faces, maintain scaled condition satisfactory to Civil Engineer for duration of Work. Do not commence work on subsequent lifts or shots until scaling is complete. Accomplish scaling with hand tools, hydraulic splitters, machine scaling with excavators or other equipment, high pressure water spray, light explosive charges, or other approved methods.
2. Check side slopes for slips which may have taken place; remove any dislodged material.
3. Use rockfall mitigation methods such as rock catchment fences, wire mesh draping, flexible or rigid barriers and other techniques to intercept rockfall and control it before it reaches the roadway or other facilities.

N. Review and comment by the Civil Engineer and Geotechnical Engineer of the Contractor's blasting plans and/or inspection of the performance of the work by the Civil Engineer and Geotechnical Engineer does not relieve the Contractor of responsibilities, liability for injuries and/or damages resulting from blasting.

O. Contractor shall perform a pre-blast survey of all existing residences, structures, etc. that fall within a 1,500’ radius - unless local requirements stipulate a larger survey area - as measured from the center of the blast pattern. Pre-blast survey shall be performed by a licensed engineer registered in the State of Alabama. Pre-blast survey shall have inspect reports for each structure visited with photographs and video taping as a minimum with an interview with the current property owner which describes the reason for the survey. Additional investigations /surveys may be required due to complaints or claims as a result of the blasting activity at no additional cost to the owner.

P. A minimum of five seismographs - unless local requirements stipulate more - shall be accounted for in the base bid and shall be placed on the subject property as well as key areas adjacent to and off of the site to assure that blasts do not exceed local, state and federal

guidelines. Additional seismographs may be required due to complaints or claims as a result of the blasting activity at no additional cost to the owner.

Q. All blasting must be comply with the following requirements by KinderMorgan:

1. No blasting within the existing pipline easement.
2. Standoff distances of 100-feet for line or grid configurations containing a total charge weight of greater than 100 pounds are required.
3. The Contractor must provide seismological surveillance reports as requested.
4. All blasting activities must be coordinated and confirmed with KinderMorgans's Damage Prevention Group.
5. Prior to starting any blasting activities, the Contractor shall provide KinderMorgan with evidence of experience, licenses, certifications, and permits as required from the Federal, State, OSHA, local, and jurisdictional regulations.

3.04 EXCAVATION, GENERAL

A. All excavation on this project is unclassified regardless of the character of surface and subsurface conditions encountered, including rock, soil materials, and obstructions.

B. Material encountered in grading operations that, in the opinion of the Geotechnical Engineer, is unsuitable or undesirable shall be as follows:

1. The removal of unsuitable material will be directed by the onsite Geotechnical Engineer. All unsuitable material that is removed by the Contractor shall become the property of the Contractor and disposed of offsite or in a manner satisfactory to the Owner at no additional cost. All ground modifications in the upper 24 inches from existing grade shall be included in the base bid.
2. Backfill for these areas will be with material approved by the Geotechnical Engineer, with layers of acceptable material compacted to the requirements set forth in these specifications.

C. The Contractor shall be responsible for removing overshot/overbroken/disturbed rock and replacing with the appropriate material such as flowable fill, lean concrete, or systematically compacted crushed stone at the direction of the Geotechnical Engineer at no additional cost.

D. Undercutting and replacement of loose soils may be required to the underlying stiff soils. All undercut and replacement shall be handled in accordance with 1.3 Unit Prices B. above for material below 24 inches from existing grade.

E. Keying in/benching required to construct non-reinforced slopes to tie into the natural embankment and the consequent removal of unsuitable soils with such benching/keying is "base bid" work and not a part of the undercut of unsuitable soils allowance.

3.05 EXCAVATION FOR STRUCTURES

A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.

1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.

B. Excavations at Edges of Tree- and Plant-Protection Zones:

1. Excavate by hand to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.

C. Where rock is encountered, the “cut line” shall be a minimum of 4 feet below the proposed subgrade and suitable material replaced to the proposed subgrade to create a soil cap.

3.06 EXCAVATION FOR WALKS, PAVEMENTS AND BALLFIELDS

A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

B. Where rock is encountered, the “cut line” shall be a minimum of 2 feet below the proposed subgrade and suitable material replaced to the proposed subgrade.

3.07 EXCAVATION FOR UTILITY TRENCHES

A. Excavate trenches to indicated gradients, lines, depths, and elevations.

1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.

B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit unless otherwise indicated.

1. Clearance: As indicated.

C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.

1. For pipes and conduit less than 6 inches in nominal diameter, hand-excavate trench bottoms and support pipe and conduit on an undisturbed subgrade.
2. For pipes and conduit 6 inches or larger in nominal diameter, shape bottom of trench to support bottom 90 degrees of pipe or conduit circumference. Fill depressions with tamped sand backfill.
3. For flat-bottomed, multiple-duct conduit units, hand-excavate trench bottoms and support conduit on an undisturbed subgrade.
4. Where rock is encountered, the “cut line” shall be a minimum of 6 inches below the proposed subgrade and suitable material replaced to the proposed subgrade.
5. Where unsuitable soil is encountered, the “cut line” shall be a minimum of 6 inches below the proposed subgrade and suitable material replaced to the proposed subgrade.

D. Trench Bottoms: Excavate trenches 4 to 6 inches deeper than bottom of pipe and conduit elevations to allow for bedding course. Hand-excavate deeper for bells of pipe.

1. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

E. Trenches in Tree- and Plant-Protection Zones:

1. Hand-excavate to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
2. Do not cut main lateral roots or taproots; cut only smaller roots that interfere with installation of utilities.
3. Cut and protect roots according to requirements in Division 01 Section "Temporary Tree and Plant Protection."

3.08 SUBGRADE INSPECTION

A. Notify Architect when excavations have reached required subgrade.

B. If Architect determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.

C. Proof-roll subgrade with a pneumatic-tired and loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.

1. Completely proof-roll subgrade in one direction. Limit vehicle speed to 3 mph.
2. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.

D. Authorized additional excavation and replacement material will be paid for according to Contract provisions for unit prices.

E. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect, without additional compensation.

F. An As-built survey must be provided as proof of compliance with Section 3.16 B. below. Contractor shall note that the Owner's building general contractor may occupy the site prior to the completion of this contract and phased turnover of areas may be required for the building pad and parking lots and shall be accounted for in the base bid.

3.09 UNAUTHORIZED EXCAVATION

A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi, may be used when approved by Architect and Geotechnical Engineer.

1. Fill unauthorized excavations under other construction, pipe, or conduit as directed by Architect.

3.010 STORAGE OF SOIL MATERIALS

A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.011 BACKFILL

A. Place and compact backfill in excavations promptly, but not before completing the following:

1. Construction below finish grade including, where applicable, subdrainage, dampproofing, waterproofing, and perimeter insulation.
2. Surveying locations of underground utilities for Record Documents.
3. Testing and inspecting underground utilities.
4. Removing concrete formwork.
5. Removing trash and debris.
6. Removing temporary shoring and bracing, and sheeting.
7. Installing permanent or temporary horizontal bracing on horizontally supported walls.

B. Place backfill on subgrades free of mud, frost, snow, or ice.

3.012 UTILITY TRENCH BACKFILL

A. Place backfill on subgrades free of mud, frost, snow, or ice.

B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. For storm utility drainage piping place 4” of #57 stone bedding for pipes less than 36” in diameter and 6” of #57 stone bedding for pipes 36” in diameter and greater. Backfill with satisfactory soils.

C. Trenches under Footings: Backfill trenches excavated under footings and within 18 inches of bottom of footings with satisfactory soil; fill with concrete to elevation of bottom of footings. Concrete is specified in Division 03 Section "Cast-in-Place Concrete."

D. Backfill voids with satisfactory soil while removing shoring and bracing.

E. Place and compact initial backfill of subbase material, free of particles larger than 1 inch in any dimension, to the top of utility pipe or utility conduit, with the exception of storm utility drainage piping.

1. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.

F. Controlled Low-Strength Material: Place initial backfill of controlled low-strength material to a height of 12 inches over the pipe or conduit with the exception of storm utility drainage piping. Coordinate backfilling with utilities testing.

G. Place and compact final backfill of satisfactory soil to final subgrade elevation.

H. Controlled Low-Strength Material: Place final backfill of controlled low-strength material to final subgrade elevation.

I. Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

3.013 SOIL FILL

A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.

B. Place and compact fill material in layers to required elevations as follows:

1. Under grass and planted areas, use satisfactory soil material.
2. Under walks and pavements, use satisfactory soil material.
3. Under steps and ramps, use satisfactory soil material.
4. Under building slabs, use satisfactory soil material.
5. Under footings and foundations, use satisfactory soil material.

C. Place soil fill on subgrades free of mud, frost, snow, or ice.

D. Fill slopes shall be constructed from the bottom up in horizontal lifts, overfilled and then cut back to the planned slope limits so that the entire slope mass (including the slope face) is uniformly compacted with a consistent, uniform slope face.

E. Rock/soil fills: Break of crush rock obtained from blasting and boulder fill removal to allow use for fill as follows:

1. Approval of any shot rock material proposed for fill shall be made prior to placement to verify gradation and maximum particle size. Maximum particle size should be on the order of 1 foot in diameter (isolated slabs may be placed as long as maximum thickness does not exceed 1 foot, and providing placement and compaction equipment can operate between the slabs. Concentrated placement of similar sized rock slabs will not be permitted), with a mixture of soil, smaller rock and fines used to create a dense, well graded, compacted rock fill. Placement and compaction of uniform fill materials will aid in the densification and testing during construction.
2. All rock fill should be placed in 12-inch to 18-inch maximum loose lifts to the full width of the cross section. Excavation and blasting procedures shall accommodate the selective placement of the material. Each lift shall be bladed as required prior to compaction to ensure uniform layer thickness. Large rock fragments having a dimension greater than one foot should be removed from the layer to be compacted or broken down and then incorporated into the lift. Rocks should be spread in order to provide a dense mass with minimal voids. Boulders should be placed at a minimum spacing of a compactor (CAT D-815) or equivalent operating width. Refer to the Geotechnical Report for additional rock placement guidelines and procedures. Boulder placement shall be limited to deep rock fills and parking and drive areas (a minimum of 24" below subgrade) as directed by the Geotechnical Engineer.
3. The Contractor shall apply water to accelerate the breakdown and to facilitate compaction. The water shall be distributed by an approved method, which provides uniform application of the required quantity of water. It is better to have excess water then not enough water in rock fill placement.
4. Care should be taken to ensure that each lift will be effectively bonded to the previous lift such that no weak planes are left within the fill mass. This may require scarifying of the previous lifts prior to placing the subsequent fill.
5. Compaction equipment and techniques will be dependent on the type of material being used as fill. A sheeps-foot roller should provide adequate compaction for the on-site silty and/or sandy soils, while the shot rock fills will require large placement and compaction equipment, such as a Caterpillar 815 or 825, following fill placement and 'tracking" with a large bulldozer.
6. The upper 48 inches of any rock fill should have a maximum rock size not exceeding 4 inches and the lift thickness reduced to 8 inches, loose, to facilitate excavation for footings and utilities. Rock fragments shall make up no more than 60% of the overall fill mass.
7. All rock fills shall be "capped" with an earth fill cap a minimum compacted thickness of 4 feet within the building pad area and 2 feet within the proposed

paving and athletic field. Cap thickness is to be measured from subgrade. Each fill material is to be approved for use by the Geotechnical Engineer.

8. The contractor shall submit for approval procedures for placing conditioning and compacting rock fills. The procedures are to be reviewed and approved by the Geotechnical Engineer prior to the Contractor beginning work.

3.014 SOIL MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 3 percent of optimum moisture content.

1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 3 percent and is too wet to compact to specified dry unit weight.

3.015 COMPACTION OF SOIL BACKFILLS AND FILLS

A. Place backfill and fill soil materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.

C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 698:

1. Under structures, building slabs, steps, and pavements, scarify and recompact top 12 inches of existing subgrade and each layer of backfill or fill soil material at 98 percent.
2. Under walkways, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 98 percent.
3. Under turf or unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 92 percent.
4. For utility trenches, compact each layer of backfill soil material at 98 percent.

3.016 GRADING

A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.

1. Provide a smooth transition between adjacent existing grades and new grades.
2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

B. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:

1. Turf or Unpaved Areas: Plus or minus 1 inch.
2. Walks: Plus or minus 1 inch.
3. Pavements: Plus or minus 1/2 inch.

C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch when tested with a 10-foot straightedge.

3.017 SUBSURFACE DRAINAGE

A. Subdrainage Pipe: As specified on drawings.

B. Subsurface Drain: Place subsurface drainage geotextile around perimeter of subdrainage trench. Place a 6-inch course of filter material on subsurface drainage geotextile to support subdrainage pipe. Encase subdrainage pipe in a minimum of 12 inches of filter material, placed in compacted layers 6 inches thick, and wrap in subsurface drainage geotextile, overlapping sides and ends at least 6 inches.

1. Compact each filter material layer with a minimum of two passes of a plate-type vibratory compactor.

C. Drainage Backfill: Place and compact filter material over subsurface drain, in width indicated, to within 12 inches of final subgrade, in compacted layers 6 inches thick. Overlay drainage backfill with one layer of subsurface drainage geotextile, overlapping sides and ends at least 6 inches.

1. Compact each filter material layer with a minimum of two passes of a plate-type vibratory compactor.
2. Place and compact impervious fill over drainage backfill in 6-inch- thick compacted layers to final subgrade.

3.018 SUBBASE AND BASE COURSES UNDER PAVEMENTS AND WALKS

A. Place base course on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place base course under pavements and walks as follows:

1. Install separation geotextile on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends.
2. Place base course material over subbase course under hot-mix asphalt pavement.
3. Shape base course to required crown elevations and cross-slope grades.
4. Place base course 6 inches or less in compacted thickness in a single layer.
5. Place base course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
6. Compact base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 98 percent of maximum dry unit weight according to ASTM D 1557.

C. Pavement Shoulders: Place shoulders along edges of base course to prevent lateral movement. Construct shoulders, at least 12 inches wide, of satisfactory soil materials and compact simultaneously with each base layer to not less than 98 percent of maximum dry unit weight according to ASTM D 1557.

3.019 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:

1. Determine prior to placement of fill that site has been prepared in compliance with requirements.
2. Determine that fill material and maximum lift thickness comply with requirements.
3. Determine, at the required frequency, that in-place density of compacted fill complies with requirements.

B. Testing Agency: Owner will engage a qualified independent geotechnical engineering testing agency to perform tests and inspections.

C. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.

D. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade if approved by Architect and Geotechnical Engineer.

E. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable. Tests will be performed at the following locations and frequencies:

1. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 2000 sq. ft. or less of paved area or building slab, but in no case fewer than three tests.
2. Foundation Wall Backfill: At each compacted backfill layer, at least one test for every 100 feet or less of wall length, but no fewer than two tests.
3. Trench Backfill: At each compacted initial and final backfill layer, at least one test for every 150 feet or less of trench length, but no fewer than two tests.

F. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

G. Settlement plates shall be monitored for vertical movement of deep fill areas with data to be provided to the Civil Engineer, Geotechnical Engineer, and the Architect for review. Monitoring shall last a minimum of 30 days. After such time additional monitoring may be required until stability of the fill mass has been achieved. Note that the owner's on-site geotechnical engineer will be the final authority on whether an area is stabilized and building construction can commence.

3.020 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

1. Scarify or remove and replace soil material to depth as directed by Architect; reshape and recompact.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.

1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

D. Settlement plates shall be protected against damage to assure an accurate and reliable data source.

3.021 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus satisfactory topsoil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

END OF SECTION

SECTION 32 12 16

ASPHALT PAVING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. ALDOT Standard Specification for Highway Construction, latest edition.

B. The City of Auburn Standard Specifications, latest edition.

1.02 SUMMARY

A. Section Includes:

1. Cold milling of existing hot-mix asphalt pavement.
2. Hot-mix asphalt patching.
3. Hot-mix asphalt paving.
4. Hot-mix asphalt paving overlay.
5. Asphalt surface treatments.
6. Pavement-marking paint.

B. Related Sections:

1. Division 31 Section "Earth Moving" for aggregate subbase and base courses and for aggregate pavement shoulders.
2. Division 32 Sections for other paving installed in asphalt pavement areas.

1.03 DEFINITION

A. Hot-Mix Asphalt Paving Terminology: Refer to ASTM D 8 for definitions of terms.

B. ALDOT: Alabama Department of Transportation.

1.04 SUBMITTALS

A. Product Data: For each type of product indicated. Include technical data and tested physical and performance properties.

1. Job-Mix Designs: For each job mix proposed for the Work.

B. Shop Drawings: Indicate pavement markings, lane separations, and defined parking spaces. Indicate, with international symbol of accessibility, spaces allocated for people with disabilities.

C. Samples for Verification: For the following products, in manufacturer's standard sizes unless otherwise indicated:

1. Each paving fabric, 12 by 12 inches minimum.

D. Submit documentation of recycled content from manufacturer for products with specified recycled content.

E. Submit documentation of manufacturing locations and origins of materials for products manufactured within 500 miles of building site.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: A paving-mix manufacturer registered with and approved by authorities having jurisdiction or the DOT of state in which Project is located.

B. Installer Qualifications: Imprinted-asphalt manufacturer's authorized installer who is trained and approved for installation of imprinted asphalt required for this Project.

C. Regulatory Requirements: Comply with ALDOT's "Standard Specifications for Highway Construction", latest edition for asphalt paving work.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver pavement-marking materials to Project site in original packages with seals unbroken and bearing manufacturer's labels containing brand name and type of material, date of manufacture, and directions for storage.

B. Store pavement-marking materials in a clean, dry, protected location within temperature range required by manufacturer. Protect stored materials from direct sunlight.

1.07 PROJECT CONDITIONS

A. Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp, if rain is imminent or expected before time required for adequate cure, or if the following conditions are not met:

1. Prime Coat: Minimum surface temperature of 40 deg F.
2. Tack Coat: Minimum surface temperature of 60 deg F.
3. Slurry Coat: Comply with weather limitations in ASTM D 3910.
4. Asphalt Base Course: Minimum surface temperature of 40 deg F and rising at time of placement.
5. Asphalt Surface Course: Minimum surface temperature of 60 deg F at time of placement.

B. Pavement-Marking Paint: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 40 deg F for oil-based materials, and not exceeding 95 deg F.

PART 2 - PRODUCTS

2.01 AGGREGATES

A. General: Use materials and gradations that have performed satisfactorily in previous installations.

B. Coarse Aggregate: Shall comply with ALDOT 801.

C. Fine Aggregate: Shall comply with ALDOT 802.

1. For hot-mix asphalt, limit natural sand to a maximum of 20 percent by weight of the total aggregate mass.

D. Mineral Filler: Shall comply with ALDOT 825.

2.02 ASPHALT MATERIALS

A. Asphalt Binder: Per ALDOT section 424B-1" maximum aggregate.

B. Asphalt Base Course: Per ALDOT section 301 (825 B).

C. Plant Mix Bituminous Base: Per ALDOT section 327 Mix I.

D. Surface Course: Per ALDOT section 424A-1/2" maximum aggregate.

E. Asphalt Cement: Per ALDOT section 804.2

F. Prime Coat: Per ALDOT section 401

G. Tack Coat: Per ALDOT section 405.

H. Water: Potable.

2.03 AUXILIARY MATERIALS

A. Herbicide: Commercial chemical for weed control, registered by the EPA. Provide in granular, liquid, or wettable powder form.

B. Sand: ASTM D 1073, Grade Nos. 2 or 3.

C. Joint Sealant: ASTM D 6690, Type II or III, hot-applied, single-component, polymer-modified bituminous sealant.

D. Pavement-Marking Paint: Alkyd-resin type, lead and chromate free, ready mixed, complying with AASHTO M 248, Type S; colors complying with FS TT-P-1952.

1. Color: As indicated.

2.04 MIXES

A. Hot-Mix Asphalt: Dense, hot-laid, hot-mix asphalt plant mixes meeting the requirements of the applicable sections of ALDOT “Standard Specifications for Highway Construction” and complying with the following requirements:

1. Provide mixes with a history of satisfactory performance in geographical area where Project is located.
2. Base Course: ALDOT 825 B
3. Surface Course: ALDOT 424, Mix A
4. Binder Course: ALDOT 424, Mix B

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that subgrade is dry and in suitable condition to begin paving.

B. Proof-roll subgrade below pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.

1. Completely proof-roll subgrade in one direction. Limit vehicle speed to 3 mph.
2. Proof roll with a loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons.
3. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.

C. Proceed with paving only after unsatisfactory conditions have been corrected.

3.02 COLD MILLING

A. Clean existing pavement surface of loose and deleterious material immediately before cold milling. Remove existing asphalt pavement by cold milling to grades and cross sections indicated.

1. Mill to a depth of 2 inches.
2. Mill to a uniform finished surface free of excessive gouges, grooves, and ridges.
3. Control rate of milling to prevent tearing of existing asphalt course.
4. Repair or replace curbs, manholes, and other construction damaged during cold milling.
5. Excavate and trim unbound-aggregate base course, if encountered, and keep material separate from milled hot-mix asphalt.
6. Keep milled pavement surface free of loose material and dust.

3.03 PATCHING

A. Hot-Mix Asphalt Pavement: Saw cut perimeter of patch and excavate existing pavement section to sound base. Excavate rectangular or trapezoidal patches, extending 12 inches into adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Remove excavated material. Recompact existing unbound-aggregate base course to form new subgrade.

B. Tack Coat: Apply uniformly to vertical surfaces abutting or projecting into new, hot-mix asphalt paving at a rate of 0.05 to 0.15 gal./sq. yd..

1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

C. Patching: Fill excavated pavements with hot-mix asphalt base mix for full thickness of patch and, while still hot, compact flush with adjacent surface.

3.04 REPAIRS

A. Leveling Course: Install and compact leveling course consisting of hot-mix asphalt surface course to level sags and fill depressions deeper than 1 inch in existing pavements.

1. Install leveling wedges in compacted lifts not exceeding 3 inches thick.

B. Crack and Joint Filling: Remove existing joint filler material from cracks or joints to a depth of 1/4 inch.

1. Clean cracks and joints in existing hot-mix asphalt pavement.

2. Use emulsified-asphalt slurry to seal cracks and joints less than 1/4 inch wide. Fill flush with surface of existing pavement and remove excess.
3. Use hot-applied joint sealant to seal cracks and joints more than 1/4 inch wide. Fill flush with surface of existing pavement and remove excess.

3.05 SURFACE PREPARATION

A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving.

B. Herbicide Treatment: Apply herbicide according to manufacturer's recommended rates and written application instructions. Apply to dry, prepared subgrade or surface of compacted-aggregate base before applying paving materials.

1. Mix herbicide with prime coat if formulated by manufacturer for that purpose.

C. Prime Coat: Apply uniformly over surface of compacted unbound-aggregate base course at a rate of 0.15 to 0.50 gal./sq. yd.. Apply enough material to penetrate and seal but not flood surface. Allow prime coat to cure.

1. If prime coat is not entirely absorbed within 24 hours after application, spread sand over surface to blot excess asphalt. Use enough sand to prevent pickup under traffic. Remove loose sand by sweeping before pavement is placed and after volatiles have evaporated.
2. Protect primed substrate from damage until ready to receive paving.

D. Tack Coat: Apply uniformly to surfaces of existing pavement at a rate of 0.05 to 0.15 gal./sq. yd..

1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

3.06 HOT-MIX ASPHALT PLACING

A. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand to areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted.

1. Place hot-mix asphalt base course in number of lifts and thicknesses indicated.
2. Place hot-mix asphalt surface course in single lift.
3. Spread mix at minimum temperature of 250 deg F.
4. Begin applying mix along centerline of crown for crowned sections and on high side of one-way slopes unless otherwise indicated.
5. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.

B. Place paving in consecutive strips not less than 10 feet wide unless infill edge strips of a lesser width are required.

1. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Complete a section of asphalt base course before placing asphalt surface course.

C. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

3.07 JOINTS

A. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints free of depressions, with same texture and smoothness as other sections of hot-mix asphalt course.

1. Clean contact surfaces and apply tack coat to joints.
2. Offset longitudinal joints, in successive courses, a minimum of 6 inches.
3. Offset transverse joints, in successive courses, a minimum of 24 inches.
4. Construct transverse joints at each point where paver ends a day's work and resumes work at a subsequent time. Construct these joints using either "bulkhead" or "papered" method according to AI MS-22, for both "Ending a Lane" and "Resumption of Paving Operations."
5. Compact joints as soon as hot-mix asphalt will bear roller weight without excessive displacement.
6. Compact asphalt at joints to a density within 2 percent of specified course density.

3.08 COMPACTION

A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or with vibratory-plate compactors in areas inaccessible to rollers.

1. Complete compaction before mix temperature cools to 185 deg F.

B. Breakdown Rolling: Complete breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Correct laydown and rolling operations to comply with requirements.

C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:

1. Average Density: 96 percent of reference laboratory density according to ASTM D 6927, but not less than 94 percent nor greater than 100 percent.
2. Average Density: 92 percent of reference maximum theoretical density according to ASTM D 2041, but not less than 90 percent nor greater than 96 percent.

D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.

E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while asphalt is still hot; compact thoroughly.

F. Repairs: Remove paved areas that are defective or contaminated with foreign materials and replace with fresh, hot-mix asphalt. Compact by rolling to specified density and surface smoothness.

G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.

H. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.09 INSTALLATION TOLERANCES

A. Pavement Thickness: Compact each course to produce the thickness indicated within the following tolerances:

1. Base Course: Plus or minus 1/2 inch.
2. Surface Course: Plus 1/4 inch, no minus.

B. Pavement Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot straightedge applied transversely or longitudinally to paved areas:

1. Base Course: 1/4 inch.
2. Surface Course: 1/8 inch.
3. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4 inch.

C. Traffic-Calming Devices: Compact and form asphalt to produce the contour indicated and within a tolerance of plus or minus 1/8 inch of height indicated above pavement surface.

3.010 PAVEMENT MARKING

A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Architect.

B. Allow paving to age for 15 days before starting pavement marking.

C. Sweep and clean surface to eliminate loose material and dust.

D. Apply paint with mechanical equipment to produce pavement markings, of dimensions indicated, with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils.

3.011 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Thickness: In-place compacted thickness of hot-mix asphalt courses will be determined according to ASTM D 3549.

C. Surface Smoothness: Finished surface of each hot-mix asphalt course will be tested for compliance with smoothness tolerances.

D. In-Place Density: Testing agency will take samples of uncompacted paving mixtures and compacted pavement according to ASTM D 979.

1. Reference maximum theoretical density will be determined by averaging results from four samples of hot-mix asphalt-paving mixture delivered daily to site, prepared according to ASTM D 2041, and compacted according to job-mix specifications.
2. In-place density of compacted pavement will be determined by testing core samples according to ASTM D 1188 or ASTM D 2726.

a. One core sample will be taken for every 1000 sq. yd. or less of installed pavement, with no fewer than 3 cores taken.
b. Field density of in-place compacted pavement may also be determined by nuclear method according to ASTM D 2950 and correlated with ASTM D 1188 or ASTM D 2726.

E. Replace and compact hot-mix asphalt where core tests were taken.

F. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

3.012 DISPOSAL

A. Except for material indicated to be recycled, remove excavated materials from Project site and legally dispose of them in an EPA-approved landfill.

1. Do not allow milled materials to accumulate on-site.

END OF SECTION

SECTION 32 13 13

CONCRETE PAVING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Driveways.
2. Parking lots.
3. Curbs and gutters.
4. Walks.

B. Related Sections include the following:

1. Division 03 Section "Cast-in-Place Concrete" for general building applications of concrete.
2. Division 31 Section "Earth Moving" for subgrade preparation, grading, and subbase course.

1.02 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash and other pozzolans, and ground granulated blast-furnace slag.

1.03 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Initial Selection: For each type of product, ingredient, or admixture requiring color selection.

C. Other Action Submittals:

1. Design Mixtures: For each concrete paving mixture. Include alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

D. Qualification Data: For qualified ready-mix concrete manufacturer.

E. Material Certificates: For the following, from manufacturer:

1. Cementitious materials.
2. Steel reinforcement and reinforcement accessories.
3. Admixtures.
4. Curing compounds.
5. Bonding agent or epoxy adhesive.
6. Joint fillers.

F. Material Test Reports: For each of the following:

1. Aggregates.

G. Field quality-control reports.

H. Submit documentation of recycled content from manufacturer for products with specified recycled content.

I. Submit documentation of manufacturing locations and origins of materials for products manufactured within 500 miles of building site.

1.04 QUALITY ASSURANCE

A. Ready-Mix-Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

B. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

C. ACI Publications: Comply with ACI 301 unless otherwise indicated.

1.05 PROJECT CONDITIONS

A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

PART 2 - PRODUCTS

2.01 FORMS

A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, and smooth exposed surfaces.

1. Use flexible or uniformly curved forms for curves with a radius of 100 feet or less. Do not use notched and bent forms.

B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and that will not impair subsequent treatments of concrete surfaces.

2.02 STEEL REINFORCEMENT

A. Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, fabricated from as-drawn galvanized-steel wire into flat sheets.

B. Deformed-Steel Welded Wire Reinforcement: ASTM A 497/A 497M, flat sheet.

C. Reinforcing Bars: ASTM A 615/A 615M, Grade 60; deformed.

D. Steel Bar Mats: ASTM A 184/A 184M; with ASTM A 615/A 615M, Grade 60, deformed bars; assembled with clips.

E. Deformed-Steel Wire: ASTM A 496/A 496M.

F. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60 plain-steel bars. Cut bars true to length with ends square and free of burrs.

G. Tie Bars: ASTM A 615/A 615M, Grade 60, deformed.

H. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded wire reinforcement, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete of greater compressive strength than concrete specified, and as follows:

1. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.

2.03 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of same type, brand, and source throughout Project:

1. Portland Cement: ASTM C 150, gray portland cement Type I/II.

a. Fly Ash: ASTM C 618, Class C or Class F.

B. Normal-Weight Aggregates: ASTM C 33, Class 1N, uniformly graded. Provide aggregates from a single source.

1. Maximum Coarse-Aggregate Size: 3/4 inch nominal.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Water: Potable and complying with ASTM C 94/C 94M.

D. Air-Entraining Admixture: ASTM C 260.

E. Chemical Admixtures: Admixtures certified by manufacturer to be compatible with other admixtures and to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material.

1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
2. Retarding Admixture: ASTM C 494/C 494M, Type B.

F. Color Pigment: ASTM C 979, synthetic mineral-oxide pigments or colored water-reducing admixtures; color stable, free of carbon black, nonfading, and resistant to lime and other alkalis.

1. Color: No color.

2.04 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, Class 3, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. dry or cotton mats.

B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

C. Water: Potable.

D. Evaporation Retarder: Waterborne, monomolecular, film forming, manufactured for application to fresh concrete.

E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.

2.05 RELATED MATERIALS

A. Joint Fillers: ASTM D 1751, asphalt-saturated cellulosic fiber in preformed strips.

B. Epoxy Bonding Adhesive: ASTM C 881/C 881M, two-component epoxy resin capable of humid curing and bonding to damp surfaces; of class suitable for application temperature, of grade complying with requirements, and of the following types:

1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

2.06 PAVEMENT MARKINGS

A. Pavement-Marking Paint: Alkyd-resin type, lead and chromate free, ready mixed, complying with AASHTO M 248, Type S; colors complying with FS TT-P-1952.

1. Color: As indicated.

2.07 CONCRETE MIXTURES

A. Prepare design mixtures, proportioned according to ACI 301, for each type and strength of normal-weight concrete, and as determined by either laboratory trial mixtures or field experience.

1. Use a qualified independent testing agency for preparing and reporting proposed concrete design mixtures for the trial batch method.
2. When automatic machine placement is used, determine design mixtures and obtain laboratory test results that meet or exceed requirements.

B. Proportion mixtures to provide normal-weight concrete with the following properties:

1. Compressive Strength (28 Days): 4000 psi.
2. Maximum Water-Cementitious Materials Ratio at Point of Placement: 0.50.
3. Slump Limit: 5 inches, plus or minus 1 inch.

C. Color Pigment: Add color pigment to concrete mixture according to manufacturer's written instructions and to result in hardened concrete color consistent with approved mockup.

2.08 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Furnish batch certificates for each batch discharged and used in the Work.

1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine exposed subgrades and subbase surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.

B. Proof-roll prepared subbase surface below concrete paving to identify soft pockets and areas of excess yielding.

1. Completely proof-roll subbase in one direction. Limit vehicle speed to 3 mph.
2. Proof-roll with a pneumatic-tired and loaded, 10-wheel, tandem-axle dump truck weighing not less than 15 tons.
3. Correct subbase with soft spots and areas of pumping or rutting exceeding depth of 1/2 inch according to requirements in Division 31 Section "Earth Moving."

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Remove loose material from compacted subbase surface immediately before placing concrete.

3.03 EDGE FORMS AND SCREED CONSTRUCTION

A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.

B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

3.04 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.

C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.

D. Install welded wire reinforcement in lengths as long as practicable. Lap adjoining pieces at least one full mesh, and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

E. Install fabricated bar mats in lengths as long as practicable. Handle units to keep them flat and free of distortions. Straighten bends, kinks, and other irregularities, or replace units as required before placement. Set mats for a minimum 2-inch overlap of adjacent mats.

3.05 JOINTS

A. General: Form construction, isolation, and contraction joints and tool edges true to line, with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline unless otherwise indicated.

1. When joining existing paving, place transverse joints to align with previously placed joints unless otherwise indicated.

B. Construction Joints: Set construction joints at side and end terminations of paving and at locations where paving operations are stopped for more than one-half hour unless paving terminates at isolation joints.

1. Continue steel reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of paving strips unless otherwise indicated.
2. Provide tie bars at sides of paving strips where indicated.
3. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or coat with asphalt one-half of dowel length to prevent concrete bonding to one side of joint.

C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, other fixed objects, and where indicated.

1. Locate expansion joints at intervals of 50 feet unless otherwise indicated.
2. Extend joint fillers full width and depth of joint.
3. Terminate joint filler not less than 1/2 inch or more than 1 inch below finished surface if joint sealant is indicated.
4. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.
5. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
6. During concrete placement, protect top edge of joint filler with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.

D. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as follows:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with grooving tool to a 1/4-inch radius. Repeat grooving of contraction joints after applying surface finishes. Eliminate grooving-tool marks on concrete surfaces.

   a. Tolerance: Ensure that grooved joints are within 3 inches either way from centers of dowels.

2. Doweled Contraction Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or coat with asphalt one-half of dowel length to prevent concrete bonding to one side of joint.

E. Edging: After initial floating, tool edges of paving, gutters, curbs, and joints in concrete with an edging tool to a 1/4-inch radius. Repeat tooling of edges after applying surface finishes. Eliminate edging-tool marks on concrete surfaces.

3.06 CONCRETE PLACEMENT

A. Before placing concrete, inspect and complete formwork installation, steel reinforcement, and items to be embedded or cast-in.

B. Remove snow, ice, or frost from subbase surface and steel reinforcement before placing concrete. Do not place concrete on frozen surfaces.

C. Moisten subbase to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.

D. Comply with ACI 301 requirements for measuring, mixing, transporting, and placing concrete.

E. Do not add water to concrete during delivery or at Project site. Do not add water to fresh concrete after testing.

F. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.

G. Consolidate concrete according to ACI 301 by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping.

1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand spreading and consolidation. Consolidate with care to prevent dislocating reinforcement dowels and joint devices.

H. Screed paving surface with a straightedge and strike off.

I. Commence initial floating using bull floats or darbies to impart an open-textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.

J. Curbs and Gutters: Use design mixture for automatic machine placement. Produce curbs and gutters to required cross section, lines, grades, finish, and jointing.

K. Cold-Weather Placement: Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing, or low temperatures. Comply with ACI 306.1 and the following:

1. When air temperature has fallen to or is expected to fall below 40 deg F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F at point of placement.
2. Do not use frozen materials or materials containing ice or snow.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in design mixtures.

L. Hot-Weather Placement: Comply with ACI 301 and as follows when hot-weather conditions exist:

1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated in total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.07 FLOAT FINISHING

A. General: Do not add water to concrete surfaces during finishing operations.

B. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.

1. Medium-to-Fine-Textured Broom Finish: Draw a soft-bristle broom across float-finished concrete surface perpendicular to line of traffic to provide a uniform, fine-line texture.
2. Medium-to-Coarse-Textured Broom Finish: Provide a coarse finish by striating float-finished concrete surface 1/16 to 1/8 inch deep with a stiff-bristled broom, perpendicular to line of traffic.

3.08 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

B. Comply with ACI 306.1 for cold-weather protection.

C. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete but before float finishing.

D. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.

E. Curing Methods: Cure concrete by moisture curing moisture-retaining-cover curing curing compound or a combination of these as follows:

3.09 PAVING TOLERANCES

A. Comply with tolerances in ACI 117 and as follows:

1. Elevation: 3/4 inch.
2. Thickness: Plus 3/8 inch, minus 1/4 inch.
3. Surface: Gap below 10-foot- long, unleveled straightedge not to exceed 1/2 inch.
4. Alignment of Tie-Bar End Relative to Line Perpendicular to Paving Edge: 1/2 inch per 12 inches of tie bar.
5. Lateral Alignment and Spacing of Dowels: 1 inch.
6. Vertical Alignment of Dowels: 1/4 inch.
7. Alignment of Dowel-Bar End Relative to Line Perpendicular to Paving Edge: 1/4 inch per 12 inches of dowel.
8. Joint Spacing: 3 inches.
9. Contraction Joint Depth: Plus 1/4 inch, no minus.
10. Joint Width: Plus 1/8 inch, no minus.

3.010 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing agency to perform tests and inspections.

B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. or fraction thereof of each concrete mixture placed each day.

   a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C 231, pressure method; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F and below and when it is 80 deg F and above, and one test for each composite sample.
5. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of three standard cylinder specimens for each composite sample.
6. Compressive-Strength Tests: ASTM C 39/C 39M; test one specimen at seven days and two specimens at 28 days.

   a. A compressive-strength test shall be the average compressive strength from two specimens obtained from same composite sample and tested at 28 days.

C. Strength of each concrete mixture will be satisfactory if average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.

D. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.

E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.

F. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.

G. Concrete paving will be considered defective if it does not pass tests and inspections.

H. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

I. Prepare test and inspection reports.

3.011 REPAIRS AND PROTECTION

A. Remove and replace concrete paving that is broken, damaged, or defective or that does not comply with requirements in this Section. Remove work in complete sections from joint to joint unless otherwise approved by Architect.

B. Drill test cores, where directed by Architect, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory paving areas with portland cement concrete bonded to paving with epoxy adhesive.

C. Protect concrete paving from damage. Exclude traffic from paving for at least 14 days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.

D. Maintain concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep paving not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION

SECTION 33 41 00

STORM UTILITY DRAINAGE PIPING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Pipe and fittings.
2. Nonpressure transition couplings.
3. Cleanouts.
4. Drains.
5. Manholes.
6. Channel drainage systems.
7. Catch basins.
8. Stormwater inlets.

1.02 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings:

1. Manholes: Include plans, elevations, sections, details, frames, and covers.
2. Catch basins and stormwater inlets. Include plans, elevations, sections, details, frames, covers, and grates.

C. Product Certificates: For each type of cast-iron soil pipe and fitting, from manufacturer.

D. Field quality-control reports.

1.03 DELIVERY, STORAGE, AND HANDLING

A. Do not store plastic manholes, pipe, and fittings in direct sunlight.

B. Protect pipe, pipe fittings, and seals from dirt and damage.

C. Handle manholes according to manufacturer's written rigging instructions.

D. Handle catch basins and stormwater inlets according to manufacturer's written rigging instructions.

1.04 PROJECT CONDITIONS

A. Interruption of Existing Storm Drainage Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:

1. Notify Program Manager no fewer than two days in advance of proposed interruption of service.

2. Do not proceed with interruption of service without Program Manager's written permission.

PART 2 - PRODUCTS

2.01 DUCTILE-IRON, CULVERT PIPE AND FITTINGS

A. Pipe: ASTM A 716, for push-on joints.

B. Standard Fittings: AWWA C110, ductile or gray iron, for push-on joints.

C. Compact Fittings: AWWA C153, for push-on joints.

D. Gaskets: AWWA C111, rubber.

2.02 DUCTILE-IRON, PRESSURE PIPE AND FITTINGS

A. Mechanical-Joint Piping:

1. Pipe: AWWA C151, with bolt holes in bell.
2. Standard Fittings: AWWA C110, ductile or gray iron, with bolt holes in bell.
3. Compact Fittings: AWWA C153, with bolt holes in bells.
4. Glands: Cast or ductile iron, with bolt holes and high-strength, cast-iron or high-strength, low-alloy steel bolts and nuts.
5. Gaskets: AWWA C111, rubber, of shape matching pipe, fittings, and glands.

2.03 PE PIPE AND FITTINGS

A. Corrugated PE Drainage Pipe and Fittings NPS 3 to NPS 10: AASHTO M 252M, Type S, with smooth waterway for coupling joints.

1. Silttight Couplings: PE sleeve with ASTM D 1056, Type 2, Class A, Grade 2 gasket material that mates with tube and fittings.

B. Corrugated PE Pipe and Fittings NPS 12 to NPS 15: AASHTO M 294M, Type S, with smooth waterway for coupling joints.

1. Silttight Couplings: PE sleeve with ASTM D 1056, Type 2, Class A, Grade 2 gasket material that mates with pipe and fittings.

2.04 CONCRETE PIPE AND FITTINGS

A. Reinforced-Concrete Sewer Pipe and Fittings: ASTM C 76.

1. Bell-and-spigot ends and gasketed joints with ASTM C 443, rubber gaskets
2. Class III, Wall B.

2.05 CLEANOUTS

A. Cast-Iron Cleanouts:

1. Description: ASME A112.36.2M, round, gray-iron housing with clamping device and round, secured, scoriated, gray-iron cover. Include gray-iron ferrule with inside calk or spigot connection and countersunk, tapered-thread, brass closure plug.
2. Top-Loading Classification(s): Heavy Duty and Extra-Heavy Duty.
3. Sewer Pipe Fitting and Riser to Cleanout: ASTM A 74, Service class, cast-iron soil pipe and fittings.

2.06 DRAINS

A. Cast-Iron Area Drains:

1. Description: ASME A112.6.3 gray-iron round body with anchor flange and round grate. Include bottom outlet with inside calk or spigot connection, of sizes indicated.
2. Top-Loading Classification(s): Medium and Heavy Duty.

2.07 MANHOLES

A. Standard Precast Concrete Manholes:

1. Description: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for sealant joints.
2. Diameter: 48 inches minimum unless otherwise indicated.
3. Ballast: Increase thickness of precast concrete sections or add concrete to base section as required to prevent flotation.
4. Base Section: 6-inch minimum thickness for floor slab and 5-inch minimum thickness for walls and base riser section, and separate base slab or base section with integral floor.
5. Riser Sections: 5-inch minimum thickness, and lengths to provide depth indicated.
6. Top Section: Eccentric-cone type unless concentric-cone or flat-slab-top type is indicated, and top of cone of size that matches grade rings.
7. Joint Sealant: ASTM C 990, bitumen or butyl rubber.
8. Resilient Pipe Connectors: ASTM C 923, cast or fitted into manhole walls, for each pipe connection.
9. Steps: Individual Polypropylene steps with steel reinforcement, wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 16-inch intervals. At least one step is required per manhole.
10. Grade Rings: Reinforced-concrete rings, 6- to 9-inch total thickness, to match diameter of manhole frame and cover, and height as required to adjust manhole frame and cover to indicated elevation and slope.

B. Designed Precast Concrete Manholes:

1. Description: ASTM C 913; designed according to ASTM C 890 for A-16 (AASHTO HS20-44), heavy-traffic, structural loading; of depth, shape, and dimensions indicated, with provision for sealant joints.
2. Ballast: Increase thickness of one or more precast concrete sections or add concrete to manhole as required to prevent flotation.
3. Joint Sealant: ASTM C 990, bitumen or butyl rubber.
4. Resilient Pipe Connectors: ASTM C 923, cast or fitted into manhole walls, for each pipe connection.
5. Steps: Individual Polypropylene steps with steel reinforcement, wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step.

Cast or anchor steps into sidewalls at 16-inch intervals. At least one step is required per manhole.

6. Grade Rings: Reinforced-concrete rings, 6- to 9-inch total thickness, to match diameter of manhole frame and cover, and of height required to adjust manhole frame and cover to indicated elevation and slope.

C. Manhole Frames and Covers:

1. Description: Cast Iron; 24-inch ID by 6-inch riser with 4-inch- minimum width flange and 26-inch- diameter cover. Include indented top design with lettering cast into cover, using wording equivalent to "STORM SEWER."
2. Material: ASTM A 48, Class 35 gray iron unless otherwise indicated.

2.08 CONCRETE

A. General: Cast-in-place concrete according to ACI 318, ACI 350/350R, and the following:

1. Cement: ASTM C 150, Type II.
2. Fine Aggregate: ASTM C 33, sand.
3. Coarse Aggregate: ASTM C 33, crushed gravel.
4. Water: Potable.

B. Portland Cement Design Mix: 3000 psi minimum, with 0.45 maximum water/cementitious materials ratio.

1. Reinforcing Fabric: ASTM A 185/A 185M, steel, welded wire fabric, plain.
2. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (420 MPa) deformed steel.

C. Manhole Channels and Benches: Factory or field formed from concrete. Portland cement design mix, 3000 psi minimum, with 0.45 maximum water/cementitious materials ratio. Include channels and benches in manholes.

1. Channels: Concrete invert, formed to same width as connected piping, with height of vertical sides to one-half of pipe diameter. Form curved channels with smooth, uniform radius and slope.

   a. Invert Slope: 2 percent through manhole.

2. Benches: Concrete, sloped to drain into channel.

   a. Slope: 4 percent.

D. Ballast and Pipe Supports: Portland cement design mix, 3000 psi minimum, with 0.58 maximum water/cementitious materials ratio.

1. Reinforcing Fabric: ASTM A 185/A 185M, steel, welded wire fabric, plain.
2. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (420 MPa) deformed steel.

2.09 GRATE INLETS

A. Standard Precast Concrete Catch Basins:

1. Description: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for sealant joints.

2. Base Section: 6-inch minimum thickness for floor slab and 5-inch minimum thickness for walls and base riser section, and separate base slab or base section with integral floor.
3. Riser Sections: 5-inch minimum thickness, 48-inch diameter, and lengths to provide depth indicated.
4. Top Section: Eccentric-cone type unless concentric-cone or flat-slab-top type is indicated. Top of cone of size that matches grade rings.
5. Joint Sealant: ASTM C 990, bitumen or butyl rubber.
6. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch total thickness, that match 24-inch- diameter frame and grate.
7. Steps: Individual FRP steps or FRP ladder, wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch intervals. At least one step is required per manhole.
8. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section.

B. Frames and Grates: ASTM A 536, Grade 60-40-18, ductile iron designed for A-16, structural loading. Include flat grate with small square or short-slotted drainage openings.

1. Size: 30 by 30 inches minimum unless otherwise indicated.
2. Grate Free Area: Approximately 50 percent unless otherwise indicated.

2.010 STORMWATER INLETS

A. Curb Inlets: Made with vertical curb opening.

B. Gutter Inlets: Made with horizontal gutter opening. Include heavy-duty frames and grates.

C. Combination Inlets: Made with vertical curb and horizontal gutter openings. Include heavy-duty frames and grates.

D. Frames and Grates: Heavy duty.

2.011 PIPE OUTLETS

A. Head Walls: Cast-in-place reinforced concrete, with apron and tapered sides.

B. Riprap Basins: Broken, irregularly sized and shaped, graded stone according to NSSGA's "Quarried Stone for Erosion and Sediment Control."

1. Average Size: ALDOT Class II

C. Filter Stone: ALDOT #57.

D. Energy Dissipaters: According to NSSGA's "Quarried Stone for Erosion and Sediment Control," No. A-1, 3-ton average weight armor stone, unless otherwise indicated.

PART 3 - EXECUTION

3.01 EARTHWORK

A. Excavation, trenching, and backfilling are specified in Division 31 Section "Earth Moving."

3.02 PIPING INSTALLATION

A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground storm drainage piping. Location and arrangement of piping layout take into account design considerations. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.

B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.

C. Install manholes for changes in direction unless fittings are indicated. Use fittings for branch connections unless direct tap into existing sewer is indicated.

D. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

E. When installing pipe under streets or other obstructions that cannot be disturbed, use pipe-jacking process of microtunneling.

F. Install gravity-flow, nonpressure drainage piping according to the following:

1. Install piping pitched down in direction of flow.
2. Install piping with 36-inch minimum cover.
3. Install ductile-iron piping and special fittings according to AWWA C600 or AWWA M41.
4. Install PE corrugated sewer piping according to ASTM D 2321.
5. Install reinforced-concrete sewer piping according to ASTM C 1479 and ACPA's "Concrete Pipe Installation Manual."

3.03 PIPE JOINT CONSTRUCTION

A. Join gravity-flow, nonpressure drainage piping according to the following:

1. Join ductile-iron piping and special fittings according to AWWA C600 or AWWA M41.
2. Join corrugated PE piping according to ASTM D 3212 for push-on joints.
3. Join reinforced-concrete sewer piping according to ACPA's "Concrete Pipe Installation Manual" for rubber-gasketed joints.
4. Join dissimilar pipe materials with nonpressure-type flexible couplings.

3.04 CLEANOUT INSTALLATION

A. Install cleanouts and riser extensions from sewer pipes to cleanouts at grade. Use cast-iron soil pipe fittings in sewer pipes at branches for cleanouts and cast-iron soil pipe for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in sewer pipe.

1. Use Light-Duty, top-loading classification cleanouts in earth or unpaved foot-traffic areas.
2. Use Medium-Duty, top-loading classification cleanouts in paved foot-traffic areas.
3. Use Heavy-Duty, top-loading classification cleanouts in vehicle-traffic service areas.
4. Use Extra-Heavy-Duty, top-loading classification cleanouts in roads.

B. Set cleanout frames and covers in earth in cast-in-place concrete block, 18 by 18 by 12 inches deep. Set with tops 1 inch above surrounding earth grade.

C. Set cleanout frames and covers in concrete pavement and roads with tops flush with pavement surface.

3.05 DRAIN INSTALLATION

A. Install type of drains in locations indicated.

1. Use Light-Duty, top-loading classification drains in earth or unpaved foot-traffic areas.
2. Use Medium-Duty, top-loading classification drains in paved foot-traffic areas.
3. Use Heavy-Duty, top-loading classification drains in vehicle-traffic service areas.
4. Use Extra-Heavy-Duty, top-loading classification drains in roads.

B. Embed drains in 4-inch minimum concrete around bottom and sides.

C. Fasten grates to drains if indicated.

D. Set drain frames and covers with tops flush with pavement surface.

E. Assemble trench sections with flanged joints.

F. Embed trench sections in 4-inch minimum concrete around bottom and sides.

3.06 MANHOLE INSTALLATION

A. General: Install manholes, complete with appurtenances and accessories indicated.

B. Install precast concrete manhole sections with sealants according to ASTM C 891.

C. Where specific manhole construction is not indicated, follow manhole manufacturer's written instructions.

D. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. Set tops 3 inches above finished surface elsewhere unless otherwise indicated.

3.07 GRATE INLET INSTALLATION

A. Construct grate inlets to sizes and shapes indicated.

B. Set frames and grates to elevations indicated.

3.08 STORMWATER INLET AND OUTLET INSTALLATION

A. Construct inlet head walls, aprons, and sides of reinforced concrete, as indicated.

B. Construct riprap of broken stone, as indicated.

C. Install outlets that spill onto grade, anchored with concrete, where indicated.

D. Install outlets that spill onto grade, with flared end sections that match pipe, where indicated.

E. Construct energy dissipaters at outlets, as indicated.

3.09 CONCRETE PLACEMENT

A. Place cast-in-place concrete according to ACI 318.

3.010 CHANNEL DRAINAGE SYSTEM INSTALLATION

A. Install with top surfaces of components, except piping, flush with finished surface.

B. Assemble channel sections to form slope down toward drain outlets. Use sealants, adhesives, fasteners, and other materials recommended by system manufacturer.

C. Embed channel sections and drainage specialties in 5-inch minimum concrete around bottom and sides.

D. Fasten grates to channel sections if indicated.

E. Assemble channel sections with flanged or interlocking joints.

F. Embed channel sections in 6-inch minimum concrete around bottom and sides.

3.011 CONNECTIONS

A. Make connections to existing piping and underground manholes.

1. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe; install wye fitting into existing piping; and encase entire wye fitting, plus 6-inch overlap, with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.
2. Make branch connections from side into existing piping, NPS 4 to NPS 20. Remove section of existing pipe, install wye fitting into existing piping, and encase entire wye with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.
3. Make branch connections from side into existing piping, NPS 21 or larger, or to underground manholes and structures by cutting into existing unit and creating an opening large enough to allow 3 inches of concrete to be packed around entering connection. Cut end of connection pipe passing through pipe or structure wall to conform to shape of and be flush with inside wall unless otherwise indicated. On outside of pipe, manhole, or structure wall, encase entering connection in 6 inches of concrete for minimum length of 12 inches to provide additional support of collar from connection to undisturbed ground.

    a. Use concrete that will attain a minimum 28-day compressive strength of 3000 psi unless otherwise indicated.
    b. Use epoxy-bonding compound as interface between new and existing concrete and piping materials.

4. Protect existing piping, manholes, and structures to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.

3.012 CLOSING ABANDONED STORM DRAINAGE SYSTEMS

A. Abandoned Piping: Close open ends of abandoned underground piping indicated to remain in place. Include closures strong enough to withstand hydrostatic and earth pressures that may result after ends of abandoned piping have been closed. Use either procedure below:

1. Close open ends of piping with at least 8-inch- thick, brick masonry bulkheads.
2. Close open ends of piping with threaded metal caps, plastic plugs, or other acceptable methods suitable for size and type of material being closed. Do not use wood plugs.

B. Abandoned Manholes and Structures: Excavate around manholes and structures as required and use one procedure below:

1. Remove manhole or structure and close open ends of remaining piping.
2. Remove top of manhole or structure down to at least 48 inches below final grade. Fill to within 12 inches of top with stone, rubble, gravel, or compacted dirt. Fill to top with concrete.

C. Backfill to grade according to Division 31 Section "Earth Moving."

3.013 IDENTIFICATION

A. Materials and their installation are specified in Division 31 Section "Earth Moving." Arrange for installation of green warning tape directly over piping and at outside edge of underground structures.

1. Use detectable warning tape over ferrous piping.
2. Use detectable warning tape over nonferrous piping and over edges of underground structures.

3.014 FIELD QUALITY CONTROL

A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.

1. Submit separate reports for each system inspection.
2. Defects requiring correction include the following:

a. Alignment: Less than full diameter of inside of pipe is visible between structures.
b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
c. Damage: Crushed, broken, cracked, or otherwise damaged piping.
d. Infiltration: Water leakage into piping.
e. Exfiltration: Water leakage from or around piping.

3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
4. Reinspect and repeat procedure until results are satisfactory.

B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.

1. Do not enclose, cover, or put into service before inspection and approval.
2. Test completed piping systems according to requirements of authorities having jurisdiction.
3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
4. Submit separate report for each test.

5. Gravity-Flow Storm Drainage Piping: Test according to requirements of authorities having jurisdiction, UNI-B-6, and the following:

   a. Exception: Piping with soiltight joints unless required by authorities having jurisdiction.
   b. Option: Test plastic piping according to ASTM F 1417.
   c. Option: Test concrete piping according to ASTM C 924.

C. Leaks and loss in test pressure constitute defects that must be repaired.

D. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

3.015 CLEANING

A. Clean interior of piping of dirt and superfluous materials. Flush with potable water.

END OF SECTION